Data Archive Users' Guide

for the

Descent Imager and Spectral Radiometer (DISR)

on the

Huygens Probe

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Version 2.0

International Traffic in Arms Regulations (ITAR) disclosure...

Index

Preface…

The Descent Imager and Spectral Radiometer data are in NASA's Planetary Data System Archive on the Planetary Atmospheres Data Node located in the Astronomy building of New Mexico State University in Las Cruces, NM. The data volume was placed in the archive beginning in October 2006, and first released in May 2007.

The link to the DISR page is:
http://atmos.nmsu.edu/data_and_services/atmospheres_data/Huygens/DISR.html

The direct link to the DISR data is: http://atmos.nmsu.edu/PDS/data/hpdisr_0001/

Throughout this document "hpdisr_0001" refers to the initial data volume released as: "HP-SSA-DISR-2/3-EDR/RDR-V1.0", created 2007-05-17T10:05:23.688Z.

Since this was a joint US/European mission the Archive is also available on the European Space Agency's Planetary Space Archive:
http://www.rssd.esa.int/index.php?project=PSA&page=huygens

Although the DISR Archive contains documentation for every type of data contained in the archive, the Data Archive Users Guide was commissioned to make access to the data easier for those who are not intimately familiar with the instrument or the mission. At the core of the Users' Guide are examples of how to access and use the DISR data, with supporting background information and references to related publications.

In this Guide "Dataset" is used to designate the data from one observation or collection period (e.g. a Sun sensor dataset), and DISR data or data volume designates the broader collection of data.

1.0 Introduction & Science Objectives

On January 14, 2005, the Huygens Probe, part of the joint NASA/ESA Cassini-Huygens mission to Saturn, entered the atmosphere of Titan, descended for 2.5 hours under a parachute and eventually landed softly on the surface of Titan. Six experiments collected data during the descent and on ground. This guide provides information and insight to assist the user in accessing the archive of one of those instruments, the Huygens Descent Imager and Spectral Radiometer (DISR).

The Huygens probe collected the only existing in-situ data of Titan's lower atmosphere. The DISR instrument obtained images of Titan's surface, measured the upward and downward sunlight scattered intensity (from about 350 to 1700 nm), collected sky intensity strips (6º wide x 50º high) in the red (935 nm) and blue (500 nm) for two polarization states (solar aureole), and recorded the Sun's intensity attenuation (939 nm) from about 143 km altitude to the surface.

The instrument was designed to achieve science objectives in four major areas:
1) The thermal balance and dynamics of Titan's atmosphere,
2) The distribution and properties of aerosol and cloud particles,
3) The nature of Titan's surface, and
4) The composition of the atmosphere.

The details of how the science goals were to be achieved is presented in the archived document, "The Descent Imager/Spectral Radiometer (DISR) Aboard Huygens" (Ref 1), and summarized below:

The solar flux was measured at 38 altitude levels during the Titan Descent. The profile of the net flux (down-up) gives the atmospheric absorption at each level. The measured opacity and temperature profile is used to determine the radiative cooling profile. The sky intensity strips via the solar aureole camera were measured at 69 altitude levels and from Titan's surface. Radiative transfer models of the atmosphere were constructed using the opacity structure, sky polarization, particle scattering properties (optical depth, single-scattering albedo and phase function), and temperature profile to determine aerosol size, shape and distribution, which leads to constraints on the composition of the atmosphere. The growth of methane absorption bands in the spectra obtained at different altitudes gives the methane mixing profile.

Three hundred and seventy five images were transmitted during the descent, and another 240 from Titan's surface. These are used to study the wind profile, and surface geology, topography, propensity of liquid, erosion morphology, etc.

2.0 Instrument Description

The DISR consists of 14 sub-instruments; Three panchromatic imagers (side looking, downward looking medium resolution, and downward looking high resolution), four solar aureole cameras, two spectrometers covering the visible spectrum, two spectrometers in the near infrared, two violet photometers, and a Sun sensor.

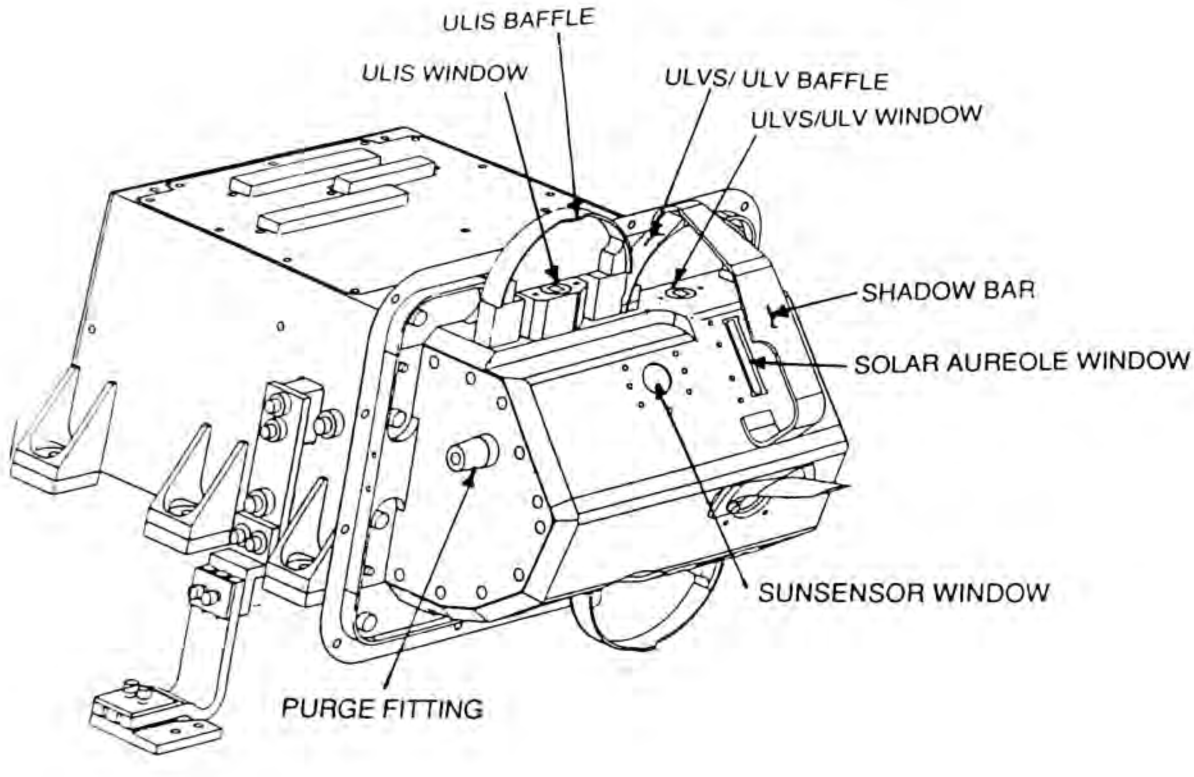


Figure 2-1: View of the top of the DISR sensor head showing its upward looking instruments.

ULIS = Upward Looking Infrared Spectrometer
ULVS = Upward Looking Visible Spectrometer
ULV = Upward Looking Violet Photometer

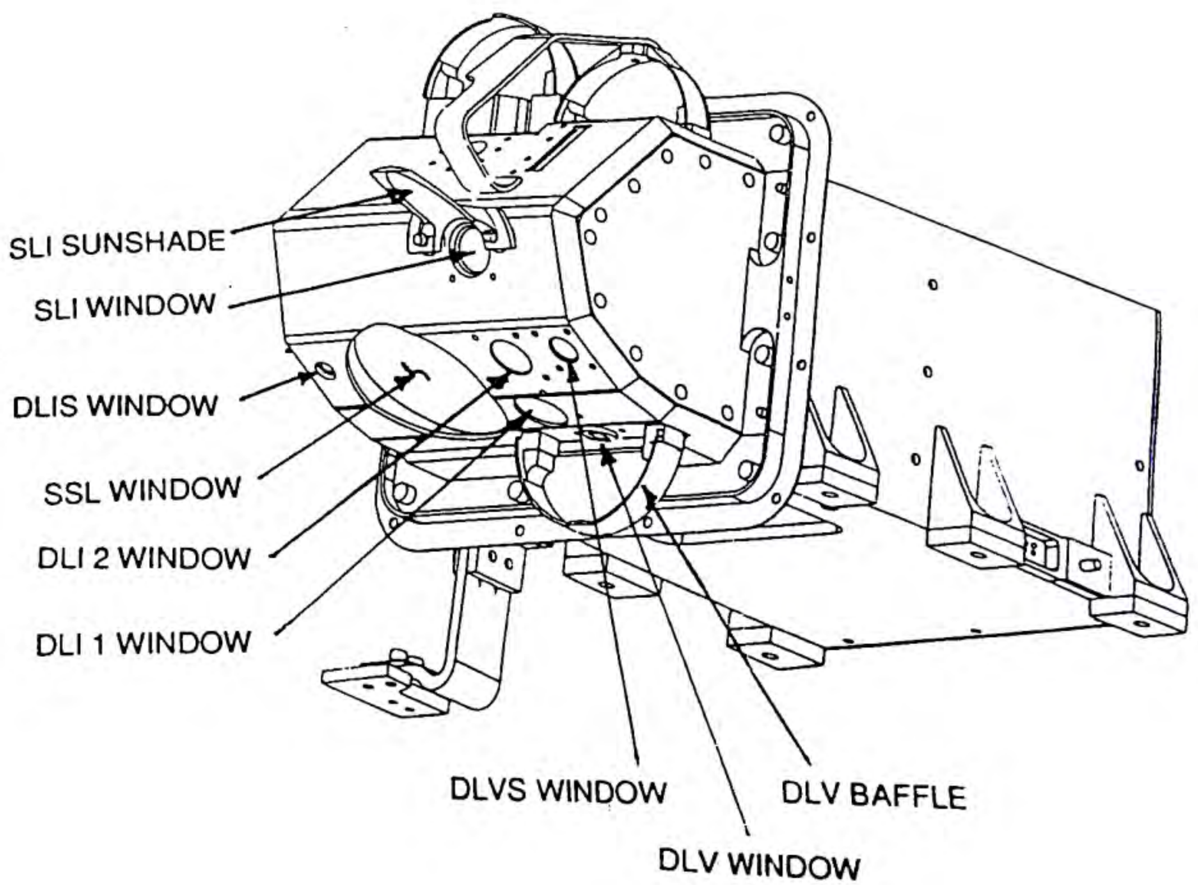


Figure 2-2: View of the bottom of the DISR sensor head showing its downward looking instruments.

DLI 1 = Downward Looking Imager 1 (aka High Resolution Imager, HRI)
DLI 2 = Downward Looking Imager 2 (aka Medium Resolution Imager, MRI)
DLIS = Downward Looking Infrared Spectrometer
DLVS = Downward Looking Visible Spectrometer
DLV = Downward Looking Violet Photometer
SLI = Side Looking Imager
SSL = Surface Science Lamp

The DISR Sensor Head (SH) protruded from the side of the Huygens probe. As the probe rotated below the parachute the SH captured observations looking both upward and downward at pre-planed azimuths relative to the predicted Sun. (However, problems with the Sun sensor caused azimuthal variations as described in section 3.0.)

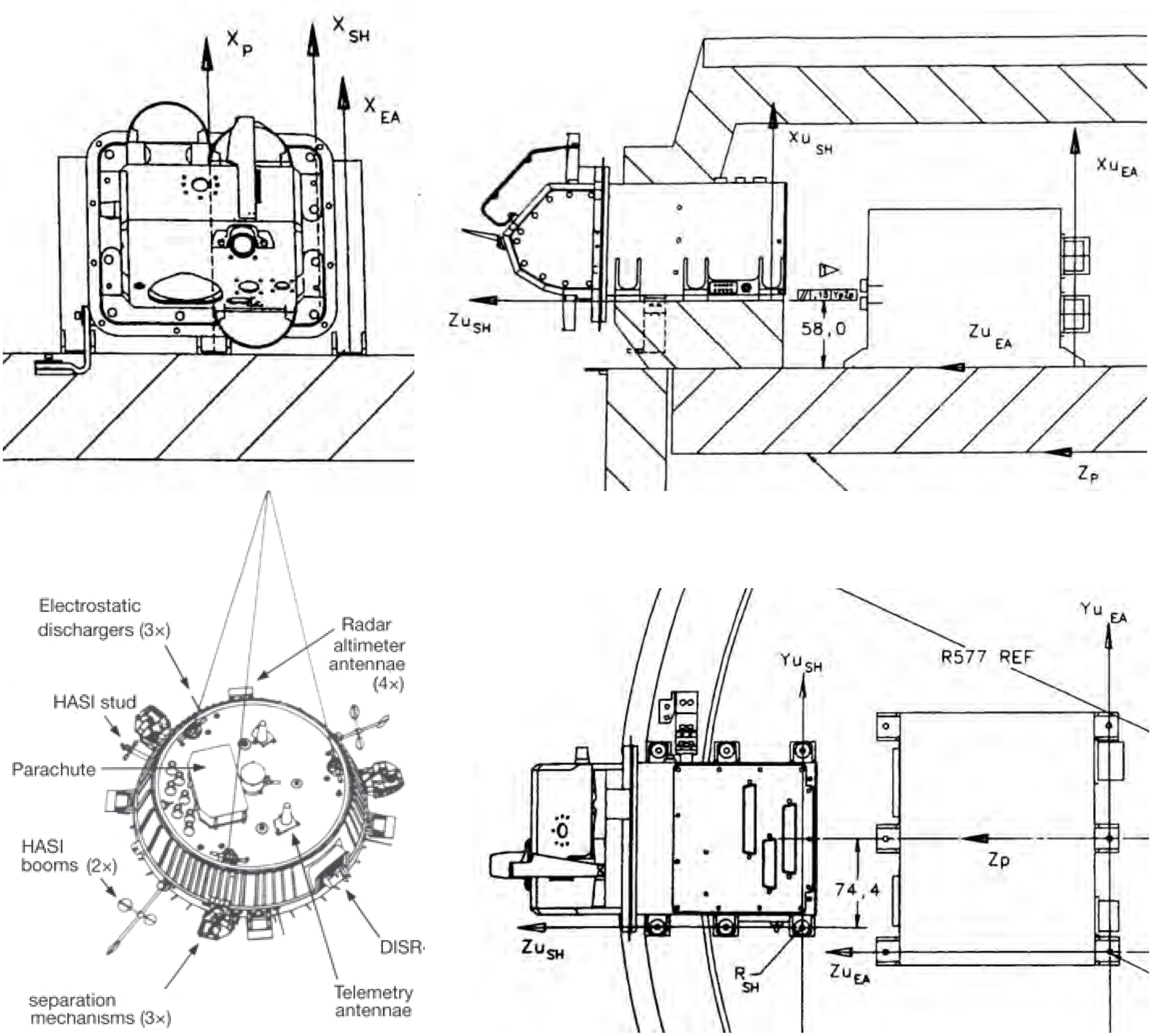


Figure 2.3 - Location of the DISR Sensor Head (SH) and Electronics Assembly (EA) in Huygens probe.

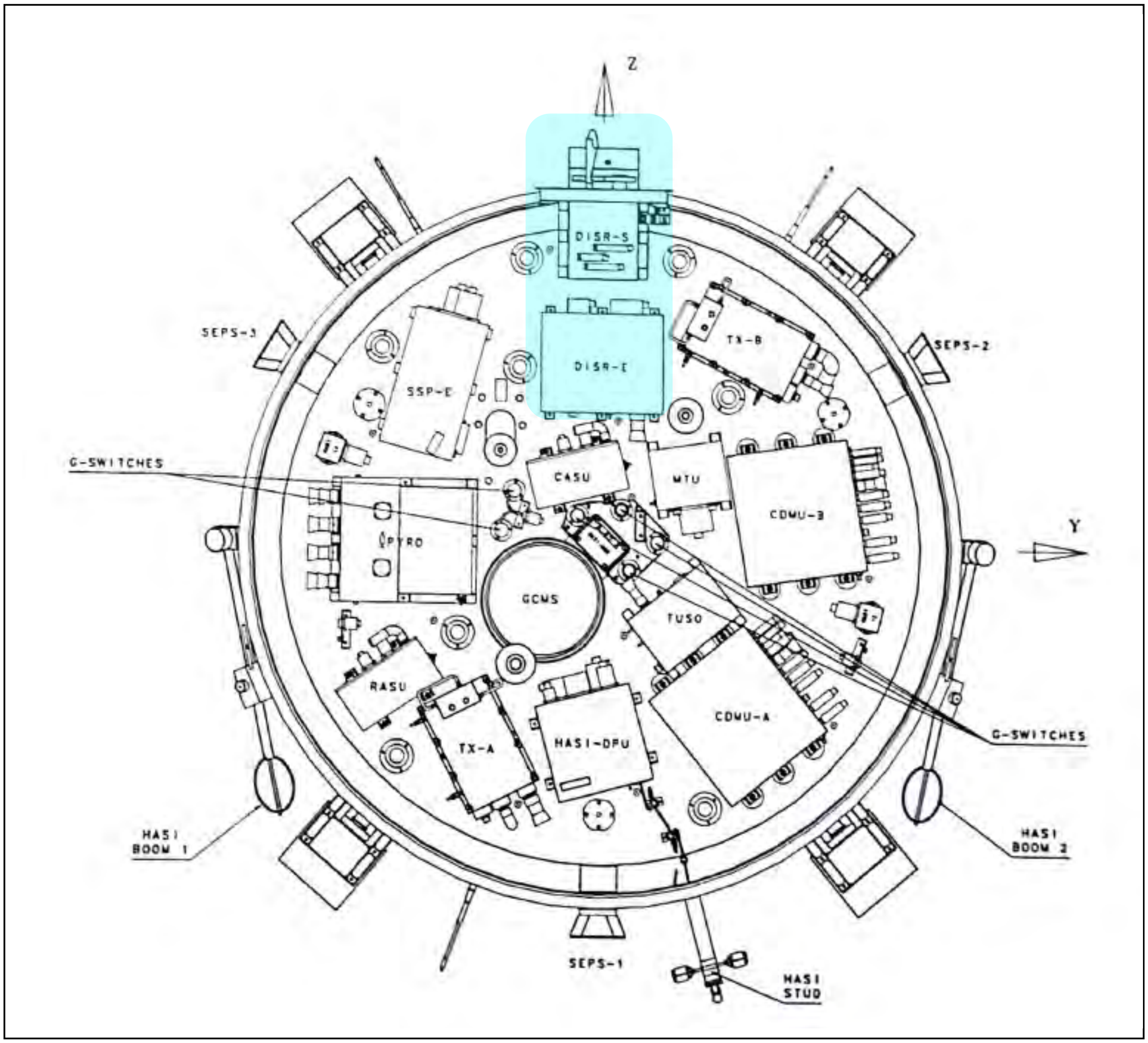


Figure 2-4: Location of Instruments on Huygens probe.

The data were taken from an altitude of approximately 143km down to Titan's surface. The data acquisition strategy was optimized by altitude and spin rate to meet the science objectives, and organized into groups of measurements called cycles.

The performance of the instrument during the descent was good, but not entirely perfect. A discussion of the off nominal behavior is presented in section 3.

The DISR data are presented in the PDS archive as described in section 4. Details of the individual instruments and their calibration are presented in section 5. Much more detailed discussion of the DISR instrument can be found in the archive under:

hpdisr_0001/CATALOG/DISRINST.CAT,
hpdisr_0001/DOCUMENT/DISR_SUPPORTING_DOCUMENTS/SPACE_SCIENCE_REVIEW,
hpdisr_0001/DOCUMENT/DISR_SUPPORTING_DOCUMENTS/ESA_SP_1177, and

hpdisr_0001/DOCUMENT/DISR_SUPPORTING_DOCUMENTS/EXPERIMENT_USERS_MANUAL.

The following tables summarize the characteristics of the Upward and Downward looking DISR sub-instruments:

Upward Looking DISR Sub-instruments Summary

Upward–Looking Instrument	Azimuth Range	Zenith Range	Spectral Range (nm)	Spectral Scale (per pixel)	Spatial Scale (per pixel)	Pixel Format
Violet Photometer (ULV)	170°	5°–88°	350–480	–	–	1
Visible Spectrometer (ULVS)	170°	5°–88°	480–960	2.4 nm	–	8 x 200
Infrared Spectrometer (ULIS)	170°	5°–88°	870–1700	6.3 nm	–	132
Solar Aureole (SA 1) Vertical Polarization	6°	25°–75°	500±25	–	1°	6 x 50
Solar Aureole (SA 2) Horizontal Polarization	6°	25°–75°	500±25	–	1°	6 x 50
Solar Aureole (SA 3) Vertical Polarization	6°	25°–75°	935±35	–	1°	6 x 50
Solar Aureole (SA 4) Horizontal Polarization	6°	25°–75°	935±35	–	1°	6 x 50
Sun Sensor (SS) (64° cone FOV)	64° cone	25°–75°	939±6	–	–	1

Downward-Looking DISR Sub-Instruments Summary

Downward–Looking Instrument	Azimuth Range	Nadir Range	Spectral Range (nm)	Spectral Scale (per pixel)	Spatial Scale (per pixel)	Pixel Format
Violet Photometer (DLV)	170°	5°–88°	350–480	–	–	1
Visible Spectrometer (DLVS)	4°	10°–50°	480–960	2.4 nm	2°	20 x 200
Infrared Spectrometer (DLIS)	6°	15.5°–24.5°	870–1700	6.3 nm	–	132
High–Resolution Imager (HRI)	9.6°	6.4°–21.6°	660–1000	–	0.06°	160 x 254
Medium–Resolution Imager (MRI)	21.1°	15.75°–46.25°	660–1000	–	0.12°	176 x 254
Side–Looking Imager (SLI)	25.6°	45.2°–96°	660–1000	–	0.20°	128 x 254

The figure below shows the relative fields of view of the various DISR sub-instruments on one of the primary calibration devices, the 24 inch integrating sphere (described in greater detail in DOCUMENT/DISR_CALIBRATION_DOCUMENTS/CALIBRATION_STANDARD/INTEGRATING_SPHERE_HOMOGENEITY).

Below is presented the view from the bottom of the integrating sphere, looking upward. The DISR is inserted from the bottom of the figure. The source and detectors are inserted at either the 4 or 8 o'clock positions, depending on the calibration mode. The FOV's for the downward looking instruments are shown on the bottom of the sphere (HRI, MRI, SLI, DLVS & DLIS), and the approximate position of the Surface Science Lamp (SSL) beam. Note the SLI extends about 6 degrees above the horizon, and the DLV covers most of the lower quarter sphere (the light green line).

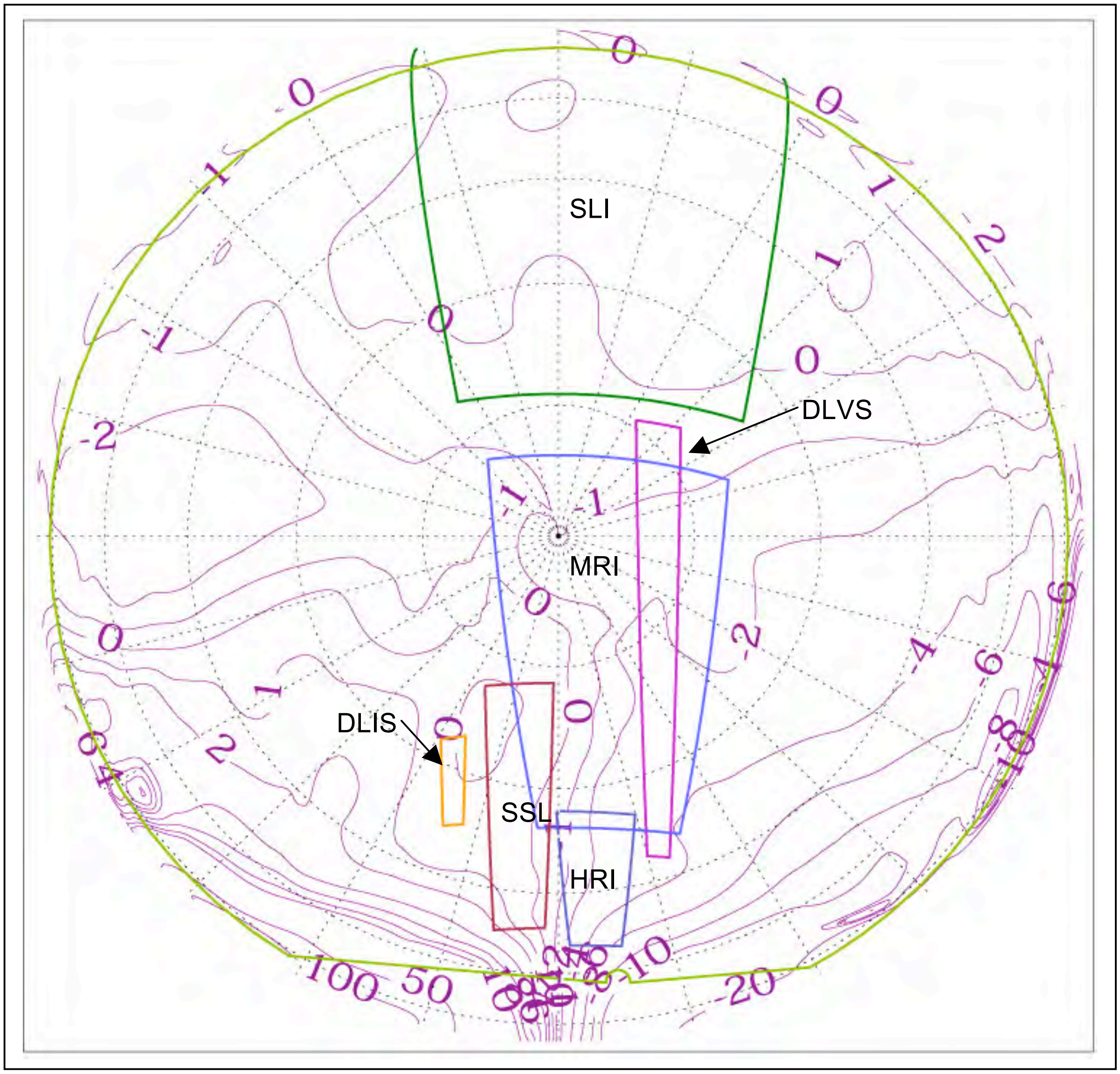


Figure 2-5: Worm's Eye view of the sub-instrument footprints on the 18 inch integrating sphere showing the relative spatial coverage. Some parallax exists since not all optics are at the center of the sphere. The contour lines show sphere intensity variation in percent.

Below is the companion figure, showing the FOV's of the upward looking DISR sub-instruments on the top of the 18 inch calibration integrating sphere. Note the SLI FOV wrapping from below (the green line toward top), and the FOV of the ULV, ULVS & ULIS cover most of the upper quarter sphere (the yellow & dark blue lines).

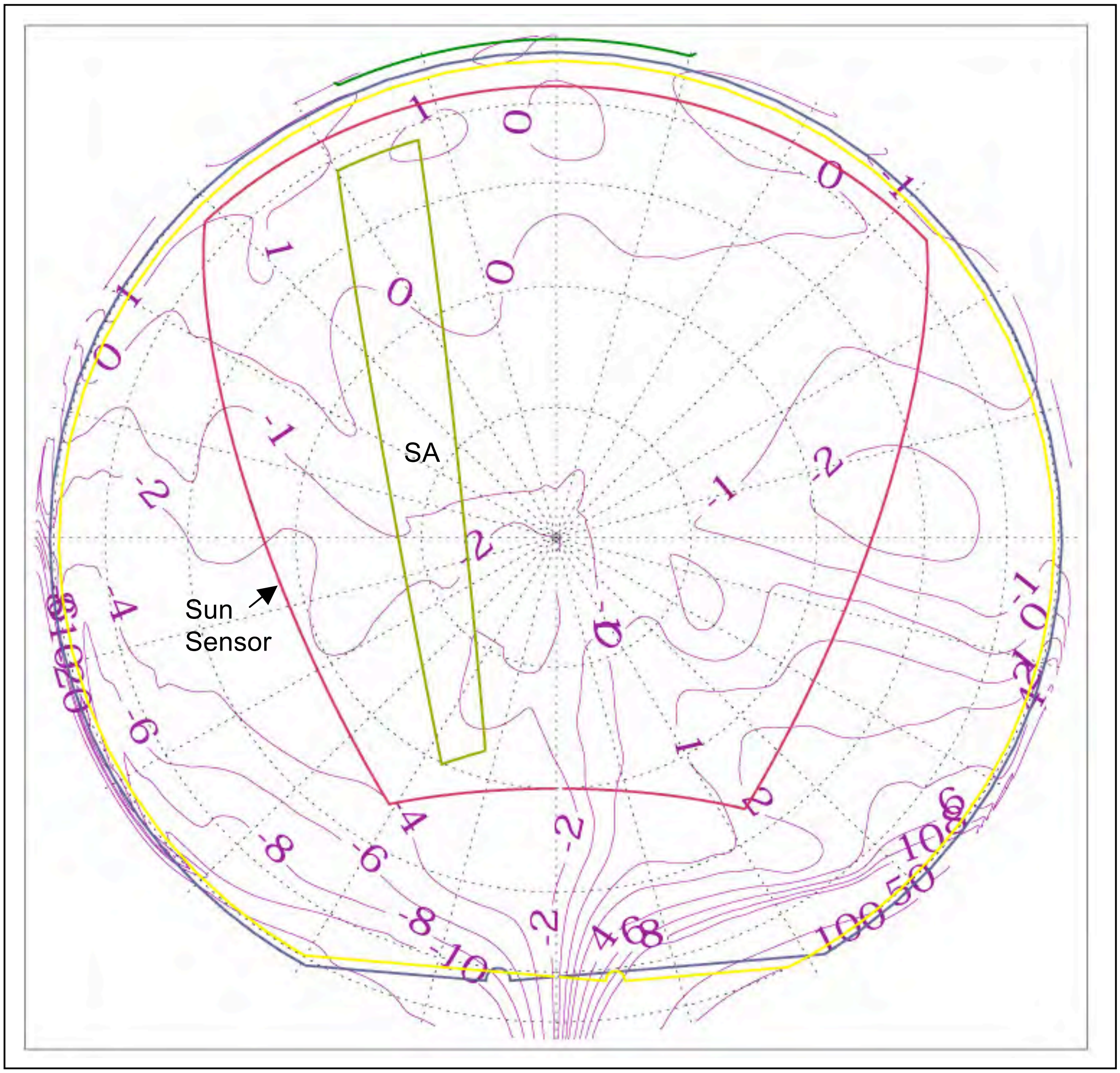


Figure 2-6: Bird's Eye view of the sub-instrument footprints on the 18 inch integrating sphere showing the relative spatial coverage. The contour lines show sphere intensity variation in percent.

3.0 Titan Descent Sequence & Divergences

A description of the intended descent sequence is presented in section 2 of this document, and in much greater detain in Reference 1, which exists in the PSS archive as:

hpdisr_0001/DOCUMENT/DISR_SUPPORTING_DOCUMENTS/ESA_SP_1177

In summary, the instrument protrudes from the side of the Huygens probe and is activated after parachute deployment at ~143 km altitude. As the probe rotates the instrument is designed to take observations at pre-determined azimuths, relative to the Sun as detected by the DISR Sun sensor. The instrument groups observations in Descent Cycles which balance desired observations with telemetry buffer space and altitude. High in the atmosphere the instrument takes plentiful images and spectra to assure the telemetry poling opportunities are optimized. At 20 km altitude the buffer is drained to secure the data taken, and lower in the atmosphere the buffer is kept only as full as necessary to avoid missed poling opportunities. At two altitudes (10 & 5 km) rapid spectral maps of the surface are to be obtained.

A good, although not entirely complete set of data was collected during the Titan descent. Most notably, only half of the DISR images taken were transmitted back to the Earth due to loss of one telemetry channel. As a result fewer overlapping images of Titan's surface were obtained and the number of stereographic images possible was significantly fewer than planned. However, even with this loss it has been possible to create a continuous view of the Titan descent, with no 'holes' in the construction. These assembled datasets are available in the EXTRAS directory of the archive as mosaics and movies of the descent as a visual aid in understanding the scope and sequencing of the data.

Just over a third (99 of 268) of the IR datasets collected were not transmitted to Cassini due to loss of the Channel A data. All of the IR data taken above 18 km, and between 18 and 4 km were sent redundantly (on both channels), however in hopes of collecting higher sampled data of Titan's surface the spectrophotometric maps taken at 18 km and 4 km, as well as all data below 4 km were split between the telemetry channels. Although the science was slightly impacted, there was still significant diversity in the data to allow generation of useful radiative transfer models of the atmosphere, and capture of a good sampling of surface spectra. A plot showing when during the descent the IR data was lost is presented in Appendix 13.

No incomplete or corrupted datasets were received from the instrument during the descent. These would be removed by the error checking in the data link. Some datasets were lost after an extended time on Titan's surface as the link margin degraded, but in general the link and probe telecommunications worked amazingly well, resulting in a useful data volume.

High-quality spectral data was collected from the near IR to the Violet, with matching spectral overlap and good spatial coverage. From this data, coupled with the Solar Aureole measurements, it has been possible to derive the atmosphere's optical depth, model Titan's aerosols, determine methane absorption coefficients, and calculate the solar heating rates. Images of features on Titan's surface made it possible to calculate the wind profile (Reference 5) and measure the reflectance spectra of the various terrains that make up Titan's surface (Reference 15).

Besides the data link problem mentioned above, there were other unexpected limitations:

a) The probe swing rates underneath the parachute were about 3 times faster, and with greater amplitude than expected, especially high in the atmosphere. The result is that the DISR Sun sensor was not able to maintain Sun lock throughout the descent, and consequently not all data were taken at the planned azimuths relative to the Sun.

Radiation exposure during the journey to Titan reduced the sensitivity of the Sun sensor. Below 30 km the optical depth of the aerosols exceeded 3 at its sensitive wavelength. This, coupled with the decreasing temperature did not allow the Sun sensor to operate below this point.

A compensating windfall was the realization that variations in the Huygens receiver AGC signal cause by the probe's rotation could be used to deduce the instantaneous azimuth of the probe, significantly aiding reconstruction of the image and spectral fields.

A post flight reconstruction of the azimuth history is presented in Appendix 5, and the deduced six degree of freedom pointing is presented in Appendix 3 at each image epoch.

c) A reversal in spin direction of the probe also caused unforeseen difficulties with the placement of measurements, particularly the IR spectra and the Solar Aureole (SA) Camera Measurements. We obtained no SA data with the Sun behind the shadow-baffle, and actually very little SA data near the Sun at low altitudes. DISR's header azimuths are defined as degrees west of north (counter-clockwise as viewed from above) relative to the Sun vector's projection on Titan's surface, in keeping with the original intended rotation sense of the probe.

d) An anomaly of the radar altimeter had two significant impacts on the DISR data ensemble. The first being that the highest Spectrophotometric map occurred at almost twice the distance from the surface as desired (18 km vs. 10). This was good and bad in that while the resolution was degraded, the coverage was extended to cover some very interesting terrain. The second impact was the loss of our coldest (lowest) calibration cycle, which was decidedly bad.

To understand this occurrence requires some insight into the DISR-Huygens data collection scheme. The altitude reported to the instruments (via the DDB) was generated by the Time-Altitude Table (TAT) until the table reached 25 km (an actual probe altitude of 26.9 km), at which time the DDB switched to using the reported altitude from the radar altimeter which was 14.8 km. This apparent instantaneous drop of ~10 km caused problems for the DISR data collection scheduling software.

The philosophy of the DISR software was to keep the data buffer as full as possible when the altitude was above 20 km to assure always having data available when polled by the probe. Below 20 km the strategy shifted to avoiding additional data (above a small polling margin) in the buffer so as not to loose valuable low altitude data upon impact. To make this transition a special data cycle executed when the DDB altitude reached 20 km, designed to deplete the buffer (called the Drain cycle). In order to avoid getting stuck in a non-data producing mode the Drain cycle was limited to 6 minutes in length.

Since the Drain cycle occurred immediately following a maximum data producing cycle (an Image cycle), the Drain cycle ran the entire 6 minutes. By this time the reported altitude was too low for the Calibration cycle to be scheduled. The radar altimeter continued to report low until it read below 10 km, which triggered the execution of the spectrophotometric map (at 18.3 km actual altitude). Shortly thereafter the radar altimeter began to function more correctly, however the maximum mission time for scheduling a calibration cycle had passed. Consequently the fourth, and coldest, Calibration cycle was missed. The effect is that for the lowest data the instrument performance must be extrapolated over a fairly wide temperature range. Fortunately there were significant data taken over temperature in the laboratory to overcome this loss.

The consequence of an early spectrophotometric map is that the resolution is degraded by nearly a factor of 2, and the signal to noise is also reduced. On the positive side more of Titan's surface is measured, and the variations between bright and dark terrain can be more fully explored (Ref 3).

The probe's altitude history has been painstakingly reconstructed by the Descent Trajectory Working Group (DTWG), and details of their work are presented in the DTWG archive. A comparison of the altitude reported during the descent via the Descent Data Broadcast (DDB), an earlier, reconstructed altitude used in the DISR headers, and the DTWG profile are presented in Appendix 7.

By combining information from the Probe receiver, DISR Sun sensor, imagers and upward looking instruments it was possible to reconstruct the sub-sampled, low frequency swing of the probe under the parachute. Those data are presented in Appendices 4 and 5 and in the PDS archive under:

/EXTRAS/PROBE_ATTITUDE/HUYGENS_DESCENT_PARAMETERS/HUYGENS_DESCENT_PARAMETERS.TXT and

/EXTRAS/PROBE_ATTITUDE/DATA_AT_SOLAR_CROSSING/AZIMUTH_MODEL_29AUG05.TXT

The Titan descent lasted almost 2.5 hours, which was about 15 minutes longer than expected. The probe survived impact and significant data was returned from Titan's surface. The following figure shows the acceleration profile upon probe impact on Titan's surface, and the corresponding mission time relative to parachute deployment (T0) from Reference 17. Recent analysis shows that the was likely some probe movement for about 10 seconds after impact (Reference 19)

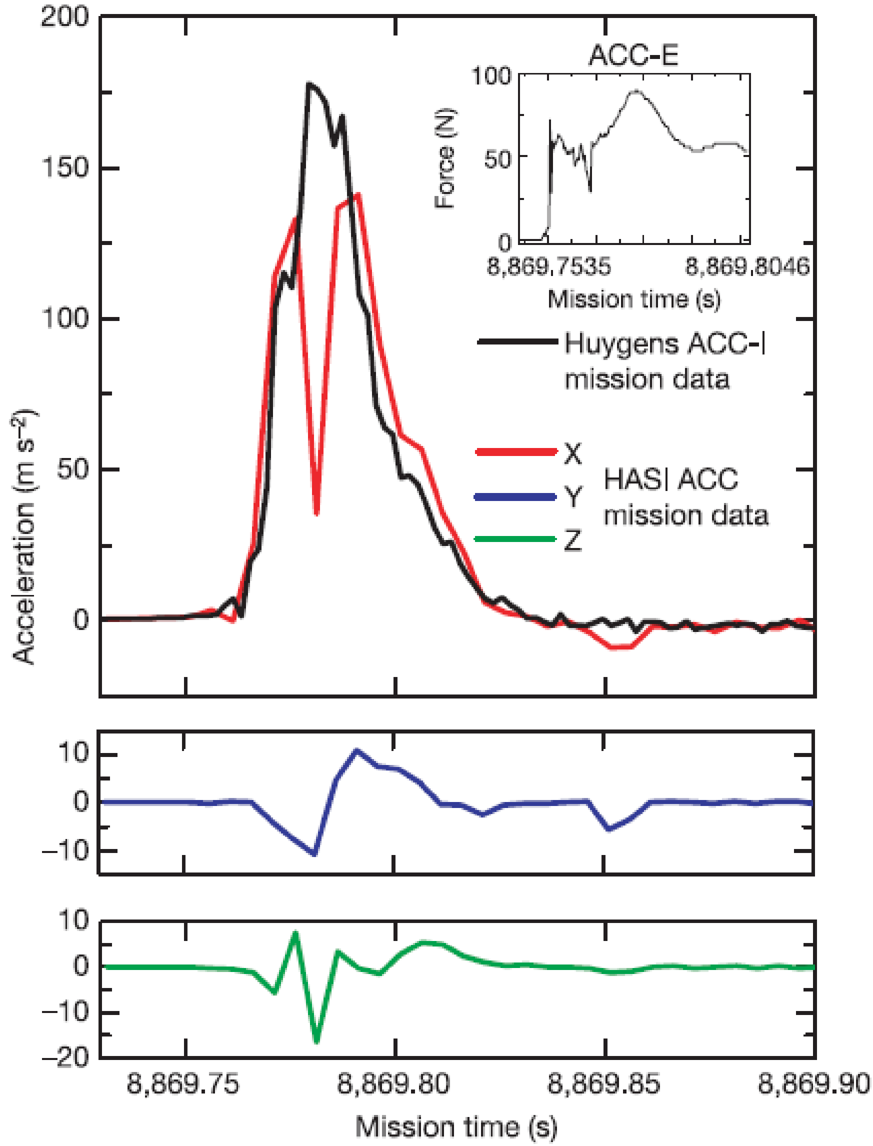


Figure 3-1- Comparison of Huygens Probe impact deceleration profiles. Surface Science Project (SSP) ACC-I in black, Huygens Atmospheric Structure Instrument (HASI) X, Y, Z in red, blue, & green respectively. The insert shows the SSP penetrometer profile. The impact time adopted for most DISR analyses is 8869.77 seconds after T0.

4.0 Archive Description

The DISR data and documentation are preserved in the National Aeronautics and Space Administration's (NASA) Planetary Data System (PDS) archive, and the European Space Agency's (ESA) Planetary Science Archive (PSA). The data can be found on the following websites:

ftp://psa.esac.esa.int/pub/mirror/CASSINI-HUYGENS/DISR/ and,

http://atmos.nmsu.edu/pdsd/archive/data/hp-ssa-disr-2-3-edr-rdr-v10/hpdisr_0001/

The most current version of the DISR archive is HP-SSA-DISR-2/3-EDR/RDR-V1.0 which first posted on 29 May 2007, and last modified on 22 October 2007 (hpdisr_0001). There will be a significant revision released in 2013 which will address:

- Corrections to calibration documents
- Inclusion of more accurate image files
- Add temperatures to label files
- Update altitude profiles to be consistent with newer DTWG data

Below is a summary of the archive's contents, however a more complete description can be found in the Experimenter to Archive Interface Control Document (EAICD) located in the DISR archive under:

hpdisr_0001/DOCUMENT/DISR_SUPPORTING_DOCUMENTS/EAICD

While reading this document, and working with the data from the archive it is important to note the conventions listed in section 9 of this document. There is additional information in the LABEL file for each dataset including a summary of the dataset's header information (altitudes, azimuth, etc) as it was known to the DISR flight software.

4.1 HP-SSA-DISR.../BROWSE/

This may be the most popular directory in the DISR archive. It contains the raw panchromatic images transmitted by DISR during the Titan Descent in 8 bit PNG format. The images are photometrically stretched from zero (black) to 2 times the mean data number (white). This produces the best result since the on-board software aims to expose the image to half of full well (half of the 4096 DN available). This stretch avoids the problem of eliminating cosmic ray hits. The images are also 'rebinned' to be twice their original pixel dimensions using bilinear interpolation smoothing. Less processed images are available in the /DATA/IMAGE directory. Higher processed images are available in the /EXTRAS directory, and in the /DATA/HIGHER_LEVEL_DATA/POSTERS directory in mosaic form.

4.2 HP-SSA-DISR.../CATALOG/

The Catalog directory contains a compendium of documents which provide an overview of the Huygens mission, DISR instrument, archive data volume, DISR personnel, and publication references. Although some of the information is dated (circa 2007) it provides a valuable top level summary of the mission.

4.3 HP-SSA-DISR.../DATA/

The DATA directory contains all the data collected by DISR during the Titan descent arranged by detector system. Although the original XDR format data are manipulated using a variant of IDL (Interactive Data Language, a product of Exelis Visual Information Solutions.), the data are here presented in tabular or ASCII form for easy accessibility. In general the individual datasets are stored in files with names in the format:
"SETID_SEQENCE#_HoursMinutesSeconds_DecimalSeconds" (i.e. VIOLET_0077_002330_2148 is Violet Photometer dataset number 77, taken 23 minutes and 30.2148 seconds after parachute deployment, T0), making it easy to find data if the set id or measurement epoch are known. See the EAICD (hpdisr_0001/DOCUMENT/DISR_SUPPORTING_DOCUMENTS/EAICD) for more details.

Each dataset has an associated Label file (.LBL). There are certain keywords in the Label files which are important for using the DISR data:

Keyword	Importance
RECORD_BYTES	Used to discriminate between data configurations (summed vs. un-summed etc,)
FILE_NAME	To find the associated data file
EXPOSURE_DURATION	The exposure time for the observation.
SPACECRAFT_ALTITUDE	The probe altitude at the start of the observation
AZIMUTH	The azimuth of the observation relative to the Sun (degrees to the DISR's left)
HUYGENS:EW_TILT_ANGLE	Spin axis tilt relative to Zenith, eastward positive.
INSTRUMENT_TEMPERATURE	The temperature at various points within the DISR.
INSTRUMENT_TEMPERATURE_POINT	Identification of thermistor locations.
LAMP_STATE	Which DISR lamps are activated (0 = off, 1 = on)
NATIVE_START_TIME	Probe DDB (system) time at start of the observation.
NATIVE_STOP_TIME	DDB time at end of the observation

The DARK datasets are the readout from covered columns of the CCD detector. Their values indicate the dark current being generated by the chip during the other measurements.

The DESCENT datasets record key parameters at the beginning of each cycle of optimized data taking including the altitude and cycle type. There were about 110 Descent Cycles during the descent, and another 50 or so on Titan's surface.

The HKEEPING (Housekeeping) datasets record DISR temperatures, voltages, and software indices.

The IMAGE directory contains tables of the detector readout values for each pixel, after the image has been decompressed (lossy hardware compression).

The IR datasets contain the per pixel (wavelength) readout from each Infrared spectrometer measurement. These readings have been summed into regions, relative to the azimuth of the Sun, to allow for accurate determination of the light intensity in the directions of interest by the onboard software. A summary of the IR data transmitted during the encounter is presented in Appendix 2.

LAMP datasets record when the calibration lamps and surface science lamp are powered, their applied voltage and current draw.

The SOLAR directory contains the measurements of the light intensity field in the upward direction. The intent is to measure the aureole around the Sun. The data are presented as tables of pixel values.

The STRIP datasets are two columns of summed rows on each side of the side looking imager, used to determine the brightness of the atmosphere toward the horizon as well as the tip of the probe.

The SUN sensor records the time when the Sun passes in front of the DISR instrument. It has a double V aperture slit, which allows determination of the tip in the direction of the Sun, by virtue of the crossing times. The Sun sensor information is used to 'time' the taking of all other data relative to the Sun (clocking to the Sun azimuth). Its amplitude is an independent measurement of the solar absorption at its pass band (938nm). The data are presented as a table of the times (relative to DDB T0) that the Sun passes in front of each of the 3 slits, as well as the detector reading in DN.

The TIME datasets record the DISR internal clock time, and DDB time, at each Broadcast Pulse.

The VIOLET datasets contain the reading (amplitude) of the violet photometer.

The VISIBLE directory contains the data from the Upward Looking and Downward Looking Visible spectrometers as a table of values. The rows of the tables are the wavelength dimension, and the columns are spatial. In some cases the columns (spatial dimension) are summed to reduce noise and data volume.

The VISIBLE_EXT datasets record the values of the column of pixels on each side of the corresponding visible spectrometer. This information is used to compensate for light bleeding through (scattered light) from the adjacent CCD instruments (imagers and solar aureole camera).

4.4 HP-SSA-DISR.../DERIVED_DATA_PRODUCTS

This directory contains the results of data reductions done by the DISR team on the spectral data. In general it presents tables of the Spectral Radiance looking upward and downward from 350 nm (i.e. the violet photometer) through 1.6 micron (i.e. the IR spectrometers). More specifically it contains the following files:

ULV_NET_DN & DLV_NET_DN - The upward and downward looking data numbers from the violet photometer (350 to 480 nm) after the appropriate dark bias has been removed.

ULV_DDP & DLV_DDP - The mean spectral radiance over the field of view of the violet photometers at each altitude where a measurement was taken. The calculations assume a quadratic intensity profile across the photometers' spectral band, which is generally correct to around 1% error.

ULVS_DDP & DLVS_DDP - The upward & downward looking spectral radiance (in watts/(m^2*μ*sr)) for each visible spectrometer wavelength, covering the range from 477.3 to 978.6 nm. The values represent the mean value across the field of view.

ULIS_AV_DDP & DLIS_AV_DDP - The spectral radiance (in watts/(m^2*μ*sr)) averaged over all azimuthal regions and over the field of view of the IR spectrometer for that descent cycle. This information can be used to calculate the energy absorbed in an altitude layer, but has no azimuth dependence information.

ULIS_AZ_DDP & DLIS_AZ_DDP - A table of the spectral radiance (in watts/(m^2*μ*sr)) for the quick exposure, 'snapshot mode' observations taken on and near Titan's surface. Again, the values are the mean over the field of view.

ULIS_I_DDP & DLIS_I_DDP - The average spectral radiance for each azimuthal region (4 for the ULIS or 8 for the DLIS) at each descent cycle altitude for the 136 IR spectrometer wavelengths (covering 822.7 to 1717.6 nm).

More information about how these data products were developed can be found in sections 6.0 & 5.0 of this document and in the corresponding calibration documents (see section 4.5).

4.5 HP-SSA-DISR.../DOCUMENT

The DOCUMENT directory contains the documents which describe how the DISR was calibrated, and how to convert the data into physical measurements. It also contains information about the equipment used during calibration and the method for compensating for the detectors' dark current offsets. The supporting documentation contains information about the instrument design and science objectives.

The DISR instrument calibration reports contain complete descriptions of each instrument detector system, the calibration data, methods, and algorithms for converting the instrument data numbers into physical units and intensities into data numbers.

Reduced mean intensities over the field of view (FOV) are provided for the spectrometers. However for the broad band instruments (imagers, SA camera) the mean intensity over the FOV is not a useful number since the spectral variation is important, and the bandpass changes significantly during the descent. It is felt that the best scientific approach is to create models which reproduce data numbers rather than mean intensities.

Although some lines of code exist as examples in the calibration reports, no generic calibration software is available. Interpretation of the DISR data is dependent on selection of the model parameters (i.e. atmospheric composition, intensity spectrum, surface reflectance, variation over the field of view) and key in deciphering the data. This is often best done using radiative transfer models. The scientist is encouraged to develop their own software to explore the physical interpretations of the DISR data. Section 5 of this Guide presents examples of how the data can be interpreted.

The CATALOG directory contains general information about the data set, such as involved personnel, instrument description, references, etc.

5.0 Data Calibration

5.1 General Information

All of the DISR detector systems were calibrated prior to launch at the Kuiper Lunar and Planetary Laboratory (LPL) on the University of Arizona's main campus in Tucson Arizona. Calibration reports, describing the each sub-instrument and its calibration are contained in the DISR Archive in the "hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS" directory. Since this was a limited duration, one time data collection a classic calibration pipeline does not exist, instead the data must be hand calibrated for the specific intended science goal. This document, as well as the calibration documents mentioned above, are intended to aid the user in that effort.

An important aspect of DISR data calibration is tracking instrument performance changes over the 7 year period from laboratory calibration to Titan encounter. Significant environmental exposures were experienced by both probe and instrument including launch, orbit insertion, atmospheric entry and surface impact along with an enhanced space radiation environment due to on-board radioscopic heaters and power plants. This tracking is made possible by a calibration lamp system within the DISR sensor head which channels light (using fiber optics) from 3 incandescent lamps to the detector systems. This system was activated several times during the flight period, and was intended to function 4 times during the descent, however one Calibration cycle was lost (as explained in section 3).

Beyond the laboratory calibration, in-transit changes, and descent calibration data one needs information on the encounter itself to make good use of the DISR data. This document contains information regarding the solar flux at Titan, Sun position, probe dynamics and descent event information for the Huygens-Titan encounter.

It is always a good idea to determine if there is updated information regarding the Titan entry parameters (i.e. time history for: altitude, tip-tilt, spin, azimuth, temperatures, etc) before proceeding with data analysis. Contact information can be found in the archive in hpdisr_0001/CATALOG/PERSON.CAT or at the end of this Guide.

The following graph presents the solar spectral irradiance used in the DISR data reduction calculations. This is the assumed intensity at 1 AU, convolved to the DISR pixels' wavelengths and extended in the blue by Erich Karkoschka, and in the red by Bruno Bezard. In calculating the solar spectral radiance, F at Titan (in watts/(m^2*micron*steradian)) these values must be divided by Pi and the distance from Titan to the Sun squared at the time of encounter which is 9.053^2 (or 81.96). The data is presented in tabular form in Appendix 1.

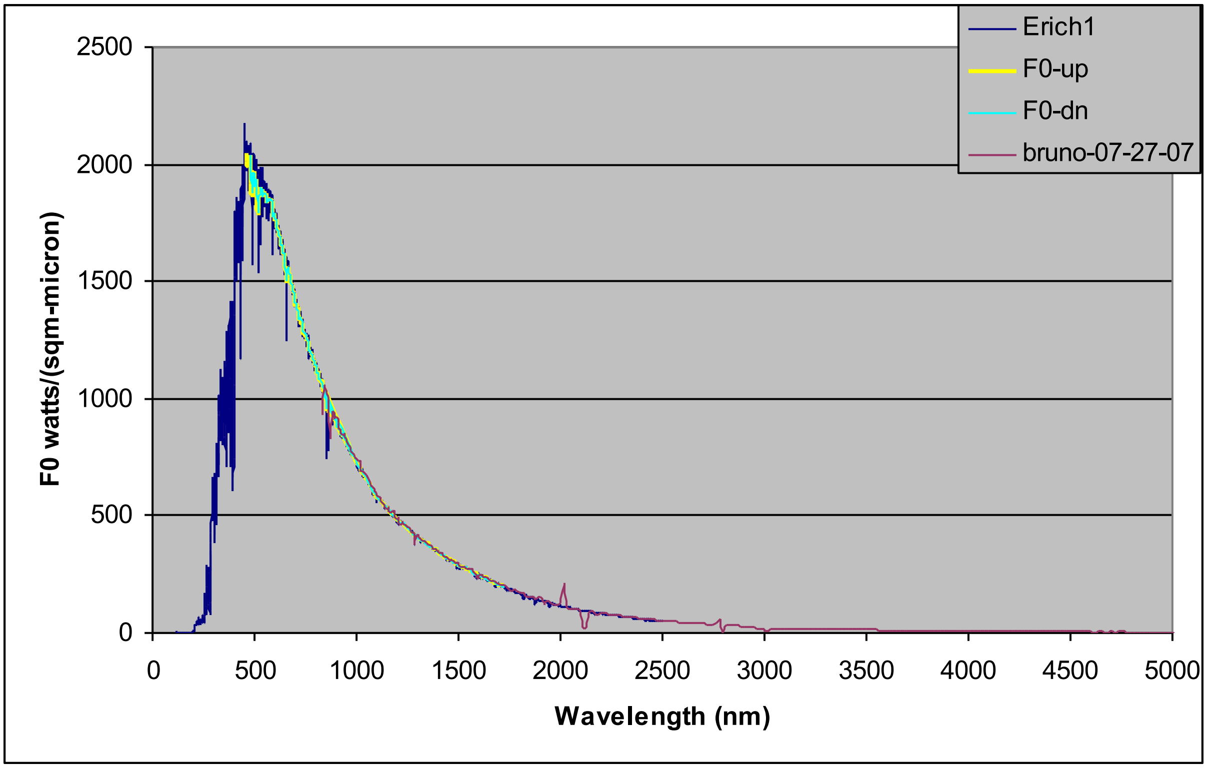


Figure 5-1: Solar Flux Spectrum (at 1 AU) used in DISR data reduction. The dark blue line is the spectrum provided by Erich Karkoschka, and the dark red is provided by Bruno Bezard, DISR team members. The yellow line is the spectrum convolved to the pixel width of the upward looking DISR spectrometers, and the light blue line is the spectrum convolved to the pixel width of the downward looking spectrometers.

5.2 Descent Cycles

The Descent Cycles datasets relay information about the data collecting schedule that was determined by the on-board software. The datasets contain the type of collection cycle, the mission time at the start of the cycle, and the DDB reported parameters of altitude and spin rate. A summary of the descent cycles experience during the encounter is presented in Appendix 6.

The following is an explanation of the text fields in the Descent Cycles datasets:

filename_pre: is the directory path on the computer that the test-log was generated on.

filename: is the name of the original file on the computer the test-log was generated on.

date_taken: is the date and time in the format *year-month-day*T*hour:minute:second* GMT.

set_name: designates the type of cycle (typically Descent or Calibration).

gse_ver: is the Ground Support Equipment (GSE) software version used to decode the data.

test_log: is the location and name of the target data-stream that was decoded.

seq_num: is the sequence number of the dataset which begins at 1, is the same as the sequence number in the filename (i.e DESCENT_0001_...), and should always agree with the cycle number.

m_time: is the mission time reported in seconds after T0 (parachute deploy command).

cycle_num: is an index count of the cycle being reported. For the Titan descent it is the same as the seq_num. For some calibration and in-flight test logs they may differ due to restarting of the sequence.

cycle_type: is cycle type number and corresponding designation (Image, Non-Image, etc) as described in the table below:

cycle_type	Cycle Name		cycle_type	Cycle Name
1	Standard non-image		11	High near surface
2	Standard image		12	Medium near surface
3	Flat Field		13	Low near surface
4	Cal Cycle A		14	Very low near surface
5	Cal Cycle B		15	Surface A
6	Cal Cycle C		16	Surface B
8	Dark current only		17	Surface C
9	Spectrophotometric		18	Surface D
10	Drain cycle			

scen_step: is the scenario step and represents the number in the cycle criteria table which defines why this particular type of cycle was selected based on mission time and altitude.

spm_flag: designates if the cycle is a spectrophotometric cycle (1) or not (0).

az_cycle_start: is the azimuth reported by the on-board software (in degrees, counter-clockwise from the Sun) for the beginning of the cycle (usually in considerable error due to rotation reversal and Sun sensor drop-outs). The actual azimuth history via Karkoschka is available in Appendix 5 (& Ref 5).

altitude: is the altitude reported in meters and kilometers, and the spin rate in RPM at the beginning of the cycle. Again, a more accurate determination of the probe altitude as a function of time is presented in Appendix 7.

spin: is the probe spin rate as reported by the on-board software in revolutions per minute (RPM). A better source for the actual spin rate is from the azimuth time history in Appendix 5.

5.3 Lamp Datasets

The Lamp datasets contain information about the 3 small on-board calibration lamps (~0.5 W each), as well as the 20 watt Surface Science Lamp (SSL) which is designed to illuminate Titan's surface once the probe gets close enough (nominally coming on at 700 m altitude).

When any of the DISR lamps are powered, Lamp datasets are generated which report the commanded lamp state (which lamps are commanded on) and the voltage & current being drawn by all 4 lamps. Since the calibration lamps are only commanded on for a short time, during each of the four calibration cycles, most of the Lamp datasets were generated when Huygens was on Titan's surface.

The archive label file and the data file both report the lamp command state using 4 binary numbers as follows: 1110, where the first three bits refer to the three calibration lamps (A, B & C), and the fourth bit references the SSL lamp state. In all cases 0 means off, and 1 means the lamp is commanded on.

The data file also reports the altitude at the time of the reporting, and the voltage and current for each lamp in volts and amps.

More details of the DISR lamp performance can be found in the Engineering Appendix to the User's Guide (Reference 19).

5.4 Housekeeping Data

Housekeeping datasets are generated at the beginning of each descent cycle (the descent cycles are summarized in Appendix 6). The Housekeeping datasets contain all DISR temperatures (see Appendix 23 for locations), except the IR chip temperatures, which are only reported during IR spectrometer measurements (and are offset hot by about 10C). Note the temperature field INSTRUMENT_TEMPERATURE(1) = "REF_T2" is a spare field and has no value assigned to it in any of the DISR datasets.

The Housekeeping data also contains internal instrument voltages including the Auxiliary electronics board (nominally 12 volt DC) supply which powers the IR shutter, the 5 volt CPU board voltage, which powers the on-board integrated circuits, and Analogue to Digital Converter (ADC) voltages, as well as information about the size of the software queues.

The time reported in both the label and data files is the start of the Descent cycle in seconds after T0 (parachute deployment command).

The temperatures are reported in both the label (as the INSTRUMENT_TEMPERATURE array) and data files in degrees Kelvin.

The altitude at the beginning of the Descent cycle is reported in the Housekeeping data in kilometers.

The temperature sensor supply current (t_sensor_curr) is reported in the data file in amps.

The Auxiliary Board voltage, CPU supply voltage and ADC offset are all reported in volts.

The maximum size of each system queue (Dispatcher, Alarm, Telemetry, Science Processing & Stack) is reported. Unlike the other housekeeping parameters, the queue sizes are the maximum since the last Housekeeping dataset and therefore reflect the maximum over the previous descent cycle. There is no Housekeeping dataset at the beginning of the first cycle, however the Housekeeping dataset at the beginning of the second cycle reports the queue sizes for the first cycle.

5.5 Sun Sensor Observations

The DISR instrument is equipped with a masked photodiode sensor whose primary purpose is to track the location of the Sun in Titan's sky to allow for proper azimuth angle timing of the DISR's observations. However this device is also valuable for measuring the extinction of the solar beam during the descent. The device is designed to view the Sun through one of the spectral windows (943 nm) in Titans atmosphere.

The Sun Sensor provides 3 pulses per probe revolution. The flight software is designed to use this information to determine the probes azimuth relative to the Sun. To avoid false detections a reasonably elaborate filtering algorithm is used to determine if the pulses measured by the Sun sensor are valid or not. Only when five Huygens rotations of 'valid' Sun sensor pulses are observed (Sun sensor lock) is the azimuth information from the Sun sensor used , otherwise DISR relies on the Descent Data Broadcast information for timing observations.

Unfortunately three disruptive conditions occurred during the descent which limited the usefulness of the Sun sensor data to time observations. The first is that Sun sensor was not equipped to tell the direction of rotation of the probe, so when it began to spin backwards, the software produced unexpected results. Secondly, there were greater probe swing dynamics than expected, beyond the filtering capability of the DISR flight software, so often pulses were considered 'in-valid' and Sun sensor 'lock' was lost. The third problem was that radiation exposure during the cruise from Earth to Titan cause a significant loss of sensitivity of the photodetector, and low in the atmosphere there was not enough signal left to reliably retain Sun sensor lock (see section on "Sun Sensor Performance" (7.1) of the "DISR Engineering Data Companion Document" in the archive for the details). The result was that only 45 of the 360 or so Sun crossings were measured.

The DISR Sun Sensor is a photodiode located behind a narrow band filter (943 nm) and a 3 slit mask:

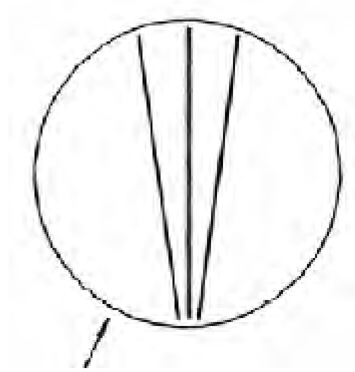


Figure 5.5-2 - Sun sensor slit mask configuration.

The Sun Sensor datasets contain the amplitude of the peak photodiode signal (in DN) and the mission time when the Sun passes in front of each slit (3 pulses per revolution) and thus gives information about the azimuth, rotation rate and tip of the probe.

Details of the Sun Sensor calibration are in the DISR Archive under: DOCUMENT/DISR_CALIBRATION_DOCUMENTS/SUN_SENSOR (see Reference 9).

A summary of the Sun sensor data is presented in Appendix 28.

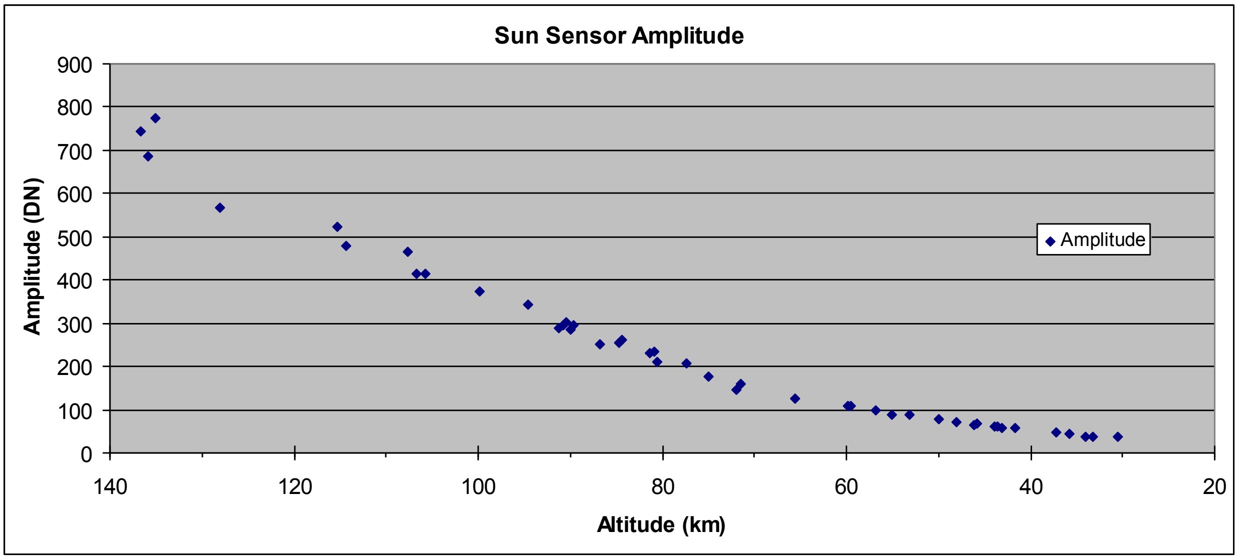


Figure 5.5-3 – DISR Sun sensor amplitude history, raw data numbers (DN)

The solar direct flux at 943 nm is related to the Sun sensor amplitude (equation 6 of Reference 9) by:

$$\text{Flux}(943\text{ nm}) = (\text{DN}-2.5)/\ (414.4\ \text{DN/Watt/sq.m-micron}).$$

where DN is the amplitude reading from the DISR dataset.

This relationship is dependent on the probe spin rate, solar zenith angle and temperature. It is correct at 4 rpm spin, 50 degrees solar zenith angle, and 295.185 ºK but must be corrected for variations in these parameters, as described in the following sections.

Correction for solar zenith angle (SZA)...

The following plot shows the variation in response vs. elevation angle (90-SZA),

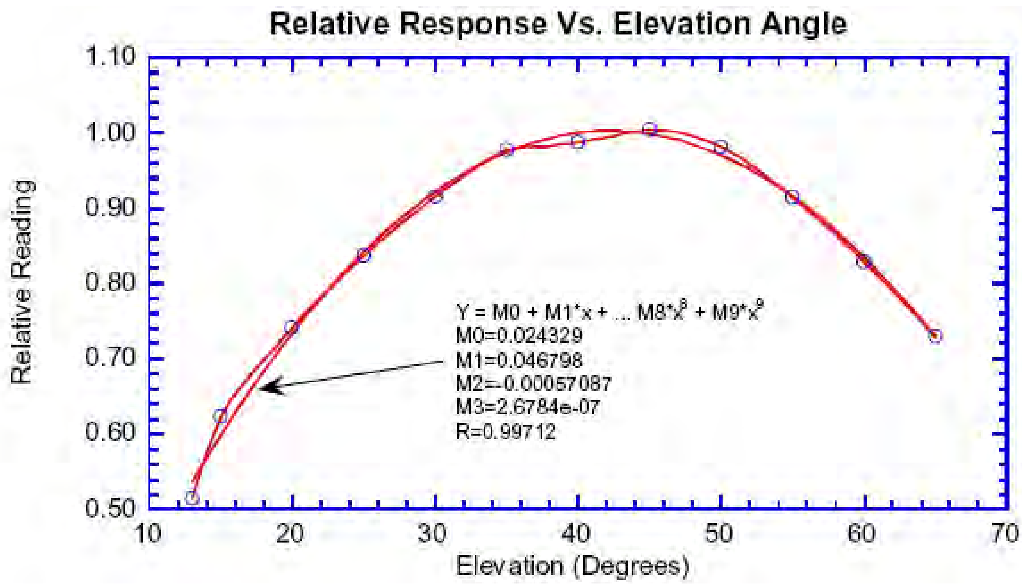


Figure 5.5-4 – Sun sensor variation with elevation angle. Data, cubic spline, and 3rd order polynomial fit (with coefficients) are shown.

From this fit comes the SZA correction equation:

$$DN'(40\ \text{degeees}) = DN'(\text{elevation}) / (0.024329+0.046798*el-5.7087x10^{-4}*el^{2}+2.6784x10^{-7}*el^{3}).$$

or

$$Re = 0.024329 + 0.046798 *el - 5.7087x10\text{-}4 *el^{2} + 2.6784x10\text{-}7 *el^{3}$$

where:

DN' is the unbiased data number, (DN - 2.5), and
el is the elevation angle (90º - SZA).

The equation models the variation by better than 2%.

The solar zenith angle was 40 degrees at the beginning of the descent; decreasing to 33.8° by impact continuing to about 32 degrees at loss of signal as described in Appendix 14.

Correction for spin rate...

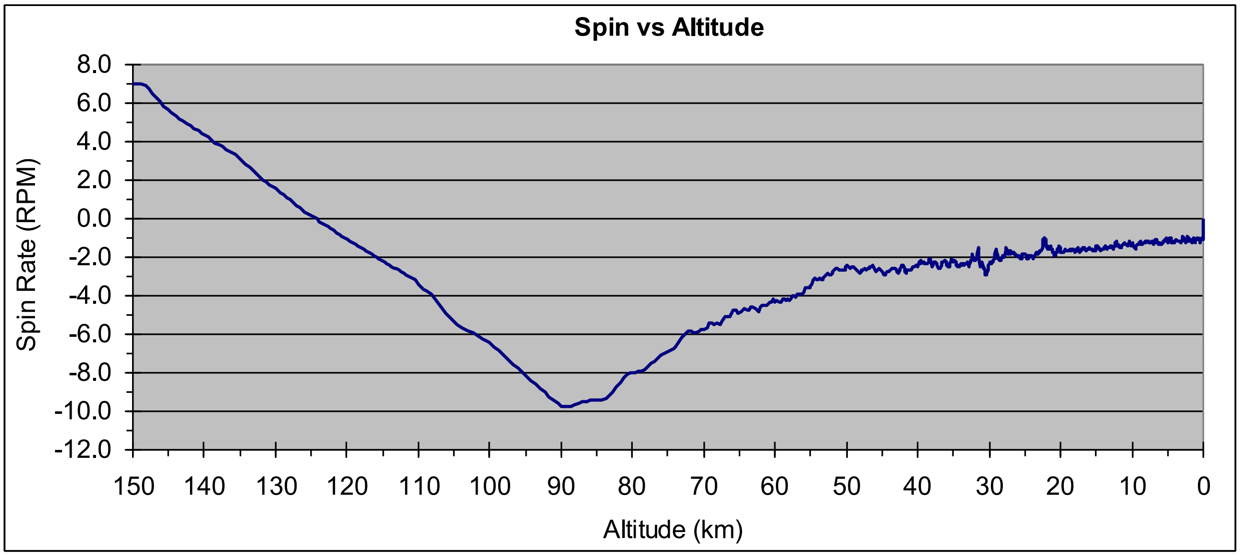


Figure 5.5-5: Huygens probe spin rate vs. altitude. Note the reversal in spin direction around 125 km altitude.

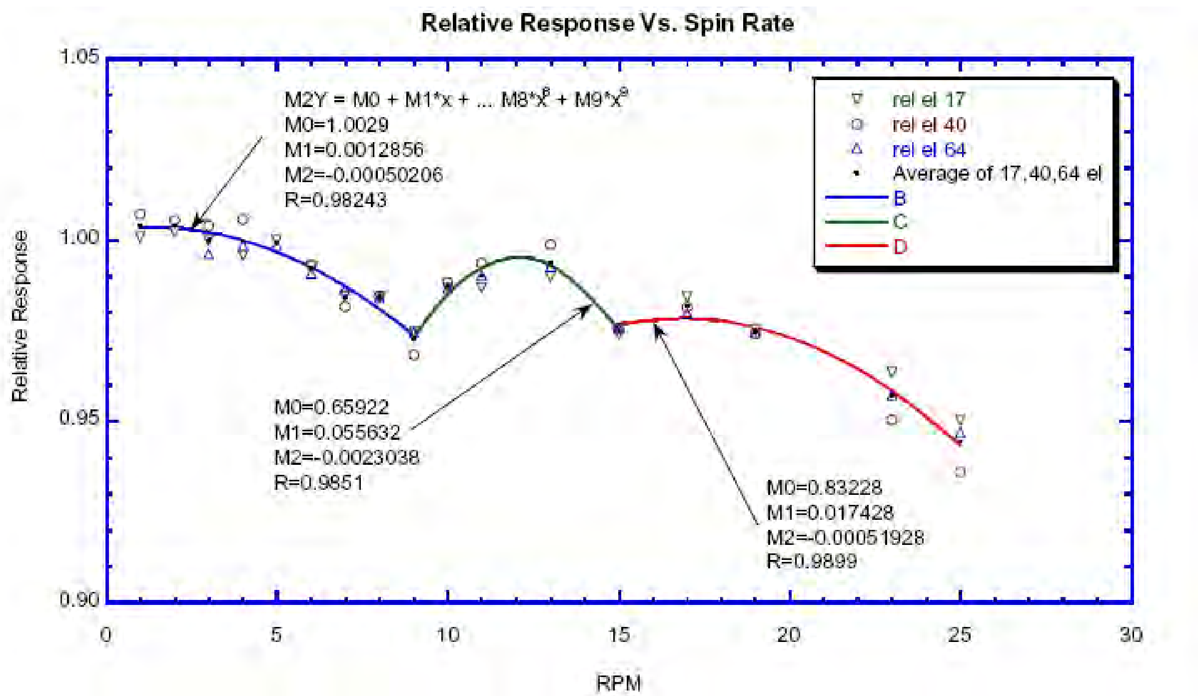


Figure 5.5-6 – This plot shows the Sun sensor variation with probe spin rate. The symbols show the calibration data at three different Sun elevations, and the average. The Sun sensor spin rate variation has different characters over 3 spin regimes. The curve fits and corresponding polynomial coefficients (M0, M1 & M2) are shown.

Therefore there are 3 spin correction equations...

for rpm < 9, $R= 1.0029 + 0.0012856 *rpm - 0.00050206 *rpm^2$,
for 9 < rpm < 15, $R=0.65922 + 0.055632 *rpm - 0.0023038 *rpm^2$,
for rpm > 15, $R=0.83228 + 0.017428 *rpm - 0.00051928 *rpm^2$.

where R is relative response, to be divided into the unbiased response:

DN'(4 rpm) = DN'(spin) / R

Correction for temperature difference...

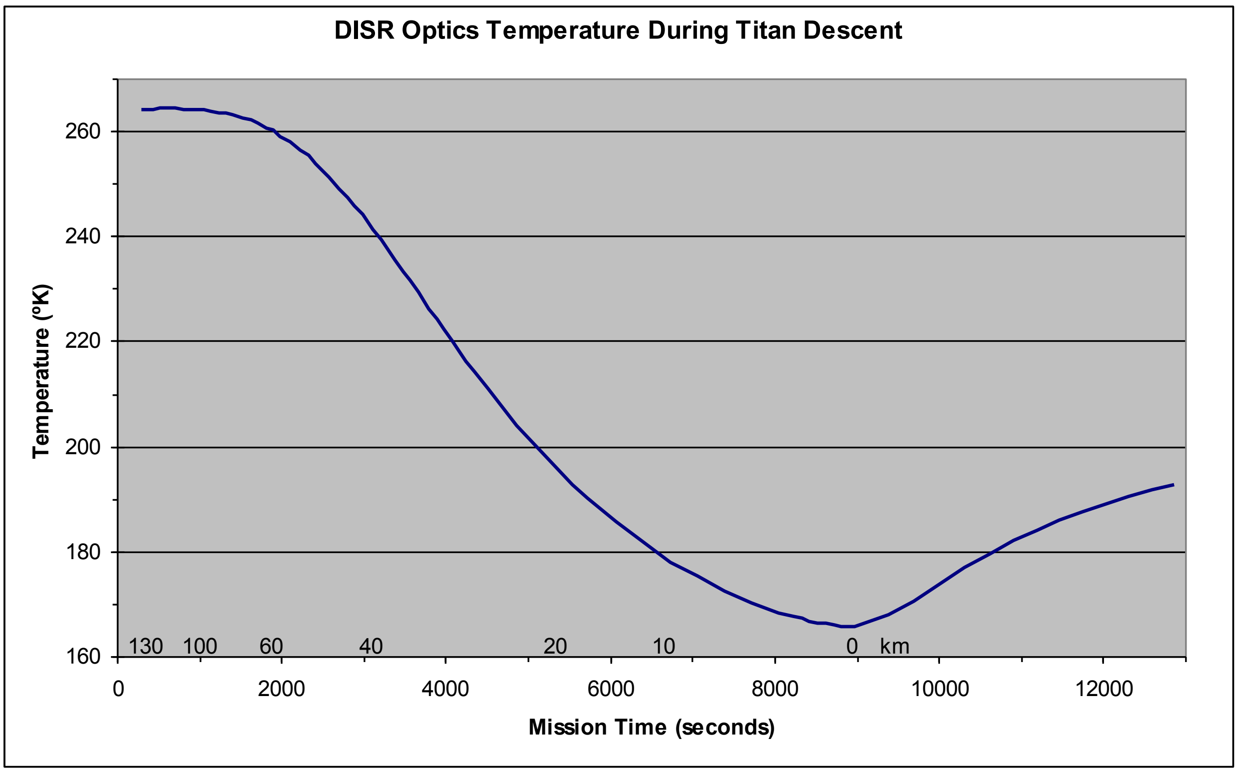


Figure 5.5-7: DISR optics temperature during Titan descent vs. mission time with altitudes noted. The probe began to warm after touchdown.

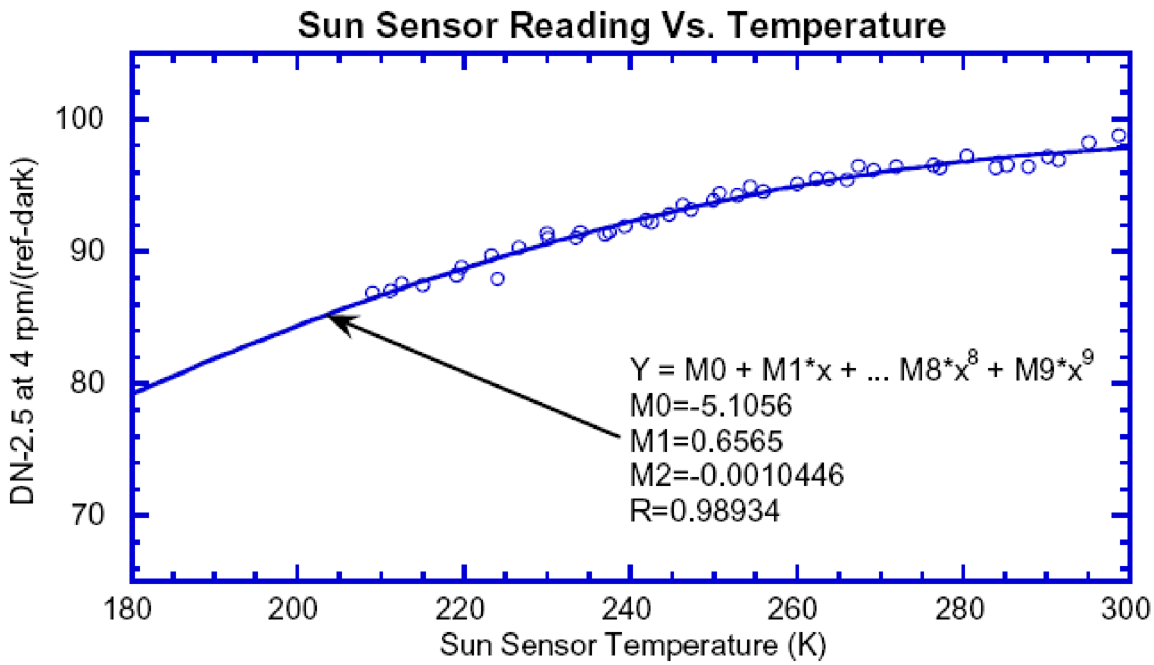


Figure 5.5-8: For a constant source intensity, the Sun sensor's responses varies as shown. The circles are the calibration data, and the blue line is the curve-fit indicated by the polynomial equation with coefficients M0 thru M2.

To correct a measurement at any temperature (T) to the calibrated (Optics) temperature of 295.185 requires the scaling factor described in the Sun sensor calibration document in the section named "Variation of Responsivity with Temperature" (Reference 9, section 6):

$$(DN\text{-}2.5) \text{ at } 295.185\text{ K} = (DN\text{-}2.5 \text{ at } T) / [-0.05228 + 0.006722*T - 1.0696\text{x}10^{-5}*T^2]$$

or

Rt = -0.05228 + 0.006722*T –1.0696x10-5*T^2

Thus, the procedure for converting the data numbers from the Sun sensor to the flux in the direct solar beam is to remove the bias of 2.5 DN then correct the result to 4 rpm, 50º SZA & 295.185ºK by dividing by R, Re & Rt. The result is then divided by the Sun sensor absolute responsivity of 414.4 DN/(Watt/sq.m-micron) to give the absolute flux in the solar beam in Watts/sq.m-micron.

$$Flux(943nm) = \frac{(DN - 2.5)}{414.4 * R * R_e * R_t}$$ in Watts/(sqm micron)

Diffuse Flux...

As Huygens descends through Titan's thick atmosphere, the direct solar flux observed by the DISR Sun sensor is increasingly contaminated by diffuse, scattered light. At 943 nm the diffuse flux is negligible at 400 km altitude, but increases to almost 1% of the signal near Titan's surface as seen in the plot below.

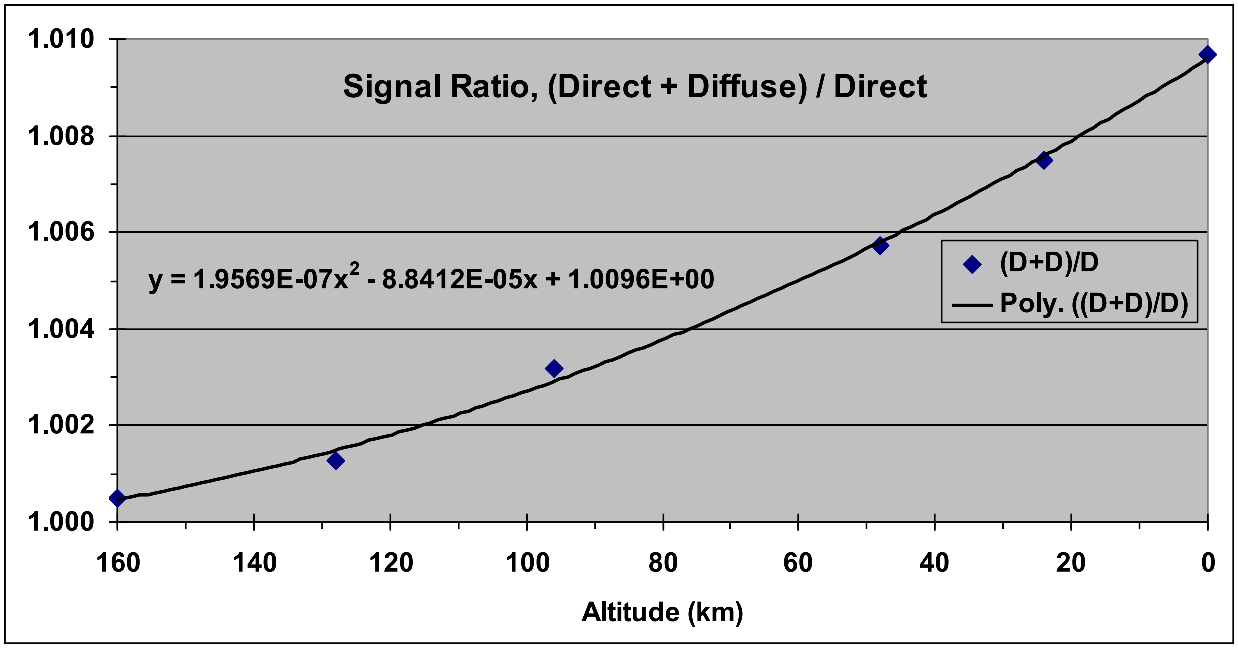


Figure 5.5-9: Ratio of Direct plus Diffuse flux seen by the DISR Sun Sensor to the direct solar beam at 934 nm, as a function of altitude. The diffuse flux is essentially 0 (ratio = 1) at 400 km, but increased to about 1% of the signal near Titan's surface. (Ref 9, Sun Sensor Cal. Report, table 10)

To compensate for diffuse flux contamination we introduce a correction factor Rh, which is a function of altitude as:

$$Fs = Fm / Rh$$

where:

Fs is the direct solar flux,
Fm is the flux measured by the DISR Sun sensor, and
Rh is the correction factor, which is a function of altitude (h) thusly:

$$\mathbf{R_h = 1.9569E\text{-}07h^2 - 8.8412E\text{-}05h + 1.0096E\text{+}00}$$

Flux Calculation Example...

Of the 4 components (scattered flux, probe spin, temperature & solar zenith angle) that modify the Sun sensor's flux measurement, the apparent solar zenith angle is the least well known.

1) The scattered flux is measured to around 1% by the DISR spectrometers.

2) The probe spin is well measured by the Sun sensor's period, variation in the link AGC, intensity variations in the optical instruments, and features in the images (ref Karkoschka), although short term variations are possible. Our azimuth function is smoothed to the scale of half a rotation, and fits quite well, however instantaneous measurements may be several degrees in error, resulting in significant rate variations. However even a factor of two error in spin rate results in only a few percent error in measured flux by the Sun sensor.

3) The temperatures are well measured by the DISR and probe sensors (albeit with some lag and gradients).

4) But lacking a good probe dynamics model, the 6 degree of freedom (DOF) motion of the probe is not so well known. So although the SZA is well known, the instantaneous angle between the Sun vector and the probes spin axis could be in error by several degrees as described below.

The Sun's apparent elevation in the sky has 3 components:

1) The solar zenith angle (90º-elevation) history at the probes position vs. time:

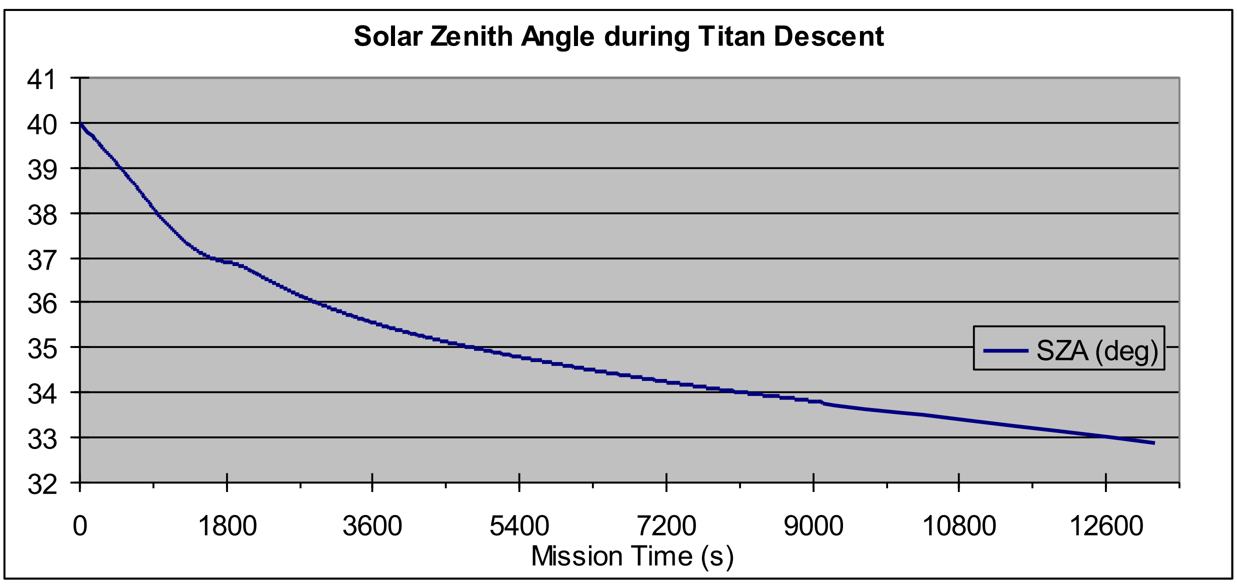
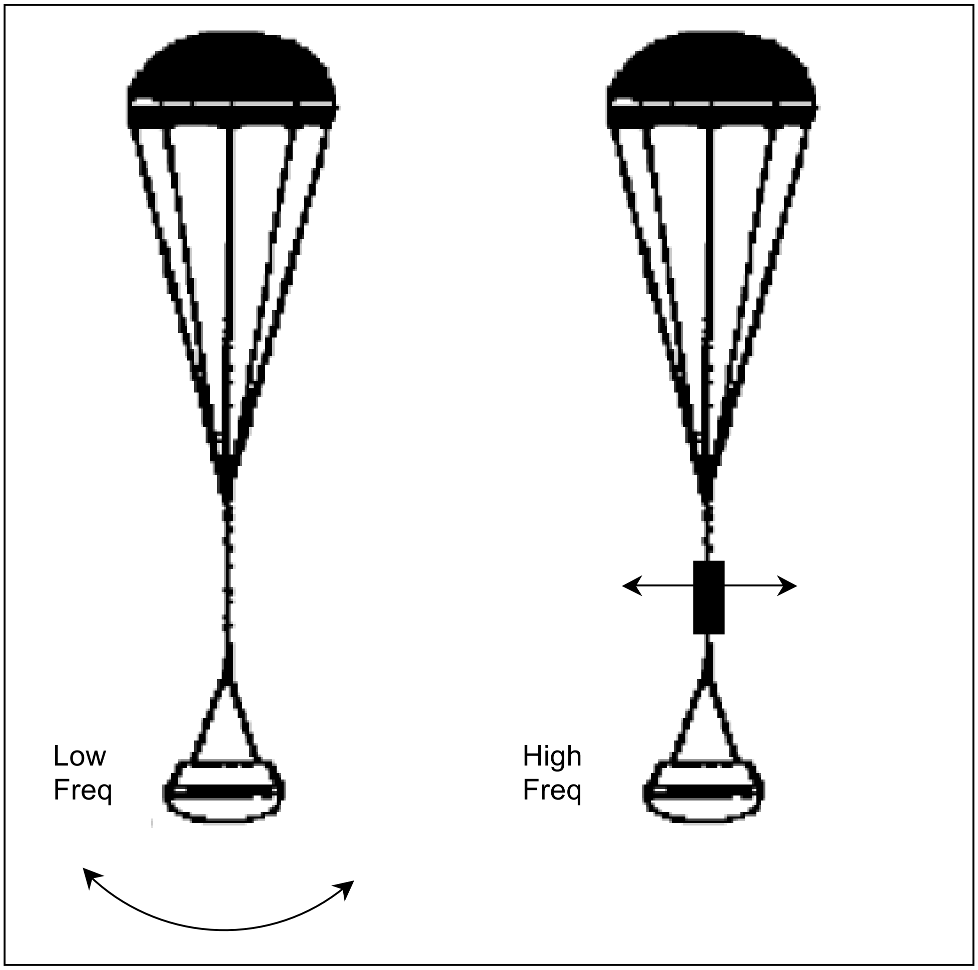


Figure 5.5-11: Solar Zenith Angle (SZA) relative to the Huygens probe's position during the Titan encounter.

2) The East-West tip of the probe's spin axis during the Titan descent caused by wind and pendulous motion (~0.1 Hz) below the parachute, and

3) A higher frequency (~1 Hz) swaying motion caused by movement relative to the parachute swivel (Ref 5, Karkoschka).

Figure 5.5-12 – Parachute stability



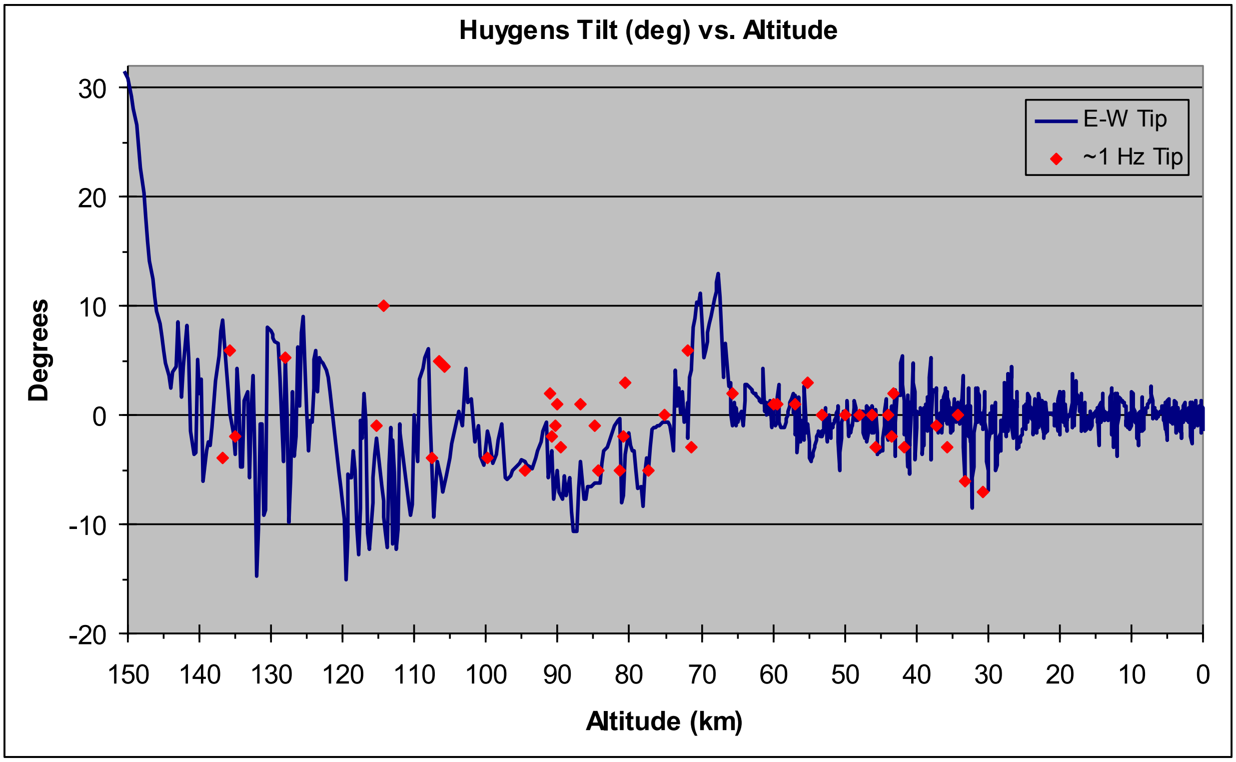


Figure 5.5-13: Two components of probe tilt motion during the Titan descent. The blue line is the low frequency (~0.1 Hz) pendulous motion of the probe - parachute system. The red dots represent the implied tip from the higher frequency (~1 Hz) swinging motion of the probe due to the parachute swivel movement.

The summary of the DISR Sun sensor data presented in Appendix 28 was calculated using:

$$Flux(943nm) = \frac{(DN - 2.5)}{414.4 * R * R_e * R_t * R_h}$$ in Watts/(sqm micron)

To obtain the apparent Sun elevation the East-West tip component toward the Sun was added to 90-SZA for each observation. The unknown high frequency tip was adjusted within the limits of ±10º to contain out-of-family measurements, resulting in the red dots shown in the figure above, and included in Appendix 28 as "Tip toward Sun".

The result is presented in the figure below, fit with two exponentials (F1 & F2), one for the upper atmosphere, and one for the lower. The results are also in Appendix 28 as "Flux @ 943 nm".

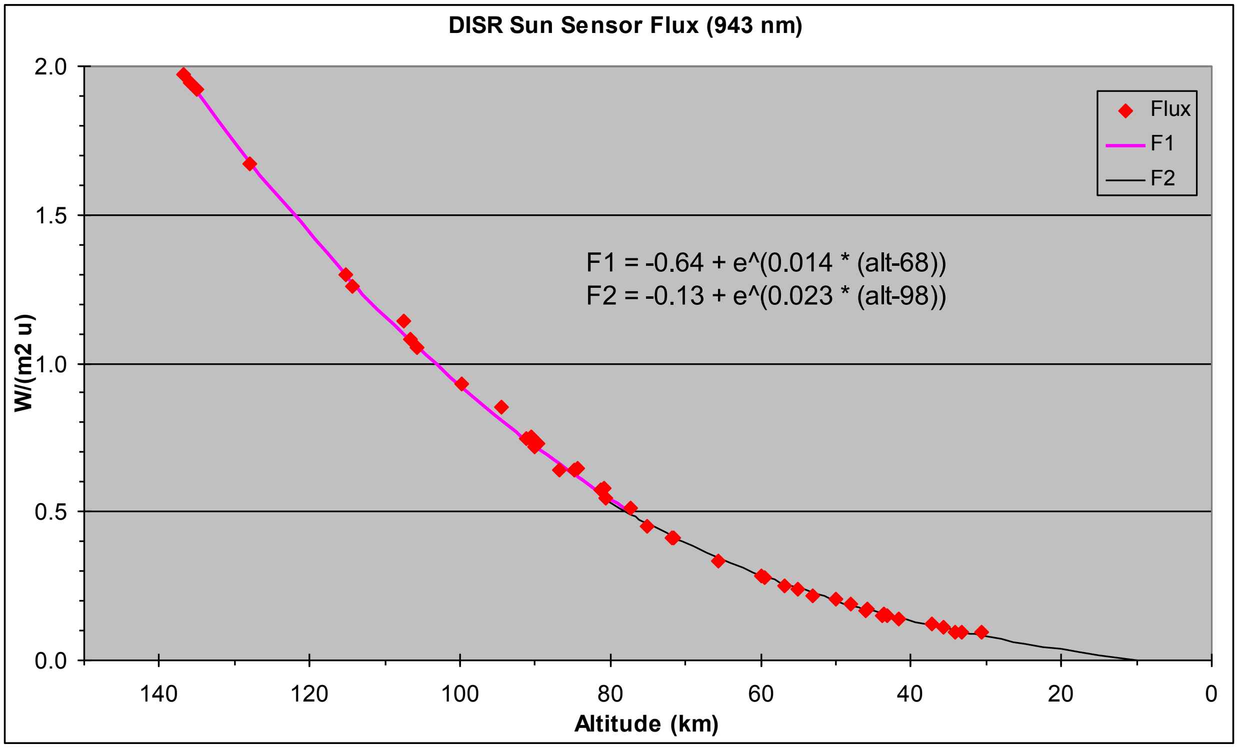


Figure 5.5-14: Downward flux at 943 nm as measured by the DISR Sun Sensor.

These results do not take into account the degradation in absolute responsivity of the Sun sensor during cruise. See section, "Sun Sensor Performance" (7.1) of the "Engineering Appendix Companion Document" for details.

5.6 Violet Photometer Measurements

Detailed descriptions of the Violet systems operation are presented in the calibration document in the data archive (Ref 4), SP-1177 (Ref 1a), and in section 2.3 (Violet Photometer) of the PSS aerosol paper (Ref 2).

There are two violet photometers in the DISR sensor head, the Upward Looking Violet (ULV) and Downward Looking Violet (DLV). Both violet spectrometers have baffles which limit their fields of view (FOV) of roughly ½ a hemisphere (π steradians), and consist of a one element filtered silicon photodetector providing a single value representing the integral of the violet flux over the spectrum of 350 to 480 nm.

Photometer calibration was carried out in 3 steps:
1) The relative spectral response (Rel_{spec}) of the system was determined using an integrating sphere stimulated with monochromatic light scanned across the photometer's pass band.
2) The systems Absolute Responsivity (Resp) was determined using the same integrating sphere and a broad-band white source, traceable to the National Bureau of Standards (NBS).
3) Variations in the systems response across its field of view (Relative Spatial Response, Rel1) was determined using a collimated light source and a precision azimuth/altitude tilting device.

Steps 1 and 2 above were repeated for detector temperatures from about 300º K down to 200º K, the expected temperature range during the Titan descent. Polynomial fits of the systems response with temperature determine the coefficients for equations 5.6.1, 5.6.2, & 5.6.4 as detailed in the calibration report (Ref 4). Since the shape band pass filter is not a perfect rectangle, variations in Rel_{spec} are defined for an energy equivalent idealized filter with wavelength cutoffs λ_1 & λ_2 with temperature dependence as indicated in equations 5.6.2 & 5.6.4.

The equation relating the instruments response to a spectral radiance < I > is given in the flux determination calibration report:
DOCUMENT/DISR_CALIBRATION_DOCUMENTS/VIOLET_PHOTOMETERS/VIOLET_PHOTOMETER_CAL_DOC
(equation 1) as:

$$DN - DNdark = \mathrm{Resp}_{peak} \int \left[\int I(\lambda, \vartheta, \varphi) \mathrm{Rel}_{spec}(\lambda) d\lambda \right] \mathrm{Rel}_1(\vartheta, \varphi) d\Omega \qquad \text{(eq. 5.6.0)}$$

Where:
DN is the data number observed,
DN_{dark} is the data number due to the electrical bias when the instrument is in the dark,
Rel1 is the relative spatial response function when the observations were collected,
Resp_{peak} is the peak absolute responsivity (at the maximum of the spectral and spatial relative response functions) of the instrument,
Rel_{spec} is the relative spectral response at each wavelength (λ)
I is the average diffuse spectral radiance over zenith angle and azimuth angle.
φ and ϑ are the Sun azimuth and elevation

Units:
The integrals of Rel1 and Rel_{spec} are dimensionless, and normalized to unity at their peaks.
Resp_{peak} has units of DN/(watts/(m^2*micron*sr)) or DN*m^2*micron*sr/watt
λ is in microns, resulting in:
< **I** > having units of watts/(m^2*micron*sr)

Inverting equation 5.6.0 for determining spectral radiance, **I** from the DISR data, considering the isotropic nature of the calibration source, and defining a constant, equivalent energy, spectral shape results in equation 5.6.1 for the average spectral radiance over the DISR's field of view:

$$\langle \mathbf{I} \rangle = [DN - DN_{dark}] / [\mathrm{Resp}_{peak} * \int \mathrm{Rel}_{spec}\, d\lambda * \int \mathrm{Rel1}\, d\Omega] \qquad \text{(eq. 5.6.1)}$$

Determining the radiance variation as a function of wavelength within the spectral window, and the variation with azimuth and solar zenith angle requires some assumptions about the absorptivity and scattering of light by the atmosphere, as they are not measured directly by the DISR violet system. See the calibration report (Ref 4) for more details. For this example it is assumed that the spectral shape can be well represented by a quadratic across the photometers band; and an equivalent rectangular spectral profile is used as described in the Violet Flux Determination calibration document in the archive (Ref 4). We believe this to be a very good approximation.

This example also uses an isotropic radiance profile, however adaptation to a non-isotropic case is discussed in section 5.6.3.

Consequently, for this example: $\int \text{Rel1}\, d\Omega = 1.0$

5.6.1 Upward Looking Violet (ULV) Photometer Example

Laboratory calibration characterization of the ULV photometer (as seen in the calibration report, Ref 4, & detailed below) yields the following polynomial coefficients relating the temperature dependence of the terms required to complete equation 5.6.1:

Table 5.6.1-1

DISR ULV Calibration Coefficients					
	Rel1	**Resp_{peak}**	**Rel_{spec}**	**λ1**	**λ2**
Coef.	**1**	**2**	**3**	**4**	**5**
A	1.0	918.9	0.8089	354.2	478.45
B		1.8446	0.000111	-0.0095199	-0.0072
C		-0.0030642			
Ref.		p 59, fig 33	p 42, eq 25	p 42, fig 22	p 42, fig 22

For the form: $R = A + B*T_v + C*T_v^2$ Where T_v is the violet detector temperature, and $d\lambda = \lambda 2-\lambda 1$ (in nanometers).

Thus for the ULV Equation 5.6.1 becomes:

$$< I > = [(DN-DN_{dark})] / [A_1*(A_2+B_2*T_v+C_2*T_v^2)*(A_3+B_3*T_v)*((A_5+B_5*T_v)-(A_4+B_4*T_v))] \quad \text{(eq. 5.6.2)}$$

Where the coefficients are shown in table 5.6.1-1 and the detector temperature, T_v is available in the corresponding label file, and of course DN is available from the ULV data file.

The value for DN_{dark} is not as well established. It is a function of the Violet detector temperature, and the DISR electronics temperature. For large values of DN (>>50) variations in DN_{dark} are insignificant, however for measurements deep in Titan's atmosphere the variations in DN_{dark} must be addressed. For comparison of these dark offset values the data is scaled to the typical laboratory temperature values of 295ºK detector temperature, and 302ºK electronics temperature.

$$DN_{corr} = DN + (A_1 + B_1 * T_v) * (295 - T_v) + A_2 * (T_e - 302) \quad \text{(eq. 5.6.3)}$$

Where
DN is the measured data number,
T_v is the violet detector temperature in ºK,
T_e is the DISR electronics temperature (EA_BOX_T11 in Housekeeping datasets) in ºK,
DN_{corr} is the corrected data number, and the coefficients are from this table:

Table 5.6.1-2

Temp. Extrapolation Coef's		
	T_v	T_e
Coef	1	2
A	-0.05156	0.0203
B	2.4858E-04	

During the trip from Earth to Saturn all detector systems were stimulated at approximately 6-month intervals using the on-board calibration lamp system. During some of these in-flight checkouts substantial variation were noted in the ULV dark measurements. Below is an example from in-flight check 14 (F14), taken in July of 2004.

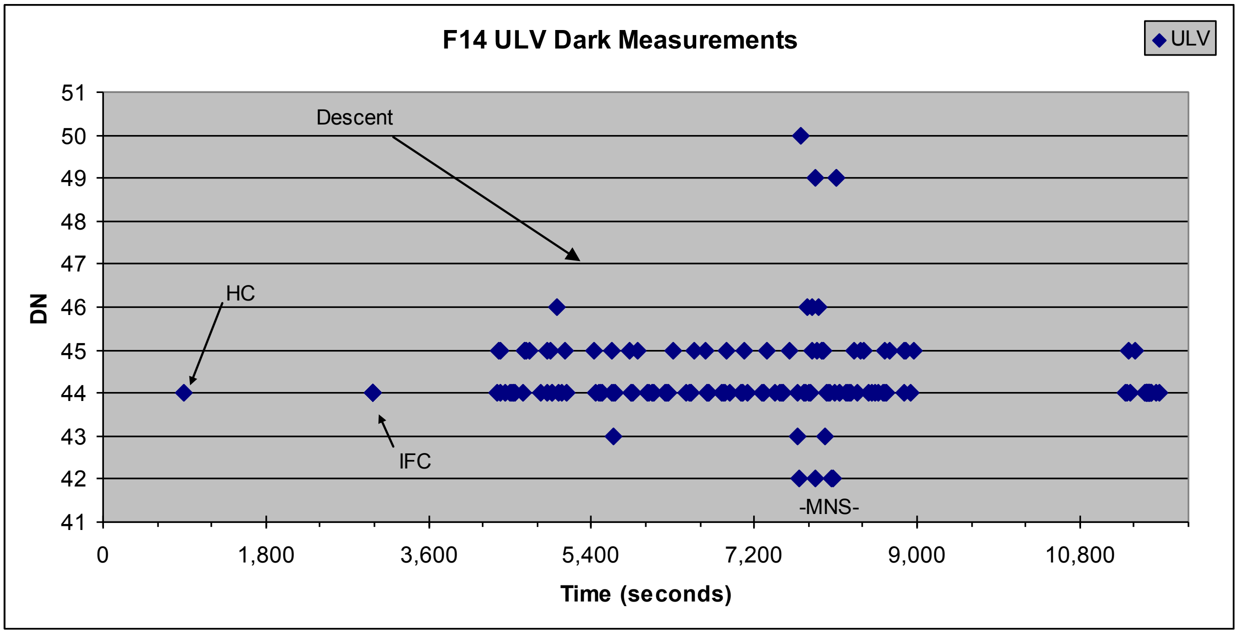


Figure 5.6-1: ULV dark measurements taken during the 14th In-flight test. HC indicates Heath Check routine exposures, IFC indicates In-Flight Calibration sequence exposures and the rest are simulated descent mode measurements. MNS indicates when the Medium Near Surface Cycles executed, which correlates to the most noisy violet measurements.

This test consisted of Health Check (HC) & In-Flight Calibration (IFC) sequences, followed by a portion of a simulated descent. The darks taken during the HC & IFC sequences were consistent (44 DN). For the simulated descent portion of the test, which is most similar to the Titan encounter, the majority of the readings are between 44 and 45 DN with a deviation of a fraction of a DN. However there were significant outliers (as high as 5 DN) especially during the Medium Near Surface (MNS) cycle which pushed the 1 sigma variation to ~1DN.

The situation was improved during the final in-flight checkout (F16) which occurred about 2 months before encounter (see below).

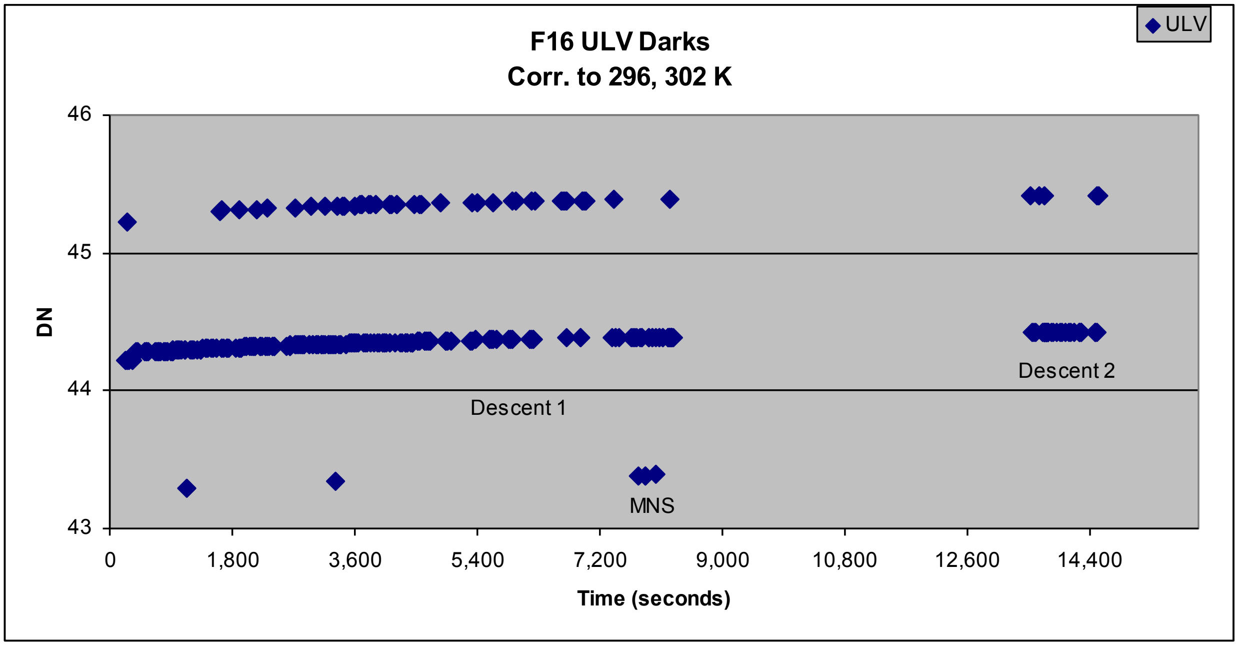


Figure 5.6-2: ULV photometer measurements taken during the last In-flight test sequence in November of 2004. A complete descent simulation was completed, then later in the test (at ~13,000 seconds) the instrument was re-commanded into descent mode to collect additional data (at zero altitude).

Again there were a number of outliers, particularly associated with the MNS cycle, but none were greater than 1 DN. The standard deviation for this set was only 0.37 DN.

A systematic change in the ULV bias was also observed from lab calibration to encounter as can be seen in this historical plot (below) of all tests taken with the instrument mated to the Huygens probe.

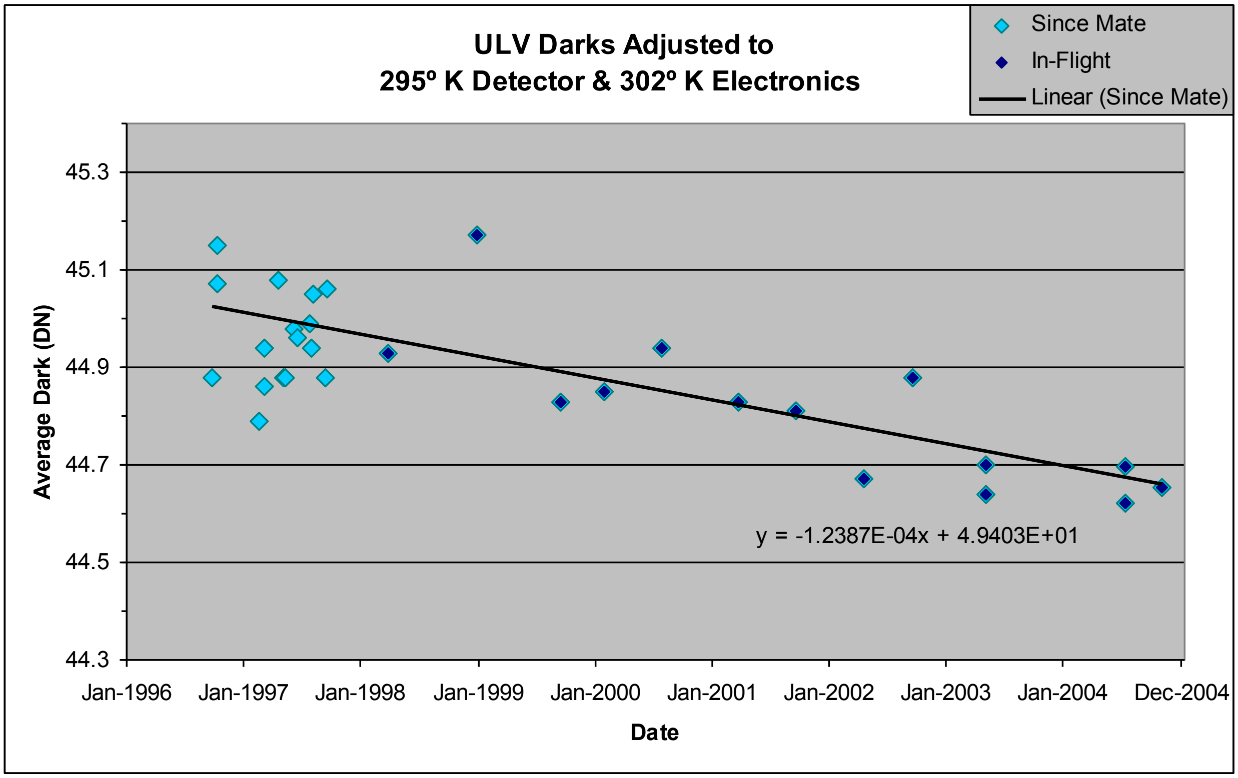


Figure 5.6-3: History of ULV photometer data from the installation of DISR into the Huygens probe until Titan encounter. Each point represents the average reading during a particular test sequence.

Extrapolating this data to the Titan encounter epoch (14 Jan 2005) yields an anticipated ULV dark current offset of 44.65 DN with a standard deviation of 0.18 DN (at T_v = 295ºK & Te=302ºK).

Using this information for the ULV dark offset in equation 5.6.2 allows us to plot the Titan Descent data as seen below.

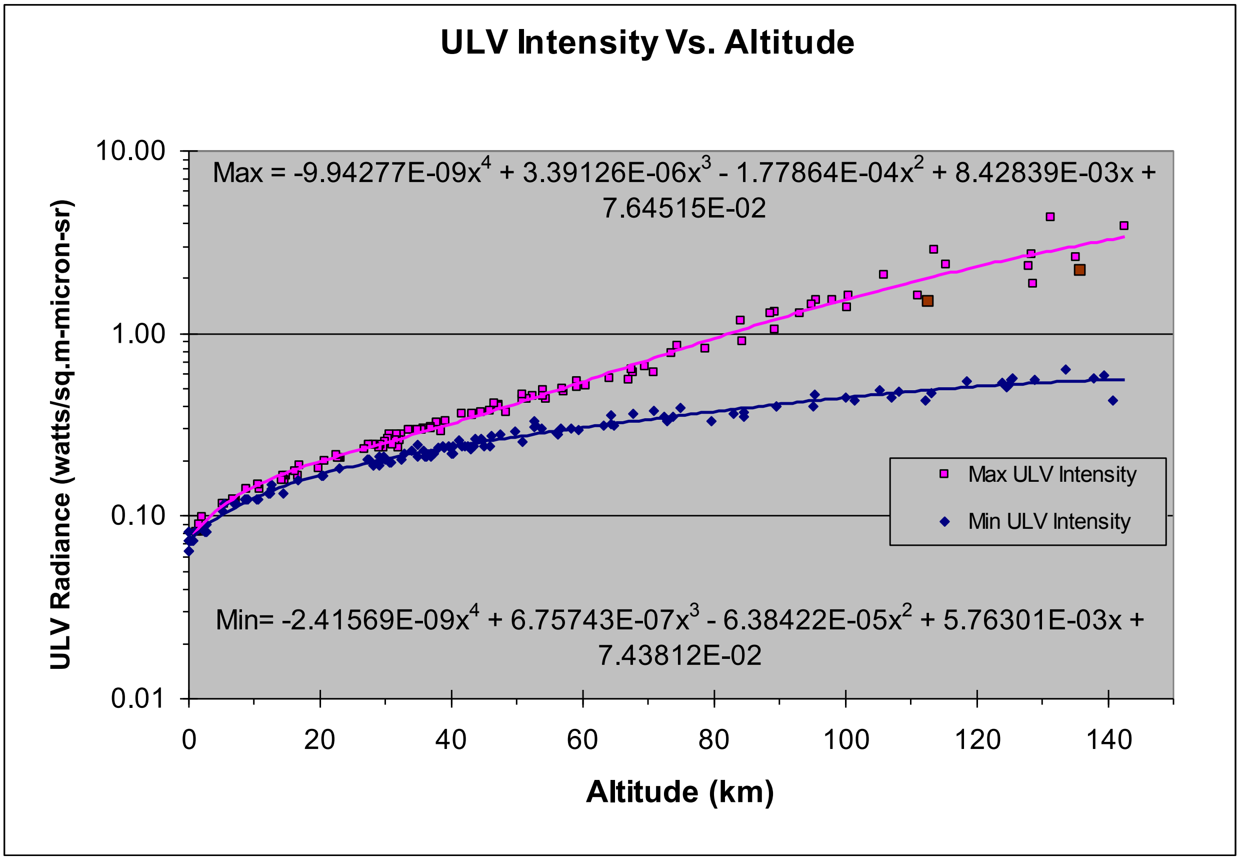


Figure 5.6-4: The hemispherical average upward looking radiance measured during the Titan descent by the violet photometer (350 to 470 nm) as a function of altitude. Red observations include Sun in the field of view.

As one might expect there are two populations of ULV data, one with the Sun in the field of view, and one without. These populations converge at around 2 km altitude as the direct solar beam becomes small in comparison to the diffuse sky flux. Erich Karkoschka has calculated that in this wavelength band the Sun in Titan's daytime sky delivers about the same relative energy to the surface as the half moon delivers to the earth during the day. That is, although the Sun would be visible, it would not deliver significant direct illumination.

As a further example of reducing the ULV data let us consider a pair datasets near 79 km altitude, one with the Sun in the field of view, and one without. The following information is available from the DISR archive datasets:

Table 5.6.1-3

ULV Data near 79 km, from PDS Archive						
File	M_Time	Altitude	Azimuth	EW_Tilt	Tv	DN
	(sec)	(km)	(deg)	(deg)	(deg K)	
VIOLET_0080_002342_1905	1422.19	79.61	152.77	-3.16	255.1	85
VIOLET_0081_002401_4356	1441.44	78.70	319.94	-8.02	245.9	146

In Table 5.6.1-3, 'File' is of course, the DISR archive file name. As encoded in the file name, these are the 80^{th} and 81^{st} violet measurements taken during the descent. M_time is the mission time relative to T0 (the parachute deployment and DDB time reset epoch). Azimuth is the position of the probe +Z axis (i.e. DISR sensor head) in degrees counter-clockwise from above (i.e. spin vector coincident with probe +X axis using right hand rule) relative to the Sun at the start of the measurement. EW_Tilt is the angle between the probes +X (spin) axis and Zenith in the east-west direction (east positive). T_v is the violet detector temperature. DN is the 12 bit digital data number corresponding to the violet detector measurement (4096 max).

Next we will update the altitude, azimuth and tilt parameters. Interpolating in the June 2011 DTWG altitude table (echoed in Appendix 11) yields 79.62 km and 78.70 km for epoch's 1422.19 seconds and 1441.44 seconds respectively, so these header values are correct and do not have to be updated; however, this is not always the case, as can be seen in the altitude comparison presented in Appendix 7.

The azimuth information can be updated using Karkoschka's table presented in Appendix 5 (& Ref 5). This produces rotations of 74.9876 and 77.42826 East of North (or Naz = 355.5º & 154.2º). Obtaining the Sun positions from Appendix 14 (Saz = 113.61º & 113.6184º) allows us to calculate Huygens azimuth relative to the Sun at our two data points as AZ= Naz-Saz = 207.64º & 40.37º, somewhat different than the header entries.

Appendix 4 contains the east-west tilt information from 2007. Interpolating in this table results in tilts of -3.12º & -6.75º for our measurement epochs.

Our ULV data with updated parameters is presented in the following table.

Table 5.6.1-4

ULV Data near 79 km, updated						
File	M_Time	Altitude	Azimuth	EW_Tilt	Tv	DN
	(sec)	(km)	(deg)	(deg)	(deg K)	
VIOLET_0080_002342_1905	1422.19	79.62	207.64	-3.12	255.1	85
VIOLET_0081_002401_4356	1441.44	78.70	40.37	-6.75	245.9	146

To calculate the measured intensity we still need the DISR electronics temperature for determination of the correct dark offset. Interpolating to the measurement epochs in the table in Appendix 15 yields an electronics temperature of 292.1ºK for both measurements (Quantization error in the DISR temperature measurements is about 0.1K). Recalling that the extrapolated dark offset is 44.65 DN at T_v=295 & T_e=302 we determine the offset at the observation conditions using equation 5.6.3:

$$DN_{corr} = DN + (A_1+B_1*T_v)*(295-T_v)+A_2*(T_e-302) \qquad \text{(eq. 5.6.3)}$$

$$DN_{corr} = 44.65 + (-0.05156 + 2.4858E\text{-}04 * 255.1) * (295-255.1) + 0.0203 * (292.1 - 302)$$

Which results in dark offsets of:

Table 5.6.1-5

File	M_Time	Dark Offset
	(sec)	(DN)
VIOLET_0080_002342_1905	1422.19	44.92
VIOLET_0081_002401_4356	1441.44	44.92

We are now ready to calculate the radiance for our two measurements using equation 5.6.1:

$< I > = [(DN-DN_{dark})] / [A_1*(A_2+B_2*T_v+C_2*T_v^2)*(A_3+B_3*T_v)*((A_5+B_5*T_v)-(A_4+B_4*T_v))]$ (eq. 5.6.4)

For VIOLET_0080_002342_1905:

$< I_{80} > = [(85 - 44.92)] / [1.0*(918.9 + 1.8446 * 255.1 - 0.0030642 * 255.1^2) * (0.8089 + 0.0001112 *255.1) * ((478.35 - 0.00726 * 255.1) - (354.1 - 0.0095 * 255.1))]$

$< I_{80} >$ = 0.0003222 watts/(m^2-nanometer-sr) = 0.322 watts/(m^2-micron-sr)

and for VIOLET_0081_002401_4356:

$< I_{81} >$ = 0.0008158 watts/(m^2-nanometer-sr) = 0.816 watts/(m^2-micron-sr)

We cannot accurately correct for tip-tilt (i.e. misalignment between probe spin axis and zenith) since the zenith angle dependence of the radiation field is not measured directly. To do this properly requires development of a radiative heat transfer model. However we can apply a first order adjustment which likely over corrects the flux by assuming a sinusoidal variation.

$$I_{corr}=I_{meas}*(1+\sin(tilt_1)*\cos(E_{az}))*(1+\sin(tilt_2)*\cos(90+E_{az})) \quad \text{(eq. 5.6.5)}$$

where:

- I_{meas} is the measured radiance,
- I_{corr} is the corrected radiance,
- $tilt_1$ is the tilt in the E-W direction in degrees, E positive as in Appendix 4,
- $tilt_2$ is the tilt in the N-S direction in degrees, S positive, and
- E_{az} is the observation azimuth relative to East in degrees.

Eaz is calculated from our table information as E_{az}=AZ+(SAZ-90), where AZ is the azimuth of the observation from our table and SAZ is the position of the Sun relative to north obtained from Appendix 14 (~113º to 115º).

Since we have no information about the north-south tilt we will assume that it is zero. In reality it is probably similar in magnitude to the east-west tilt, but until a detailed probe dynamics model is completed we do not have this information.

Applying this tilt correction to our measurement results in:

Eaz = 207.64 + (113.61-90) = 231.25º

$< I_{80} >$ = 0.3222 * (1+sin(-3.12º)*cos(231.25º))*(1+sin(0)*cos(90+231.25º))
= 0.3332 watts/(m^2-micron-sr)

and

$< I_{81} >$ = 0.7738 watts/(m^2-micron-sr) (vs. 0.816 before tilt adjustment)

These results agree well with the trend line established in Figure 5.6-4.

So at 79 km altitude the diffuse upward looking (downward directed) radiance averaged over roughly one hemisphere and averaged across the photometer's spectral range (350 to 470 nm) is:

$I_{diffuse} = I_{80}$ = 0.336 watts/(m^2-micron-sr),

and the direct solar beam contribution to the average downward radiance is:

$I_{direct} = I_{81} - I_{80}$ = 0.388 watts/(m^2-micron-sr).

5.6.2 Downward Looking Violet (DLV) Photometer Example

We will now consider a similar set of data for the DLV. In anticipation of calculating the net flux (down-up) we will choose the two DLV measurement from the same data cycle (14). From Appendix 16 we find that there are 2 DLV measurements in cycle 12, sequence numbers 77 & 78, and we fetch the following data from the DISR archive (in hpdisr_0001/DATA/VIOLET/VIOLET_00XX):

Table 5.6.2-1

DLV Data near 79 km, from PDS Archive						
File	M_Time	Altitude	Azimuth	EW_Tilt	Tv	DN
	(sec)	(km)	(deg)	(deg)	(deg K)	
VIOLET_0077_002330_2148	1410.215	80.19	5.18	-1.80	255.4	255
VIOLET_0078_002333_7809	1413.781	80.01	194.41	-2.63	255.3	214

Updating this data as we did in section 5.6.1 for the ULV we end up with the values listed below (also see Appendix 16):

Table 5.6.2-2

DLV Data near 79 km, updated						
File	M_Time	Altitude	Azimuth	EW_Tilt	Tv	DN
	(sec)	(km)	(deg)	(deg)	(deg K)	
VIOLET_0077_002330_2148	1410.215	80.19	355.35	-1.7	255.4	255
VIOLET_0078_002333_7809	1413.781	80.02	166.11	-2.3	255.3	214

From the Violet calibration document (hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/VIOLET_PHOTOMETERS/VIOLET_PHOTOMETER_CAL_DOC) we obtain the coefficients for the Peak Responsivity (Pg 59, Fig 33), Relative Spectral Response (Pg 42, Eq 26), and λ1 & λ2 (Pg 42, Fig 22) as shown in the following table:

Table 5.6.2-3

DISR DLV Calibration Coefficients					
	Rel1	**$Resp_{peak}$**	**Rel_{spec}**	**λ1**	**λ2**
Coef.	**1**	**2**	**3**	**4**	**5**
A	1.0	7202.4	0.8182	353.97	478.26
B		18.671	0.000116	-0.0094799	-0.0073198
C		-0.027489			

For the form: $R = A + B*T_v + C*T_v^2$ Where T_v is the violet detector temperature, and dλ= λ2-λ1 (in nanometers).

Since we are using the Peak Responsivity instead of the Measured Responsivity, Rel1 is 1.0 as explained in the section named "Absolute Responsivity as a function of temperature" (V) of the calibration document.

Determination of the dark offset values (DN_{dark}) is discussed in section, "Dark data values during descent" (VII-A) of the calibration document (Ref 4). This offset is semi-randomly bimodal, but is also a function of the descent cycle in which the data was taken. The best way to determine the offset is to iteratively trend the data using all of the possible offsets and acquire a best fit. This was done by the DISR team and a table of resulting offsets for each of the Titan descent DLV measurements is presented in Appendix 17. Below is an excerpt for our two observations...

Table 5.6.2-4

Seq #	Cyc. #	Cycle Type	Time (sec.)	DN	Bias	Lamps
77	14	Image	1410.22	255	43	0000
78	14	Image	1413.78	214	31	0000

We are now ready to calculate the radiance for our two measurements using equation 5.6.4:

$$< I > = [(DN-DN_{dark})] / [A_1*(A_2+B_2*T_v+C_2*T_v^2)*(A_3+B_3*T_v)*((A_5+B_5*T_v)-(A_4+B_4*T_v))] \quad \text{(eq. 5.6.4)}$$

For VIOLET_0077_002330_2148:

$$< I_{77} > = [(255 - 43)\ ] \ / \ [1.0*(7202.4 + 18.671 * 255.4 -0.027489 * 255.4^2) * (0.8182 + 0.000116 *255.4) * ((478.26 - 0.0073198 * 255.4)-(353.97 - 0.0094799 * 255.4))]$$

$< I_{77} >$ = 0.0001968 watts/(m^2-nanometer-sr) = 0.197 watts/(m^2-micron-sr) and for VIOLET_0078_002333_7809:

< I_{78} > = 0.0001699 watts/(m^2-nanometer-sr) = 0.170 watts/(m^2-micron-sr)

We will now correct for the east-west tilt as before:

$$I_{corr}=I_{meas}*(1+\sin(tilt_1)*\cos(E_{az}))*(1+\sin(tilt_2)*\cos(90+E_{az})) \quad \text{(eq. 5.6.5)}$$

where E_{az}=AZ+(SAZ-90), E_{az} = 18.95 for seq. # 77 and 189.71 for seq. # 78, and the corrected radiances become:

< I_{77c} > = 0.0001913 watts/(m^2-nanometer-sr) = 0.191 watts/(m^2-micron-sr)

< I_{78c} > = 0.0001766 watts/(m^2-nanometer-sr) = 0.177 watts/(m^2-micron-sr)

So even looking downward the radiance is brighter in the Sun's direction.

As promised we will now calculate the net flux in our violet band, near 79 km altitude, in Titan's atmosphere using these observations. From equation 50 of the calibration document the upward streaming flux is given by:

$F_{up} = \pi * I_{ave}$, where I_{ave} is the azimuthally averaged down-looking radiance, and likewise for the downward streaming flux:

$F_{down} = \pi * I_{ave}$, where I_{ave} is the azimuthally averaged up-looking radiance.

To do this properly of course requires a radiative heat transfer model to calculate the azimuthal dependence, however since our observations represent the average over half a hemisphere and are nearly 180º apart their average is a good representation of the hemispherical average. There will be some error of course since our upward observation of the direct beam does not have the Sun squarely in the center of the FOV.

Fup = π * Average(0.191,0.177) = 0.1840 Watts/(m^2-micron),

Fdown = π * Average(0..3333,0.7738) = 0.5535 Watts/(m^2-micron), and

The net flux, Fnet = Fdown - Fup = 0.3696 Watts/(m^2-micron)

Since this is the average flux we can multiply by our detector bandwidth to determine the Total Irradiance:

$$E = I * d\lambda = 0.3696 * (0.48-0.35) = 0.0480 \text{ Watts/m}^2$$

which becomes the measured energy absorbed in our layer at 79 km altitude.

Trending the data with altitude minimizes errors due to noise, probe motion and bias uncertainty. The figure below shows a polynomial curve fit to the Net DLV data (measured DN minus chosen bias). The equation thus becomes our expression for the average downward looking violet measurement at each altitude (ignoring the azimuthal variations).

Evaluating this equation at the average of our example observations (80.11 km) gives an average value of 196.9 DN, vs. our measured value of 197.5 DN (0.3% different).

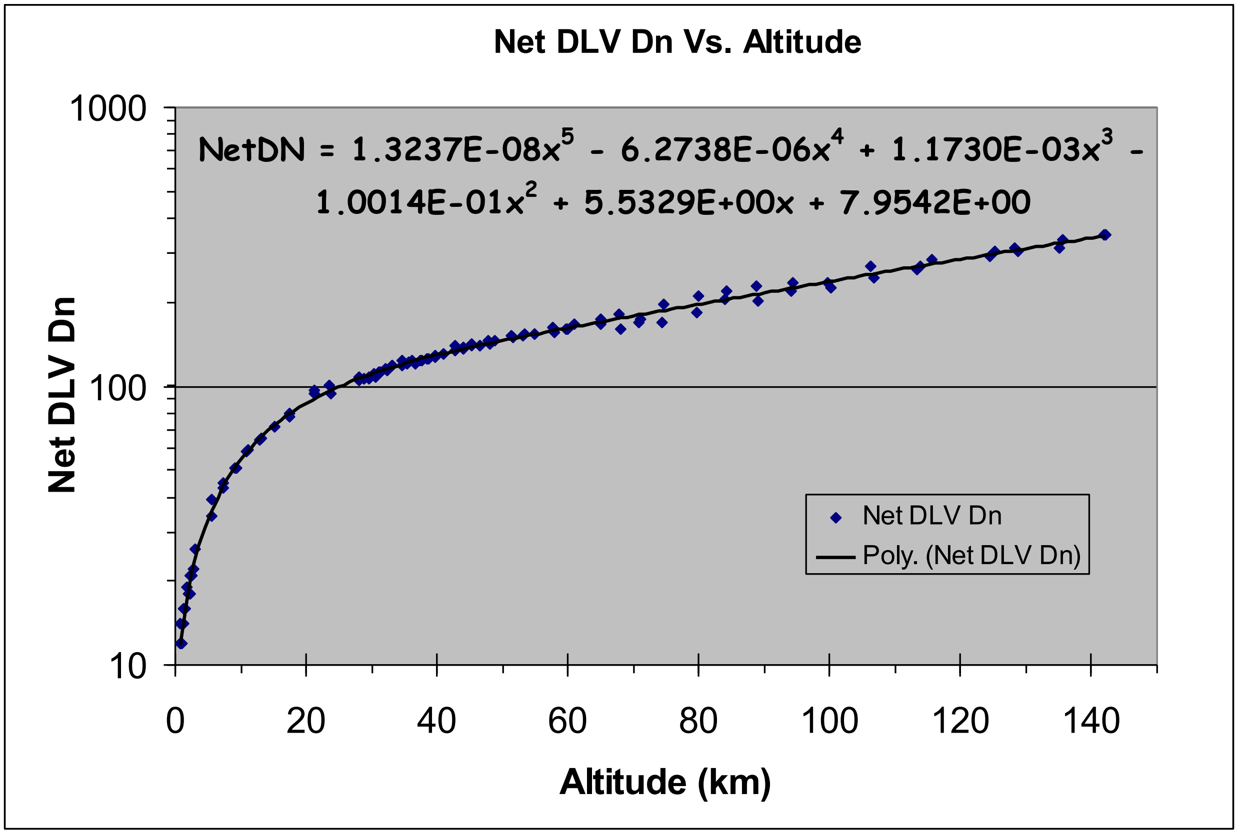


Figure 5.6-5 - Measured data number (DN) minus the derived dark DLV offset vs. altitude.

Similarly we can trend the downward looking radiance as a function of altitude (figure below). The blue trendline represents the average radiance at each altitude. The grey lines show the extent assuming that the azimuthal variation is ±7% of the average value i.e.:

$$I = I_{ave} + 0.07 * I_{ave} * \text{Cos(Azimuth)}$$

where: I is the radiance, I_{ave} is the azimuthally averaged radiance, and 'Azimuth' is the azimuth of the observation relative to the Sun.

One could get better agreement by varying this value with altitude.

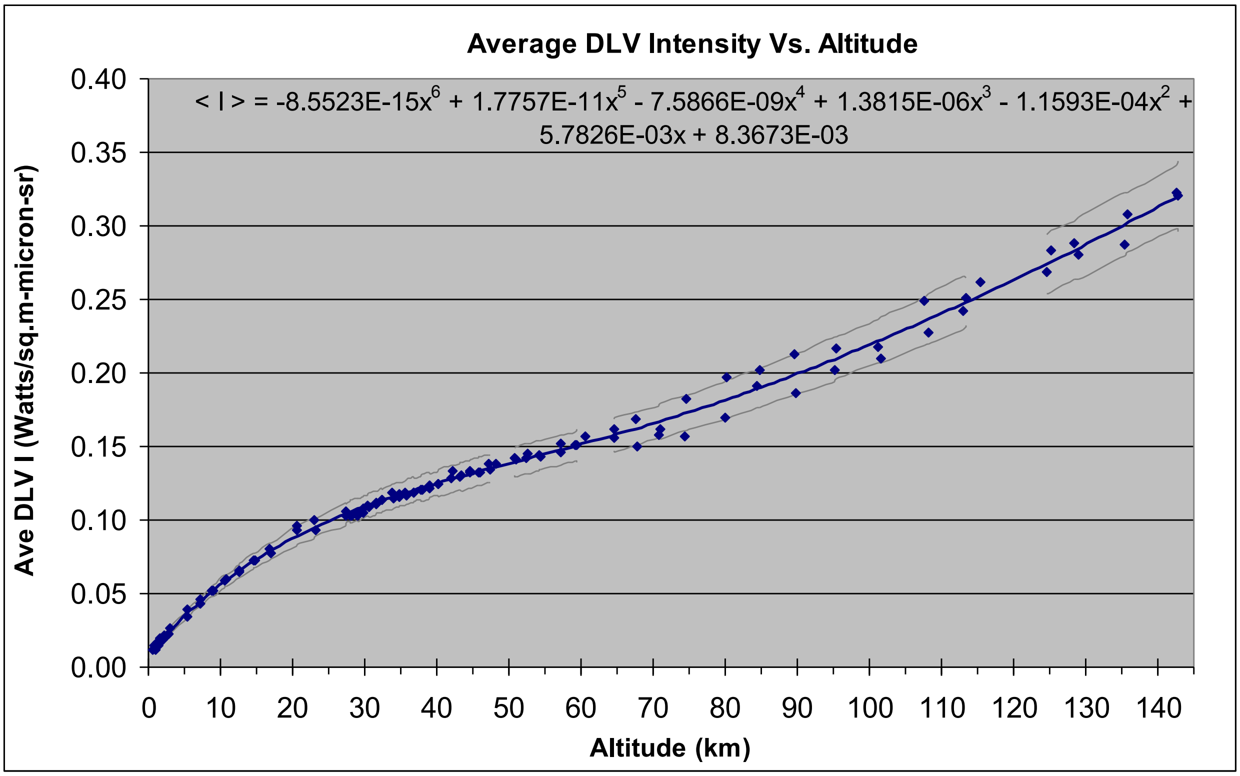


Figure 5.6-6: Downward looking spectral radiance as a function of altitude with expected azimuthal variation.

Correspondingly we can plot the upward streaming flux as a function of altitude from the DLV data (below).

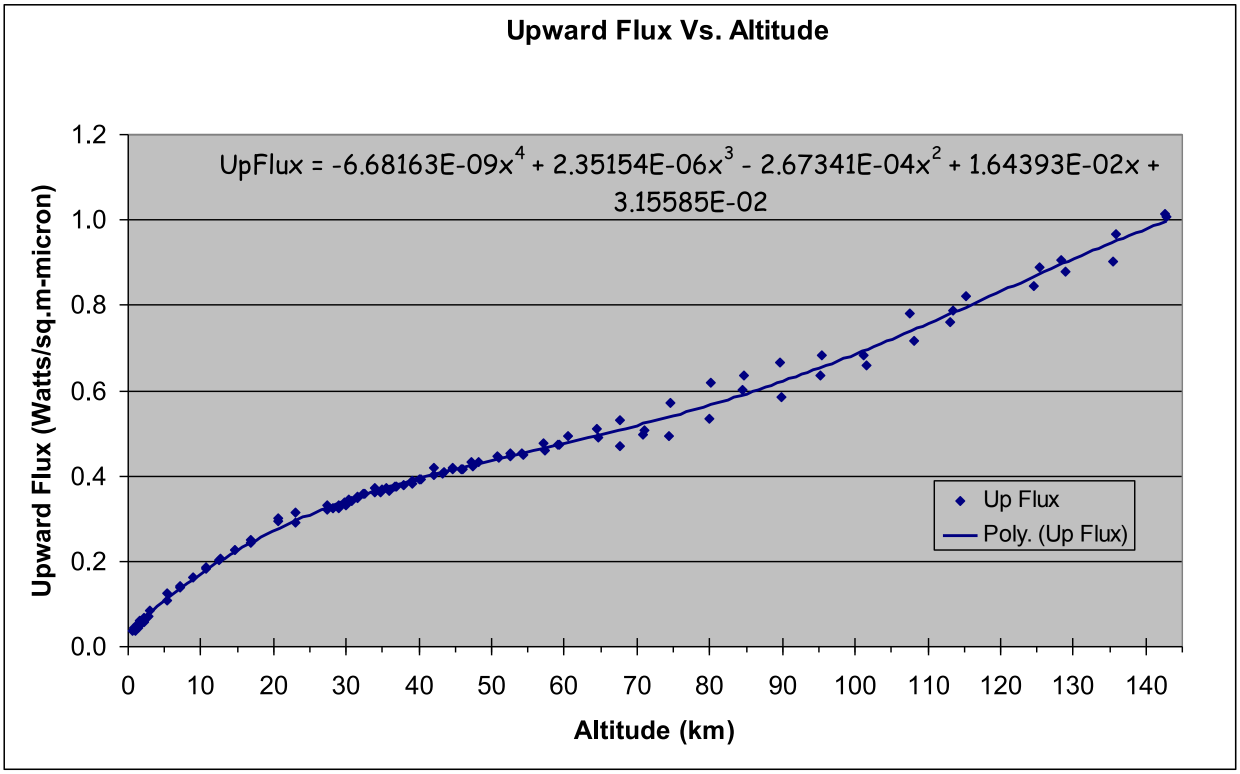
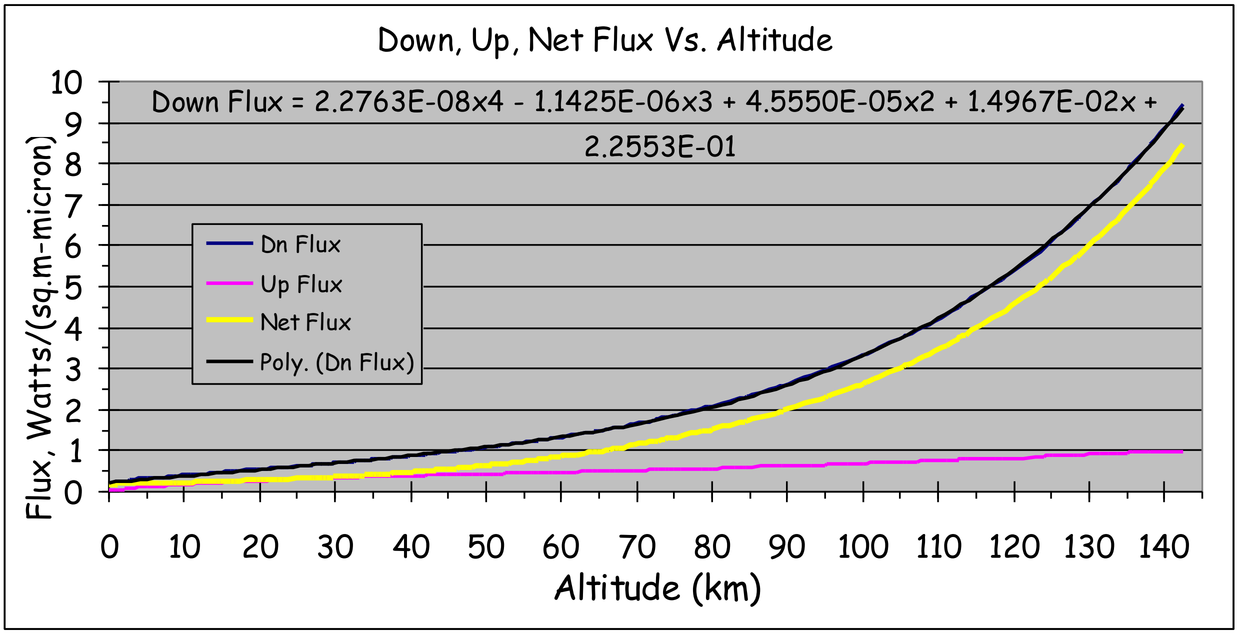


Figure 5.6-7: Upward streaming spectral flux as a function of altitude as measured by the DISR Downward Looking Violet Photometer (~350 to 480 nm).

Similarly we calculate the downward streaming flux from the average of the sunward and anti-sunward ULV data presented in Figure 5.6-4. Evaluating the downward flux equation at the surface (x=0) we find the flux at the Huygens Landing site is 0.226 W/(m^2 * micron), or 0.03 W/m^2 across our UV band (compared to ~100 W/m^2 on the Earth), and the net flux as the difference of the two.



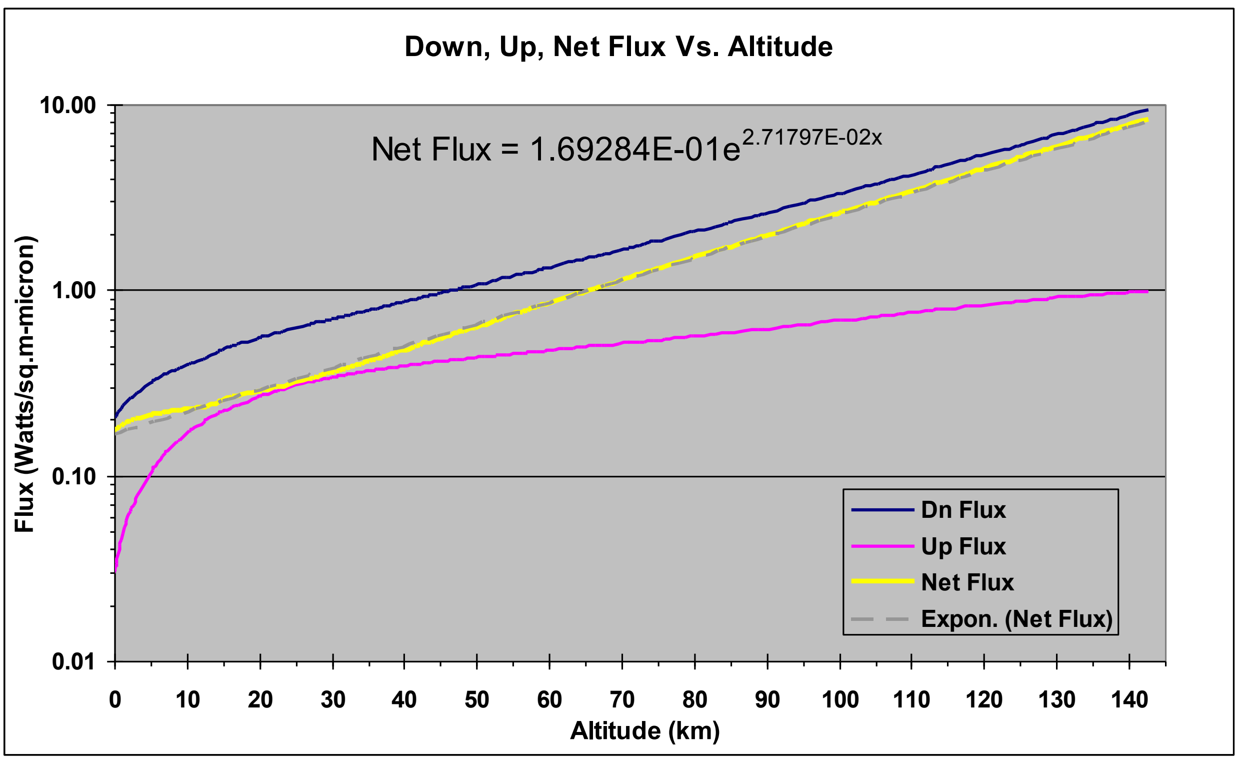


Figure 5.6-8: Violet Flux (~350 to 480 nm) in Titan's atmosphere as measured in January 2005 by the DISR instrument aboard the Huygens probe.

5.6.3 Other Violet Photometer Considerations

Relative Spatial Response...

We have discussed how to calculate the average response over the photometers field of view, however the user may wish to explore the shape of the radiation field. There is no unique answer to this quest, however it is possible to determine if a proposed radiation profile is consistent with the DISR data. To do this one would need the Relative Spatial Response Function (Rel1) of the instrument which is described in section IV, "Relative Spatial Response" of the Violet Photometer Calibration Document (Ref 4).

Any radiation field who's product with the Rel1 (figures 24 & 25 of Reference 4) integrates to 1 is consistent with the isotropic case used to develop the DISR calibration. Some simplistic examples are all of the radiation occurring at the peak of Rel1, or a radiance of 2 times the average distributed evenly over the area between the 0.45 and 0.55 contours in figures 24 or 25. One can always adopt a candidate radiation field by normalizing the integral of its product with Rel1 to unity:

$$[\int \mathbf{I} * \mathrm{Rel1}\, d\Omega\,] / \mathrm{E}_{ave} = 1$$

where:

- $\mathbf{I}$ is the Irradiance per unit solid angle at each point in the FOV.
- Rel1 is the Relative Spatial Response Function from Ref 4
- E_{ave} is the average Irradiance over the field of view

The upward looking violet photometer (ULVP) is obscured by a shadow bar in its FOV. This allows the measurement of the sky's diffuse intensity both toward and away from the Sun. Since the instrument was calibrated with an isotropic radiation field, this does not effect the results in the isotropic case. However, it does have implications if one wishes to model a non-isotropic sky. The location of the shadow bar, and parachute baffle is apparent in the Rel1 (Figure 24 of Reference 4). To facilitate analytic removal of the shadow bar the following fit to the 95% attenuation contour is presented. Azimuths here are in degrees to the left (CCW from above) relative to the DISR's (& Probes) +Z axis. Attenuation occurs between the horizontal lines (i.e. near 0 azimuth)

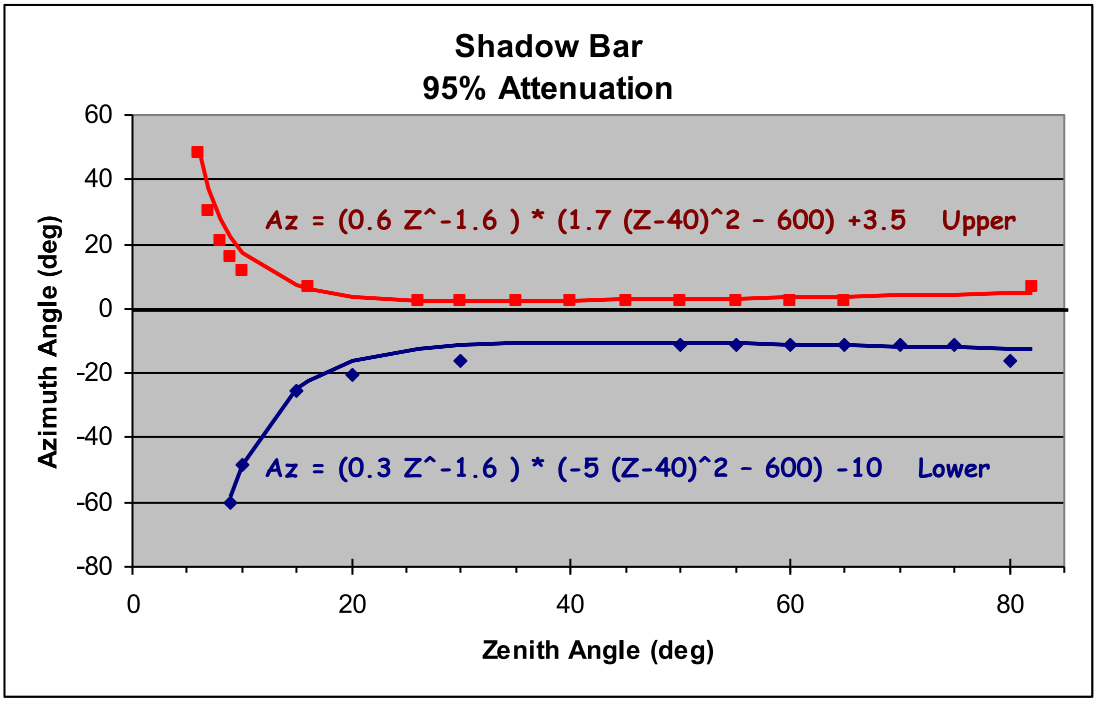


Figure 5.6-9: Attenuation of the ULV signal by the DISR shadow bar.

$Az = (0.6\ Z^{-1.6}) * (1.7\ (Z-40)^2 - 600) + 3.5$ Upper - for zenith angles from 6 to 82 deg.
$Az = (0.3\ Z^{-1.6}) * (-5\ (Z-40)^2 - 600) - 10$ Lower - for zenith angles from 9 to 80 deg.

Although the ULV photometer is physically baffled 5 degrees from the probe from horizon to horizon (5º zenith, from -90º to +90º azimuth), in actuality fiber optic geometry of the ULV photometer significantly attenuates radiation to about 8 degrees zenith angle from -90º to 0º Azimuth.

A word about azimuths, and the Relative Spatial Response plots:

The probe rotated clockwise as viewed from above for most of the descent, which is opposite what was expected. The convention used in the calibration document assigns azimuth angles increasing counter-clockwise when viewed from above, which would result in the Sun progressing in decreasing azimuth angle through the field of view with time. This was true at the beginning of the descent; however after about 550 seconds (i.e. below about 124 km) the probe began to rotate clockwise (from above) and so the Sun's progress was opposite that shown in figures 24 & 25 of the Violet Photometer calibration report.

In Reference 5 (also Appendix 5), Karkoschka defines the azimuth relative in full rotations relative to north, which is consistent with figures 24 & 25 at all altitudes (i.e. a measurement taken at 0.1 rev (36 degrees) azimuth would have the Sun on the right side of the plot, and an observation at 0.9 rev (-36 or 324 degrees) would have the Sun on the left). Thus these two figures present the instruments response from the view of an inverted DISR, such that up is down, and down is up, left is right & right is left (i.e. the plot is rotated 180º in the plane of the paper). A rotated version of Figure 24 is presented in the ULVS portion of this Guide with annotation.

Earth to Saturn Cruise Effects...

We have already discussed the progression of the Violet Photometer dark current during the Cassini cruise from Earth to Saturn. There has also been noticed an attenuation of the absolute responsivity of both the ULV and DLV. The responsivity decline appears to have begun when the Radio Isotope Heater Units (RHUs) were installed at Kennedy Space Center.

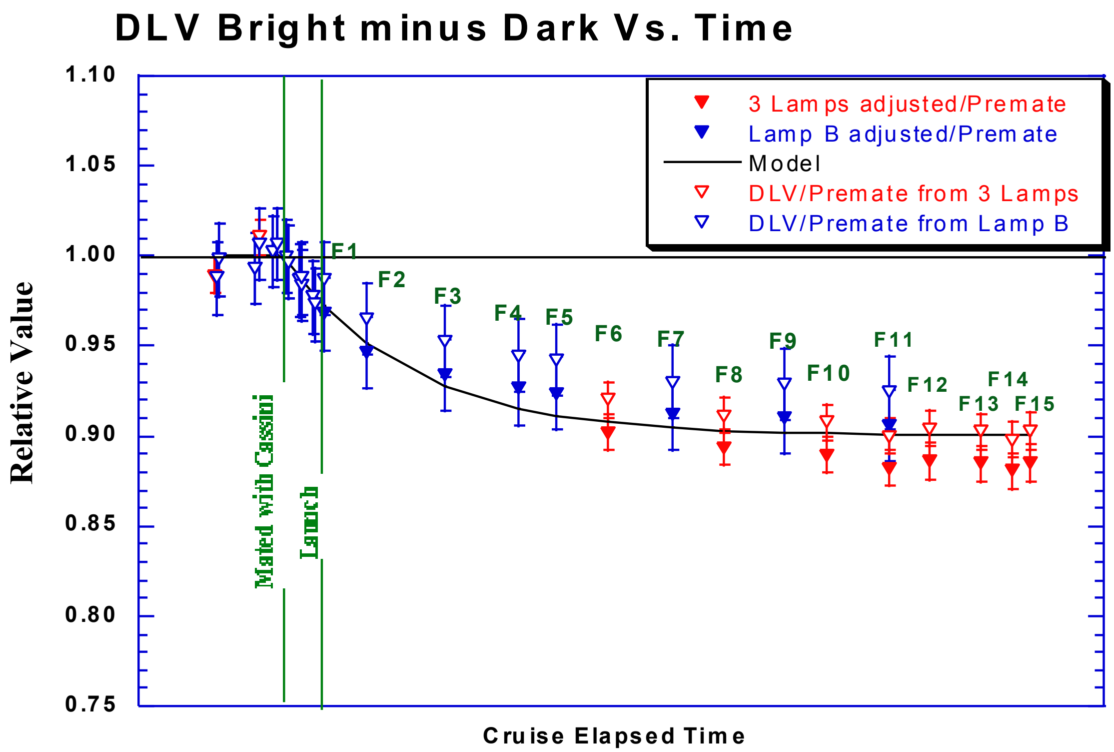
It is not known for certain what caused the responsivity reduction. It is proposed that it may be due to darkening of the Schott radiation hardened glass used in the fiber optics. Leftover specimens have turned a darkened yellowish brown color over time, even in Earth atmospheric environment.. The ratio of the attenuation between the two violet systems is roughly consistent with the length of the fiber optic bundles that transmit the light from the optics to the detectors. It may also be attributable to radiation or vacuum exposure of the detectors or electronics.

The overall reduction in responsivity is 19.2% for the ULV and 11.5% for the DLV from the laboratory calibration values (see plots below). The spectral shape in the UV is unknown, but there is likely greater attenuation toward the blue end. At a minimum the data user would be well advised to include a correction factor for the Absolute Responsivity:

$$Resp_{corr} = Resp * Q$$

where

$Resp_{corr}$ is the corrected Absolute Responsivity
Resp is the lab measured Absolute Responsivity (at the peak of the spectrum), and
Q is 0.8851 for the DLV and 0.8079 for the ULV.



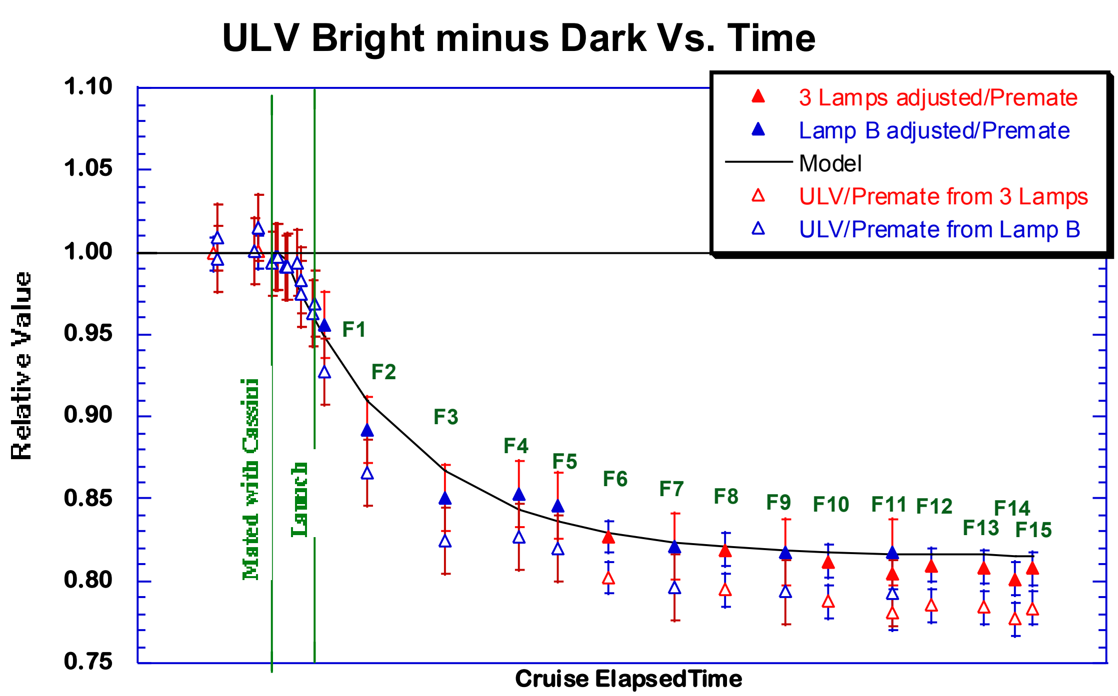


Figure 5.6-11- Violet Photometer responsivity history during Cassini cruise phase

5.7 CCD Covered Column Dark Data

It is the nature of Charge Coupled Devices (CCDs) to accumulate signal even in total darkness. This Dark Current generation rate is a strong function of temperature. DISR's IR spectrometers are equipped with a mechanical shutter which allows automatic removal of dark current from every measurement, by subtracting a like exposure with the shutter closed. However, the DISR's CCD instruments do not have a mechanical shutter, so the dark current portion of the signal must be calculated and removed by post processing. The CCD's covered columns (Dark datasets) and null pixels (in data headers) can be used for this.

The CCD layout is described in section 5.8 and shown in Figure 5.8-5.

The dark current is comprised of 4 components; the Image Zone Dark Current (R_I), which accumulates during the exposure; the Memory Zone Dark Current (R_M) which accumulates while the image is waiting under the covered section of the CCD to be read-out, the Serial Register Dark Current (R_S), which occurs as the row is being clocked-out, and an electronics offset (*O*) of about 8.9 DN:

$$DN = O + R_s + R_M \Delta t_M + R_I \Delta t_I, \qquad \text{(Equation 5.7-1)}$$

where:

DN is dark current contribution to the observed signal,

O is the electronics offset (about 8.9 DN during calibration),

R_s, R_M, and R_I are the dark current generation rates in the serial register, memory zone, and image zone, respectively, and,

Δt_M and Δt_I are the residence times in the memory zone and image zone, respectively.

R_s, R_M, and R_I are functions of detector temperature.

Details of how to determine the CCD dark current is presented in the "Dark Current Estimation" document in the Archive, (Reference 7), however an overview, with some update is presented in this section.

The dark current for every CCD pixel was measured during the lab calibration, and related to the dark current generation rate of the extra columns of pixels along the edge of the Image section (which are returned as "Dark" datasets by the instrument). In order to make this calculation accurately the contribution of the Serial Register must be removed. The value of O+Rs is related to the value of the 'null pixels' which exist in serial register, whose values are returned in the header of each dataset.

The amplitude of the dark current rate is strongly a function of temperature (particularly above 220ºK). It is also a function of radiation exposure, and increased consistently during the cruise from Earth to Titan. To adjust for changes during cruise, special, per pixel, measurements were made during the in-flight tests, and the relationship to the value measured by the Dark Datasets was updated using the 16th In-Flight test performed on 23rd November 2004 (52 days before Titan encounter). These relationships are presented in the "Dark Current Estimation" document in the Archive (Reference 7). The F16 data are summarized in Appendix 26. The examples below describe how this information can be used. In general the image zone and memory zone dark current rates are determined at one temperature (~262K) using the special F16 measurements, and the Titan descent Dark datasets are used to determine the temperature dependence.

Saturation of the CCD instruments by the Surface Science Lamp light obstructs determination of the dark current after landing, however the temperatures are low enough during this period of operation that the dark current can be neglected for datasets collected on Titan's surface (except the 8.9 DN electronics offset of course).

It is important to be aware of the difference in CCD readout modes when calculating dark current. There are two modes, Full Readout & Spectral Readout. As suggested by the name, Full Readout mode is used to readout the entire CCD contents. This mode is used when collecting Image datasets (SLI, MRI, HRI) and "Full" datasets (which are not collected during a descent). The covered column "Dark" datasets are also collected in Full Readout mode. The rest of the datasets are collected in the quicker, Spectral Readout mode, which reads out only the first 41 columns of the CCD. This includes ULVS, DLVS, & SA. The dark current accumulations rates are different for the two modes. It takes 2159 ms to shift the data through the CCD memory zone in Full Readout mode, and 263 ms in Spectral Readout mode (Ref 7).

The Dark Current Estimation document (Reference 7) has a good summary of the DISR CCD characteristics in its Appendix II ("CCD Architecture and Operation in Two Readout Modes").

Image Data Example...

For our first example we will find the dark current for one pixel in an HRI exposure. Let's choose dataset #21 (IMAGE_0021_000324_7662), since it was taken at the upper, warm part of the descent (259.2ºK). We will choose a pixel near the center of the 160 pixel wide by 256 pixel high array, which should have good signal, and not be effected by edge effects of fiber optic bundle. We will choose row #125, and column #80 (pixel 124, 79).

Here is a summary of information regarding our target pixel:

The signal level of this pixel is 2177 DN.
The CCD temperature is 259.2ºK.
Null Column 2 = 81 DN
Null Column 3 = 75 DN
Exposure Time = 7 ms

The first step is to determine how much of the signal is from the electronics offset and serial register (O+SR).

The equation for determining O+SR from Reference 7 is:

$$(Serial\_Register + Bias)_{FULL} = ((NullPixel2 / 4.0 + 0.125) + (NullPixel3 / 4.0 + 0.125)) / 2.0 \quad \text{(Equation 5.7-2)}$$

where:

NullPixel2 is the floating point value of Null Column 2 in the measurement in question.
NullPixel3 is the floating point value of Null Column 3 in the measurement in question.

The flight software multiplies the average of the null pixels by 4, truncates the result, and sends the outcome in telemetry for every CCD measurement. These values are in the dataset header, and the label file as "null_col2:" & "null_col3:".

So:

$$O+SR = \{ (81/4.0 + 0.125) + (75/4.0 + 0.125) \} / 2.0 = 19.6 \text{ DN}$$

To minimize the effects of pixel-to-pixel variations and make it easier to calculate O+SR for spectral mode measurements (which are scaled from the full frame O+SR), we have fit a temperature dependent exponential to the Titan descent (see Appendix 24).

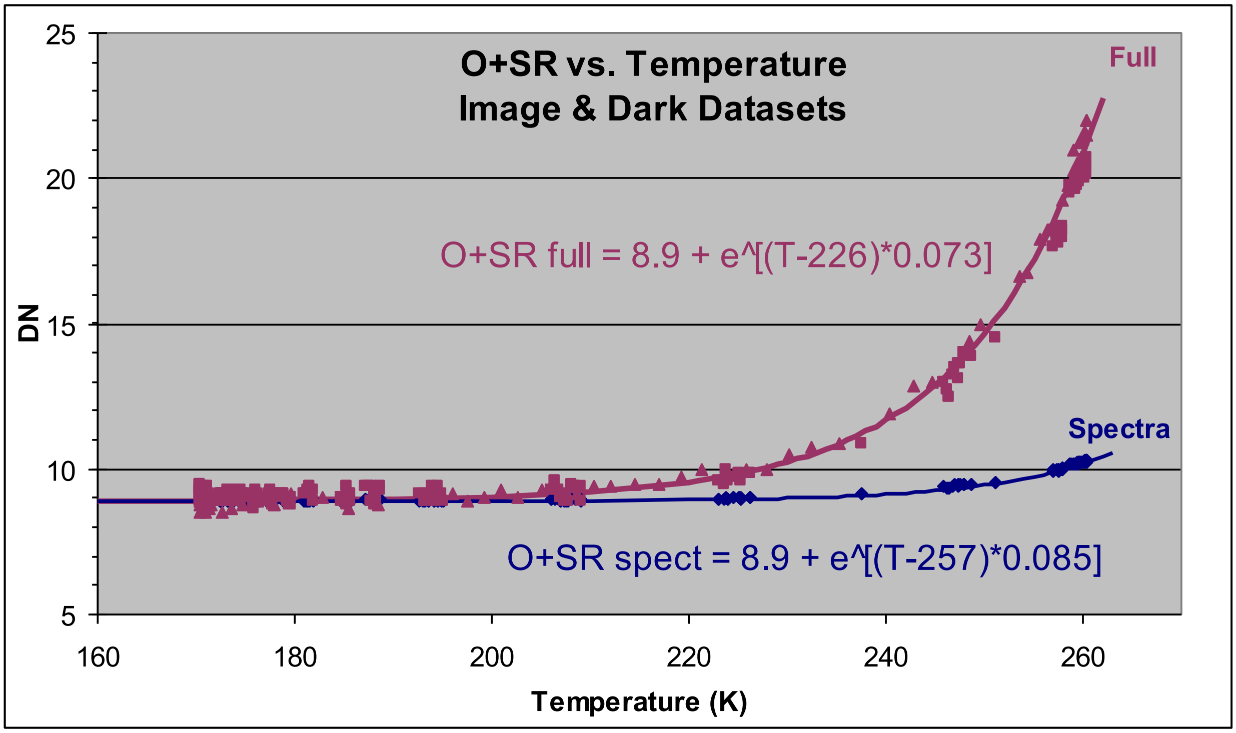


Figure 5.7-1: Electronics bias plus Serial Register dark current from full frame data (Image & Dark datasets) as measured during the Titan descent. The blue "Spectra" line is the same data scaled for the difference in serial register dwell time for the spectral mode datasets.

Thus for any full read mode dataset (i.e. Image and Darks), O+SR can be estimated by:

$$O+SR = 8.9 + e^{[(T - 226) * 0.073]} \qquad \text{(eq 5.7-2a)}$$

This relation evaluated at the CCD temperature of our observation (259.2ºK) yields:

$$O+SR = 8.9 + e^{[(259.2 - 226) * 0.073]}$$
$$= 20.2 \text{ DN, which is 0.6 DN higher than the null pixels suggest.}$$

Tables in the Dark Current Estimation document (Reference 7) provide proportionality constants which relate the dark current signal in each pixel of each CCD instrument to the average of the Dark datasets. The per-pixel dark current (i.e. Equation 6 from Reference 7) then becomes:

$$DN_f = O{+}SR + t{*}f_1{*}D + m_f{*}f_2{*}D \qquad \text{(eq. 5.7-3)}$$

where:

DN_f is the dark current signal for the given pixel,
O+SR is the offset plus serial register component calculated above,
t is the exposure time
f_1 it the proportionality constant from the tables of Reference 7
D is the per-pixel average dark signal in the Dark dataset with O+RS removed.
m_f is the memory zone residence time in seconds = (row + 1) * 0.0084, and
f_2 is the memory zone proportionality constant from the tables.

Again, to allow determination of dark current for any Titan Descent dataset, the per-pixel average value of the Dark datasets, D has been calculated and fit by the following temperature dependent exponential (see Figure 5.7-2). As noted from the F16 data, D is nearly identical for the image and memory zones of the DISR CCD.

$$D = e^{[(T - 228) * 0.107]} \qquad \text{(eq 5.7-4)}$$

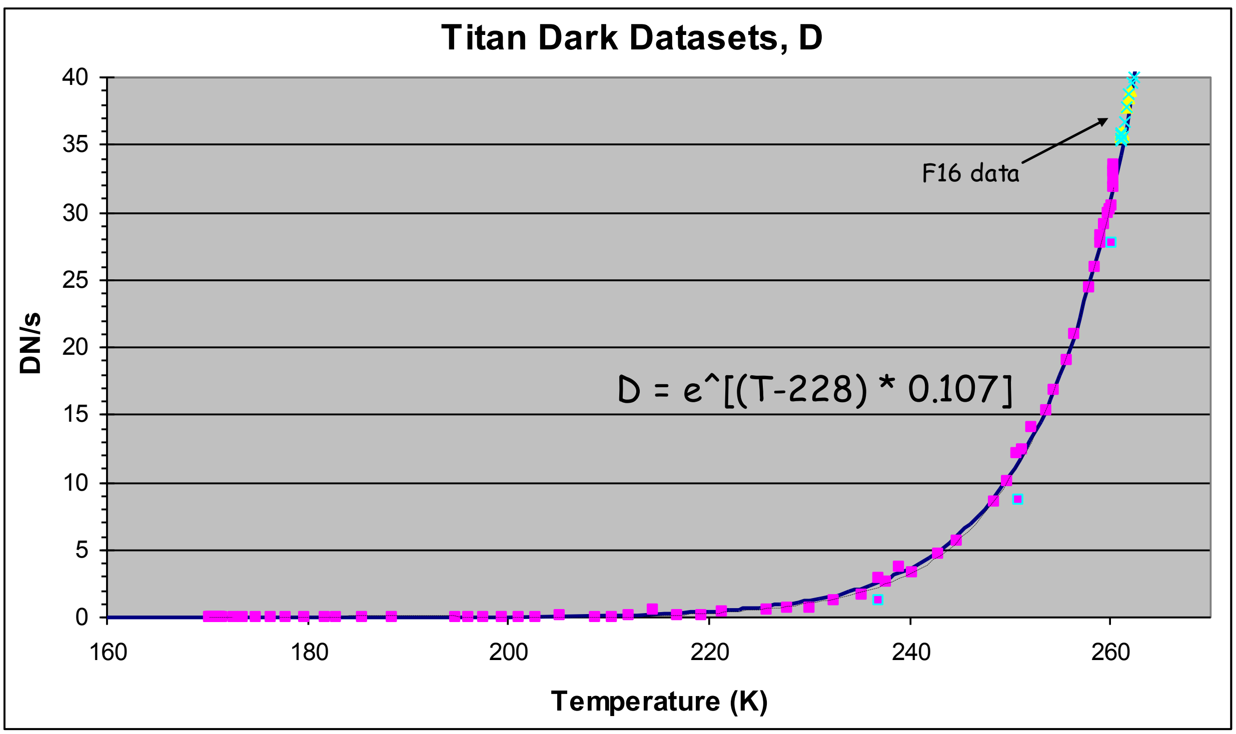


Figure 5.7-2: Average dark current rate, D (image and memory zone) for the DISR CCD as determined using the Dark datasets during the Titan descent by temperature.

At the temperature of our observation D becomes:

$$D = e^{[(259.2 - 228) * 0.107]} = 28.17 \text{ DN/second}$$

Collecting the rest of our needed elements for equation 5.7-3:

O+SR = 20.2 DN, from above
t = 7 / 1000 seconds, from dataset header
m = (row + 1) * 0.0084 = (124 + 1) * 0.0084 = 1.05 seconds (Ref 7, eq 8)
f1 = 0.18639, from Reference 7, table VIa for pixel 124, 79
f2 = 0.77338, from Reference 7, table VIIa, pg 250, for pixel 124,79

$$DN_f = O+SR + t{*}f_1{*}D + m_f{*}f_2{*}D$$

$$= 20.2 + .007 * 0.18639 * 28.17 + 1.05 * 0.77338 * 28.17$$

$$= 20.2 + 0.037 + 22.88 = 43.1 \text{ DN}$$

Thus, 43 DN of the 2177 DN signal for this observation for this pixel is dark current, the remaining 2030 DN is a combination of photonic signal, shutter effect and bleed thru. Shutter effect is discussed in section 5.8 below.

However before moving on to a spectral mode example; a few words about f2.

Because the dwell time in the memory zone is short for many pixels (those in the bottom row exit almost immediately), f2 is often not well defined. Figure 5.7.3 shows the values of f1 (blue) and f2 (red) for the 8 columns (0-7) of the ULVS. It can be seen that f2 for the lowest rows are unstable; and quantization continues to effect f2 for at least the lowest 150 rows. However, these effects aside, the f2 pixel to pixel variations are considerably less than those of f1. This being the case, it is recommended that one use the average value of f2 determined from rows above #150 (i.e. rows #150 to #200 for the ULVS). A summary of these 'alternate' f2 values is presented in table 5.7-1 below. Use of the value from this table for our HRI example above reduces the calculated dark current by 0.8 DN.

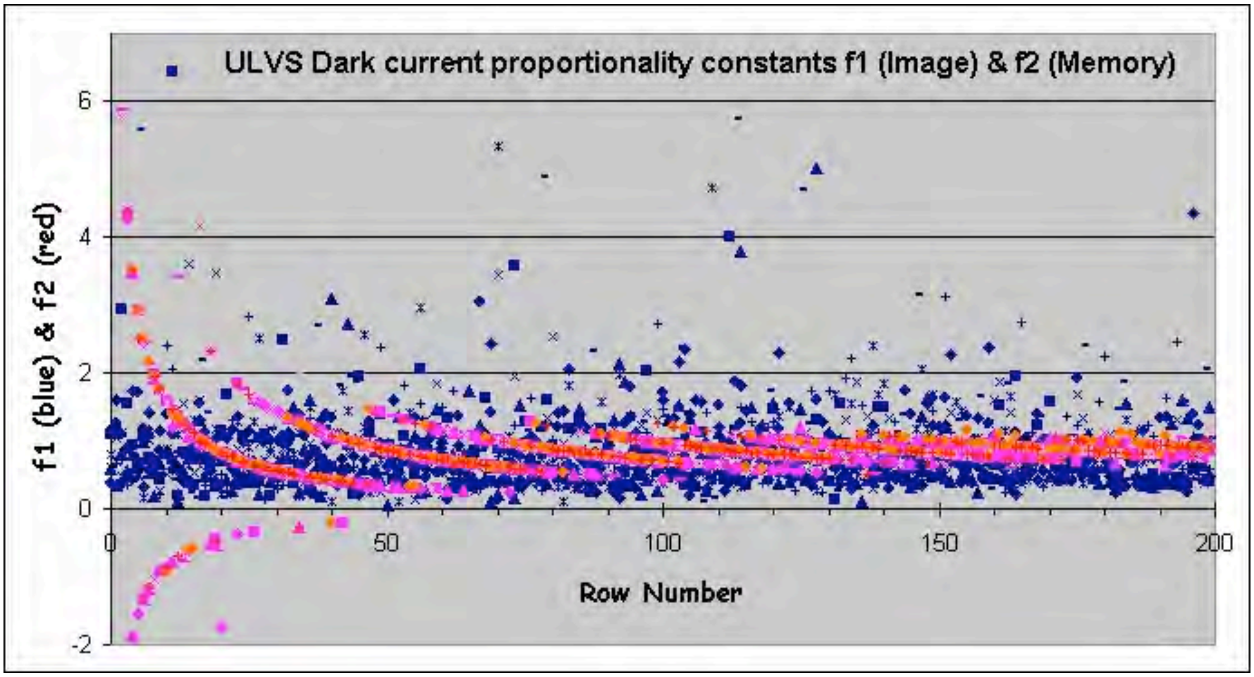


Figure 5.7-3: Dark current proportionality constants, f1 & f2 plotted vs. row number for the eight columns of the ULVS from the calibration document (Reference 7, table *IIIa*).

Table 5.7-1 Alternate (averaged) values for f2

CCD sub-instrument	Alternate value for f2
Downward Looking Visible Spectrometer	0.905
Upward Looking Visible Spectrometer	0.883
Solar Aureole 1, Blue Horizontal (0-5)	0.912
Solar Aureole 2, Blue Vertical (6-11)	0.927
Solar Aureole 3, Red Vertical (12-17)	0.919
Solar Aureole 4, Red Horizontal (18-23)	0.943
High Resolution Imager	0.872
Medium Resolution Imager	0.887
Side Looking Imager	0.893

Spectral Read Mode Example...

For this example I will choose one entry from one of the Visible Spectrometer datasets. Let us choose Visible Spectrometer dataset #67 (VISIBLE_0067_001356_0708), which is a Downward Looking Visible Spectrometer (DLVS) observation from 115 km altitude, with a CCD temperature of 260.3ºK (header information), and an exposure time of 644 ms from the label file. This dataset is summed from 20 to 10 columns width (i.e. x 2). We will choose table entry 132,0 which corresponds to the sum of pixels 132,0 & 132,1 (654 nm).

The data value from the data file is 2655 DN.

The term O+Rs in equation 5.7-1 is calculated by scaling the dwell time in the serial register from the full readout mode case:

$$(Serial\_Register + Bias)_{SPECTRA} = ((Serial\_Register + Bias_{FULL} - 8.9) * 0.992/8.384) + 8.9$$

where:

0.992/8.384 is the ratio of the pixel lifetime within the serial register in the Spectra readout mode to that in the Full readout mode.

8.9 DN is the best estimate of the electronic bias. The estimate is made from prelaunch calibration data at temperatures so cold that the serial register dark current is negligible.

Using equation 5.7-2a, the full readout O+Rs @ 260.3º K is: $8.9 + e^{[(260.3 - 226) * 0.073]} = 21.13$ DN, and correspondingly:

(O+Rs)spectra = [(21.13 - 8.9) * 0.992/8.384)] + 8.9 = 10.35 DN

Collecting the rest of the terms for the spectral mode version of equation 5.7-3:

$$DN_s = (O+SR)_s + t*f_1*D + m_s*f_2*D \qquad \text{(eq. 5.7-3)}$$

t = 0.644 seconds, from the label file,
f1 = average of 1.17633 & 0.33874 (i.e. 0.758) from Reference 7, table *Ia,*
$D = e^{[(260.3 - 228) * 0.107]} = 31.69$ DN/s, from equation 5.7-4,
m_s = (row+1) * 0.000992 = 0.13 seconds, from Reference 7, equation 9, and
f2 = 0.905 from table 5.7-1 above.

$$DN_s = 10.35 + 0.644*0.758*31.69 + 0.13*0.905*31.69 = 10.35 + 15.47 + 3.73 = 29.55 \text{ DN}$$

So 30 of the 2655 DN observed is from dark current.

New, Improved...

Lyn Doose has developed an alternate method of determining CCD dark current which is described in Appendix 35. This method also uses the F16 data to determine the image and memory zone dark current, and the Dark datasets acquired during the descent to establish the temperature dependence, but it maintains the row dependence rather than relying on only the average dark current.

5.8 DISR Images & SLI Strips

The DISR camera consists of three imagers oriented vertically (see Figure 2.2). All three take pictures in the probes +Z direction (in azimuth), cf. Figure 2.3, with the Side Looking Imager (SLI) viewing from 6º above the horizon to nearly 45° below the horizon (by 25.6º wide), the Medium Resolution Imager (MRI or DLI2) picks up at 44º degrees below the horizon (1 degree overlap), and extends down to ~16° from Nadir (21.1º wide). The High Resolution Imager (HRI or DLI1) overlaps significantly with the MRI, covering angles from 6.4º to 21.6º above Nadir but is only 9.6º wide. The three imagers are exposed simultaneously yielding a combined image that covers from 6º above the horizon to about 6º above nadir, and is mostly about 25° wide.

Figure 5.8-1 shows a joining of the three DISR imagers (known as a triplet) which were taken when the probe was resting on Titan's surface. The left triplet displays the raw images, photometrically hand stretched to reveal feature details, and sized to provide approximately matching angular coverage in the overlap regions. The triplet on the right (juxtaposed with a similarly scaled image taken on our moon) is colorized using the visible spectrometer information, and properly photometrically and spatially adjusted by Erich Karkoschka. This image is also available in the EXTRAS/POSTERS area of the DISR archive.

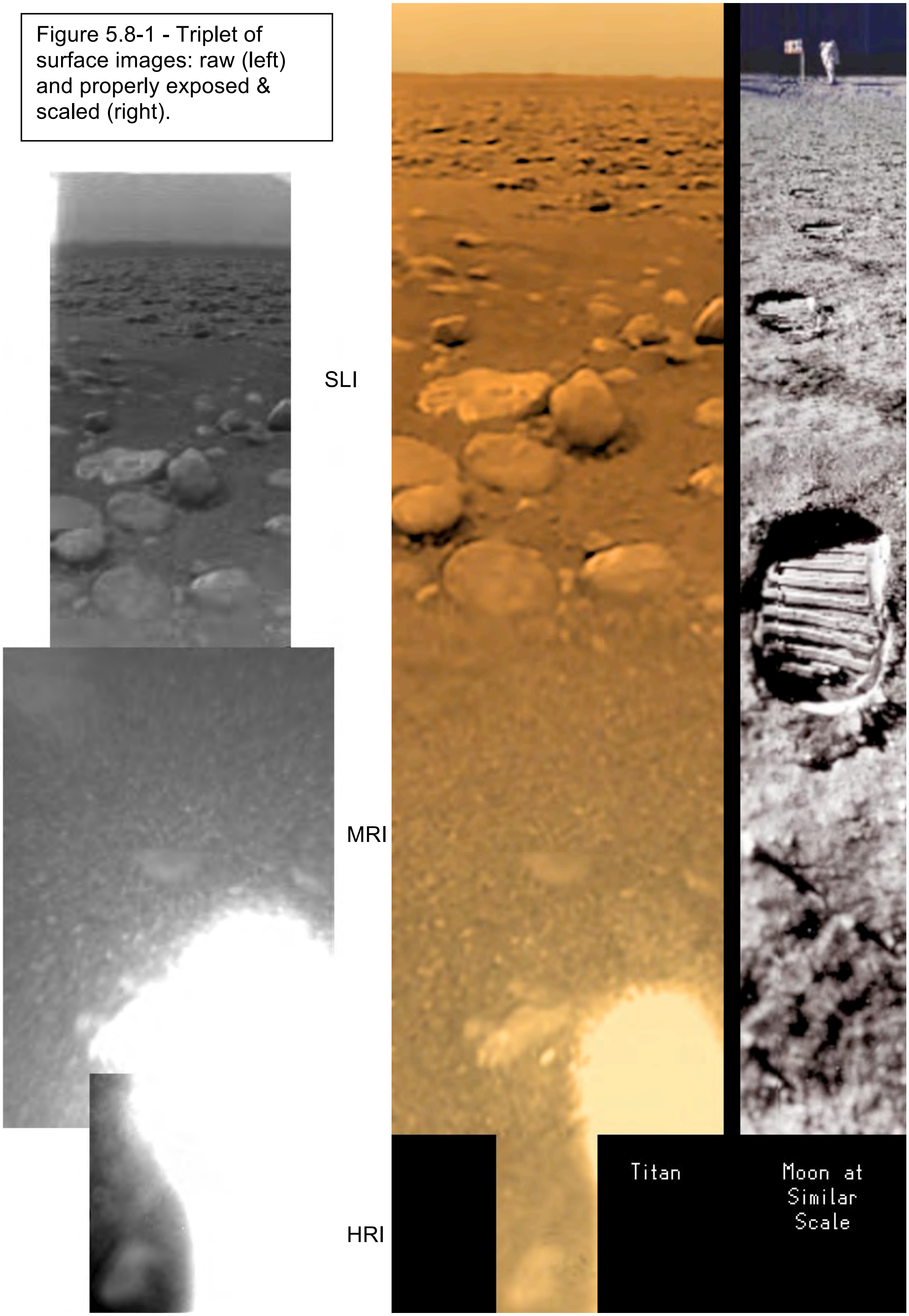
Each DISR imager has its own lens system, as described in the calibration document (Ref 6). Light is conducted, via fiber optic bundles, from each lens system to separate regions on the upper half (known as the image zone) of a shared CCD device. The exposure is controlled by timing the charge transfer from the image zone to the lower, covered half of the CCD (the memory zone). The images are then clocked out by row serially and read with a 12 bit Analog to Digital (A/D) converter.

The DISR pictures were not meant to be observed individually. The pictures are relatively small, around 40 kilo-pixels each, and not optimally exposed. The images are designed to be stitched together into 360° panoramas as described later (see Figure 5.8-4).

Due to the thick atmosphere the images are have low contrast. Figure 5.8-2 presents a popular Medium Resolution Imager (MRI) image (Sequence # 553) showing the effects of photometric contrast enhancement. The features are barely discernable in the raw, un-stretched image. Even an automatic stretch from the lowest to highest pixel value does not produce a suitable image (due to the black pixel in the upper right corner), an aggressive stretch (750 to 1100 DN) is needed to bring out the images details, however this removes some of the photometric information.

Still the individual images do have sufficient resolution to allow about a factor of 2 size increase to examine specific features if properly photometrically stretched. Figure 5.8-3 shows this same MRI expanded using two popular resizing routines, bi-linear extrapolation (IDL REBIN) and cubic convolution (IDL CONGRID). Notice that in some regions of the image the 16 bit square compression blocks, and their associated artifacts, become apparent at this size. The speckled pot marks are the result of imperfectly compensated fiber optics variations, as described later in this section. The type of expansion algorithm has negligible effect.

Figure 5.8-1 - Triplet of surface images: raw (left) and properly exposed & scaled (right).



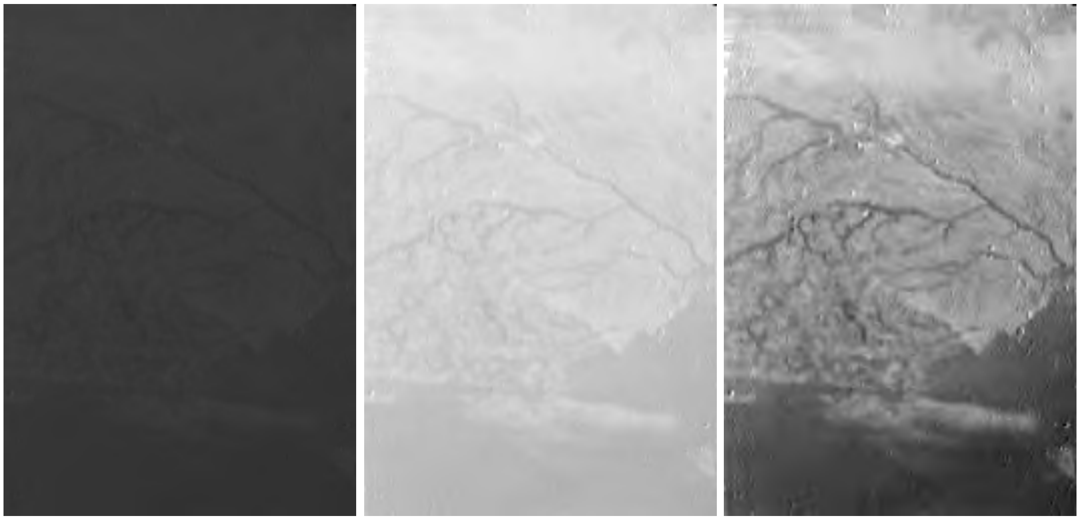


Figure 5.8-2 - Raw DISR MRI image 533 with no photometric stretch (left), stretched from minimum DN to maximum DN (middle) and stretched by hand to 37% contrast (right).

Minimum Pixel = 16 DN
Average = 939.3 DN
Maximum Pixel = 1164 DN
Standard Deviation = 64 DN
Exposure Time = 28 ms

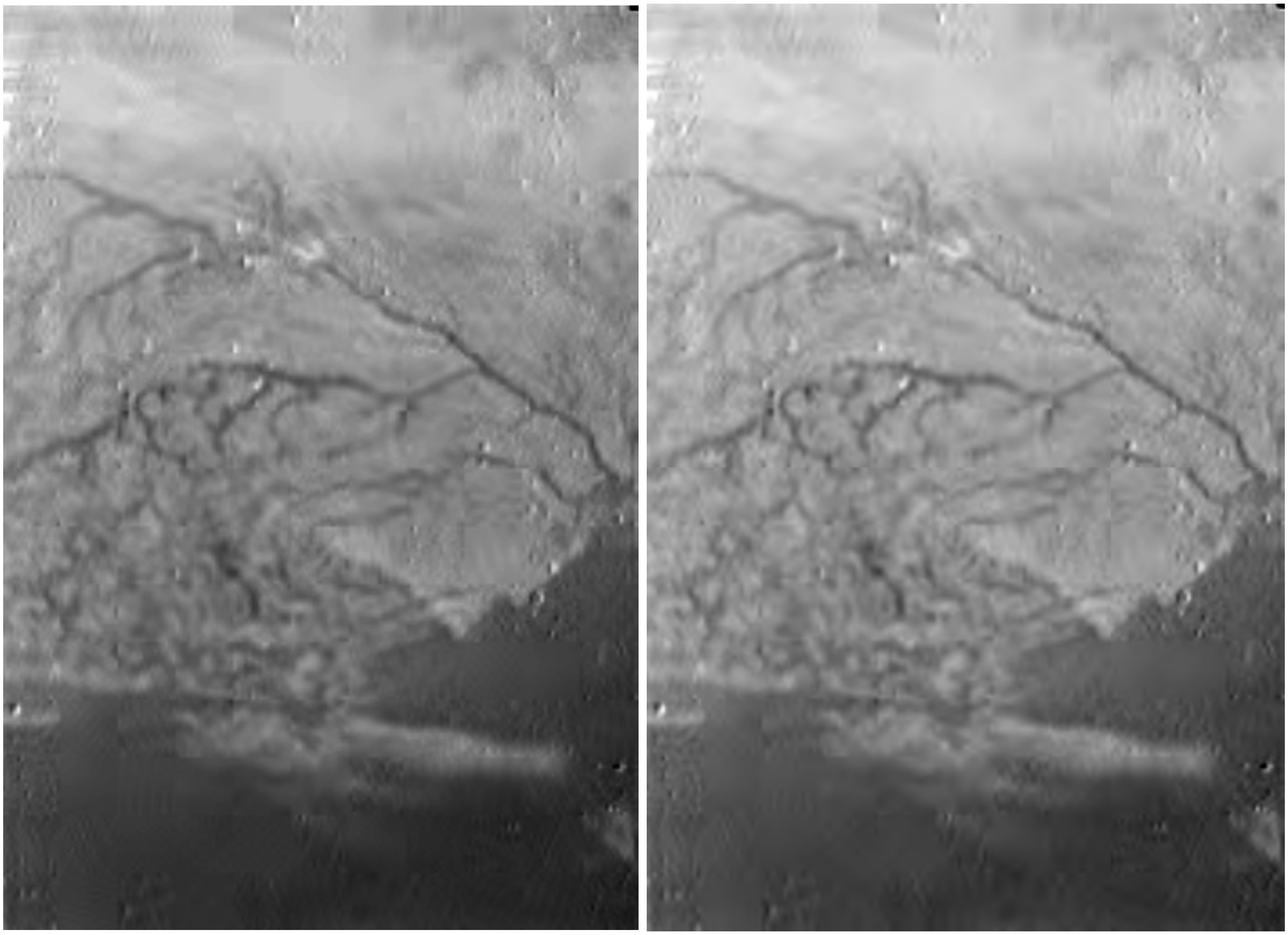


Figure 5.8-3 - Image 533 expanded using a bi-linear extrapolation (IDL REBIN) and on the right a cubic convolution algorithm (IDL CONGRID).

There are several sets of the DISR images in the PDS Archive in different formats. In the DATA/IMAGE section the images exist in two formats:

1) A table format which reports the data number (from 0 to 4095) corresponding to the light received for each individual pixel (in the TABLE_FORMAT directory), and

2) In an Image format (in the IMAGE_FORMAT directory) which is designed to work with the NASA View Image Display Software (http://pds.nasa.gov/tools/nasa-view.shtml), a tool that can be used to view the images as well as photometrically stretch and convert them to Jpeg or GIF formats.

These images are simply reconstructed by the pre-existing ground support equipment software to about 256 brightness levels (see "Image Decompression & Reconstruction", below). An improved set are to be added to the archive in 2013.

The EXTRAS/PROCESSED_IMAGES directory contains the same images with 3 separate levels of processing:

1) The "UNSMOOTHED_IMAGES" have been flat-field corrected to remove photometric distortions, temperature induced signals (dark current) have been removed, data clocking effects (shutter effect) have been compensated, bad pixels were replaced, and the images were photometrically stretched.

2) The "E_IMAGES" have been further processed to remove compressor induced artifacts, adjust for the pixels' point spread function, and adjust for negative & saturated pixels.

3) The "G_IMAGES" are further processed to adjust for geometric distortions and intensity calibrated into I/F.

The 'Unsmoothed Images' are a good representation of the scene with the instrument effects removed. The 'E' & 'G' images have been altered in an non-unique way such that low contrast features may have been eliminated or produced. These images should not be used for study of low contrast areas.

These images are in both PGM & TIFF formats. Further details of the images in the EXTRAS directory are presented in the text file:

EXTRAS/PROCESSED_IMAGES/IMAGE_PROCESSING_STEPS.TXT

The systematic design was to collect images at predesignated azimuths as the probe rotated below the parachute during the Titan descent, such that the images overlap in both azimuth and ground track. After the mission, the individual images can be assembled into mosaics of Titan's surface using any desired projection scheme. An example using flight spare images taken from the rooftop of the Kuiper Lunar and Planetary Building on the University of Arizona campus is shown in Figure 5.8-4 as a conformal conic projection. The boundries of some of the individual images are discernable.

A set of 12 evenly spaced triplets (36 images) is taken at each desingated altitude above Titan's surface (in the Image and High Near Surface cycles). Eight Image cycles (above 26 km), and nine HNS (between 23 km & 3 km altitude) cycles were executed during the Titan descent, for a total of 612 panoramic descent images, plus 24, non-azimuth controlled triplets (taken below 3 km), 27 calibration exposures, 8 half HRI images (very near the surface), and 3 Flat Field exposures, for a total of 722 images over the ~2.5 hour period. A summary of the cycles is presented in Appendix 6. Assembled mosics of Titan's surface are available in the archive in the EXTRAS/MOSAICS EXTRAS/POSTERS directories. Also, a simulated descent containing the images is presented in the EXTRAS/MOVIES directory. Due to the communication link and Sun-sensor problems described in section 3, images from variaous altitudes needed to be used to fill in gaps at each descent level.

Figure 5.8-4 - A mosiac of 30 DISR images taken from the roof of the Kuiper building (~13 m high), in conformal conic projection showing the U of A mall area.

Details of the individual imager's performance (field of view, point spread function, etc) are available in the document, "Calibration Report for the Imagers of the Descent Imager/Spectral Radiometer Instrument aboard the Huygens Probe of the Cassini Mission", located in the DISR archive under DOCUMENT/DISR_CALIBRATION_DOCUMENTS/IMAGERS (Reference 6) The derived imager pointing orientations during the Titan descent are described in Appendix 3.

The DISR cameras are far from perfect, so significant post-mission manipulation of the data is necessary to produce accurate images or do meaningful photometry. There is a significant amount of barrel distortion in the SLI, significant coma in the MRI, flat field variations, high dark current pixels, fiber-optic imperfections, bleed thru between imagers & radiation induced effects to account for. Also, although the images are captured with 12 bits of depth, they were transmitted as 8 bit words, limiting their contrast.

In order to compensate for the limitations imposed by data bandwidth, low light, and space environment, a considerable amount of on-board image processing was performed. Exposure times were adjusted based on the results of previous image exposures at similar azimuth, and additionally limited to reduce smear to less than 1.5 pixels in the center of the HRI (as derived from the probe spin rate). Flat field adjustments, and bad pixel replacements (adjacent) were made using on-board maps. The 12 bit images were reduced to 8 bits of depth using a pseudo-square root transformation via a look up table which maintains better than 100 to 1 signal to noise (S/N) ratios for pixels that exceed that threshold, and slightly reduced S/N (~7.6%) for noisier pixels. The images are compressed using an on-board hardware compressor which usually results in non-lossless compression

The list below summarizes the steps in converting a scene from a gleam in the camera's eye to a calibrated image. Details of these steps is presented in the following paragraphs.

1) The on-board software creates an image command containing the exposure time & processing options based on the observation schedule, buffer space, prior exposures & probe spin rate. The same exposure is used for all 3 imagers.
2) When the probe has rotated to the desired azimuth the CCD wells are drained and the exposure begins.
3) At the end of the desired exposure time the acquired images are shifted from the image zone down into the covered memory zone of the CCD. All 3 images (SLI, MRI, & HRI) are acquired simultaneously.
4) Each pixel's charge is read out row-by-row using a serial register at the bottom of the CCD into a 12 bit A/D converter (although the imaging devices are inverted, so the top of the image is read out first).
5) Known variations in the per-pixel Responsivity are compensated using the flat-field table.
6) Known bad pixels are eliminated by replacing their values with good adjacent pixels.
7) The images are converted from 12 bits to 8 bits using the on-board square root table described above.
8) The images are compressed by the data compression hardware.
9) The image is transmitted to the Earth via the first available telemetry channel.
10) Once the images arrive on the earth there are some options as to how they are processed. The most basic re-construction software used by the Ground Support Equipment (GSE) which processes DISR packets, decompressed the images and uses the square rooter lookup table described above to convert the 8 bit transmitted images back into 12 bit images. These are the images which reside in the DATA area of the DISR archive.
11) The two other sets of DISR images located in the EXTRAS directory of the Archive have been further processed to eliminate compressor induced artifacts, adjust for the imagers point spread functions, negative & saturated pixels, and normalize intensity (to I/F).
12) In addition to the photometric corrections described in step 11, geometric corrections are also necessary to obtain a fully calibrated image.

The detailed steps used to generate the "E" and "G" images is located in the text file:
EXTRAS/PROCESSED_IMAGES/IMAGE_PROCESSING_STEPS.TXT

Image commanding...

The flight software autonomously commands image collection. The algorithm's goal is to collect properly exposed (i.e. to approximately half of the 4095 DN available) images evenly spaced in azimuth, and staggered by ½ an image from those collected at the previous altitude. This is done by setting the exposure time of the first set (i.e. first Image Cycle) to a default value (7 ms), then adjusting the exposure time for each subsequent image taken at that azimuth to optimize the exposure (i.e. each of the 24 azimuths are optimized independently).

During the calibration cycles three sets of image exposures are taken; one set at 7 ms with the calibration lamps on, one at 7 ms with the lamps off, and a third set with 0 ms exposure time (& lamps off). This allows for determination of the dark current and responsivity changes. Near 50 km altitude one long exposure (35 ms) was taken to smear the scene and allow for flat fielding of imperfections in the imaging systems, (however only one of the flat images (the SLI) was transmitted, and most of it was saturated). Once the probe drops below 3 km, the software abandons azimuth timing and takes images based only on the telemetry buffer level. Below 300 m only half frame HRI images are collected. After landing the instrument went back to taking image triplets.

CCD chip layout & clocking...

The figure below shows the location of the various DISR instrument which share the CCD chip.

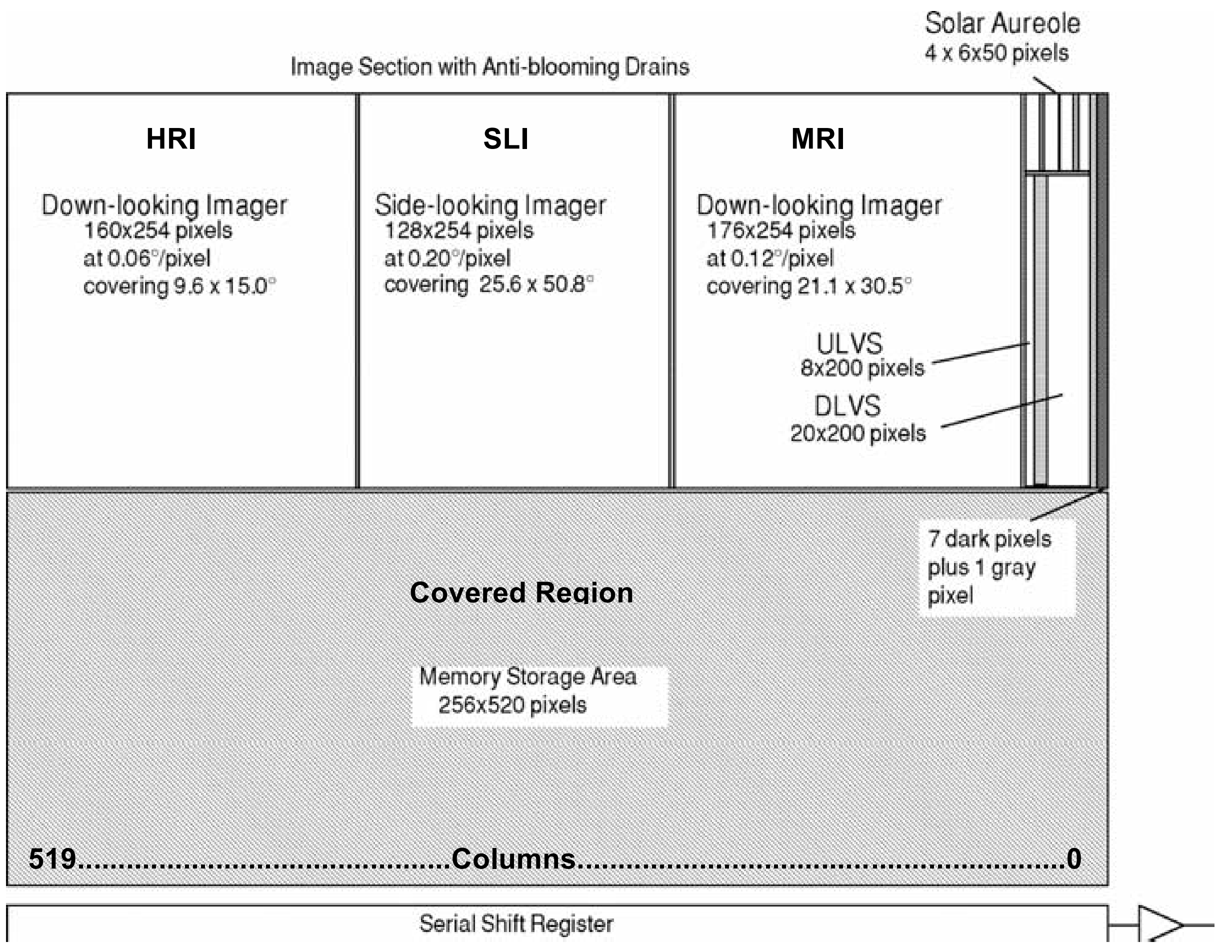


Figure 5.8-5: Layout of the instruments which share the DISR CCD chip

The CCD contains 512×520 pixels, but one half of the surface is covered by an opaque, aluminum mask. The images are formed in three subsections of the CCD, and it is then rapidly shifted (~0.51 ms transfer time) under the opaque mask. Each row of the image is deposited into a serial register, and a 12-bit analog-to-digital converter digitizes the amount of charge in each pixel in that register. The result is stored in computer memory.

The HRI uses an area of 160 columns by 254 rows on the CCD. The first and last of the 256 rows are not used, because they contain corrupted pixels. This is true for all three imagers. The MRI uses an area of 176 columns by 254 rows. The SLI uses an area of 128 columns by 254 rows.

The images are inverted. The top of the scene gets imaged to the edge of the covered region, the bottom of the scene to the top of the chip, the left and right sides of the scene map to the left and right sides of each imager, respectively. For each imager, the pixel(0,0) point is at the upper right corner of the scene. The view presented in the figure above is from the outside (or fiber optics) side of the chip. Thus, it is a mirror image compared to DISR's viewing direction (toward the outside of the probe).

The CCD is an image transfer type. Anti-blooming gates inhibit the spread of excess charge over the chip when overexposure occurs. The pixels are 23 μm squares.

Shutter effect ...

As the images are clocked downward to the covered memory storage section they pick up additional charge, both from the illuminated pixels that they traverse and dark current from all pixels they traverse. So a pixel at the top of the CCD will have additional signal that is not related to its exposure. To compensate for this it is necessary to deduct signal proportional to the dark current plus illumination signal. The time needed to shift the image to the memory section is about 0.5 ms. Shifting out the contents of the memory zone of the CCD takes about 2.2 seconds in full frame mode. The spectrometer and solar aureole data, taken in spectral read mode, take about 263 ms to drain from the memory zone.

As a simple example consider a 7 ms flat image where all the HRI pixels are at 2000 DN at the end of the exposure time. We will assume a temperature where the dark current rate is 1 DN/second for every pixel.

A pixel at the top of the HRI (which is the bottom of the scene) accumulates 2000 DN during the exposure. It acquires additional signal while clocking to the memory section of:

Shutter signal = n_pix * (Ave_DN / exp_time) * (0.5 ms / 253 pixels)

Shutter signal = 253 pixels * (2000 DN / 7 ms) * (0.5 ms / 253 pixels)
= 143 DN

A pixel mid way down (i.e. 127th) the HRI acquires an additional:

Shutter signal = 126 pixels * (2000 DN / 7 ms) * (0.5 ms / 253 pixels)
= 71 DN

The pixel at the top of the HRI will gain an additional dark current signal of:

Dark Signal = 253 rows * (2.2 seconds/ 253 rows) * (1 DN / second)
= 2.2 DN

While the pixel at row 127 will gain essentially half that. So the resulting telemetered image will have a slope from 2000 DN at the bottom of the HRI, and 2145 DN at the top.

Dark Current ...

In actuality the dark current is comprised of 4 components, and like the shutter effect is row dependent. Details of how to determine the CCD dark current is presented in section 5.7.

Bad Pixel Replacement...

Known bad pixels are replaced with a copy of a row adjacent neighbor to avoid spending compression coefficients on unreal features, which can cause severe checker-boarding of the image. Bad pixels are typically hypersensitive (hot) pixels or those poorly illuminated by the fiber optic bundle. The majority of replaced pixels are around the perimeter of the image. Tables of replaced pixels are presented in section 5.2, "Bad Pixel Maps" of the Imager Calibration Document (Ref 6).

Flat Fielding...

A perfectly uniformly illuminated DISR imager does not produce a perfectly uniform data product. In order to compensate for spatial variations in the responsivity of the optics/CCD system a flat-fielding software algorithm was incorporated. This algorithm corrects each individual imager pixel by dividing its reported signal by a correction factor:

$$DN_{corr} = \frac{DN_{original}}{correction\_factor}.$$

Files containing these correction factors for each pixel are available, and will be placed in the archive in the future. The flat field pattern is included in the Absolute Responsivity (AR) files for the instrument, and so do not need to be applied separately when determining radiance. The AR files are located in the archive under:
/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/IMAGERS/ABSOLUTE_RESPONSIVITY

The correction factors are calculated from entries in an 8 bit "Flat Field Lookup Table" for each imager (SLI, MRI, HRI).

correction_factor = (1 / 253) * Table_Entry_Value + 0.1921

The figure below shows the response pattern resulting from a uniform illumination for each DISR imager. The images are highly stretched, exaggerating the blemishes. The boundaries of the fiber optic strands create about a 3% drop in responsivity (i.e. the chicken wire pattern). Beyond that there are variations due to CCD pixel responsivity variations, and optical alignment.

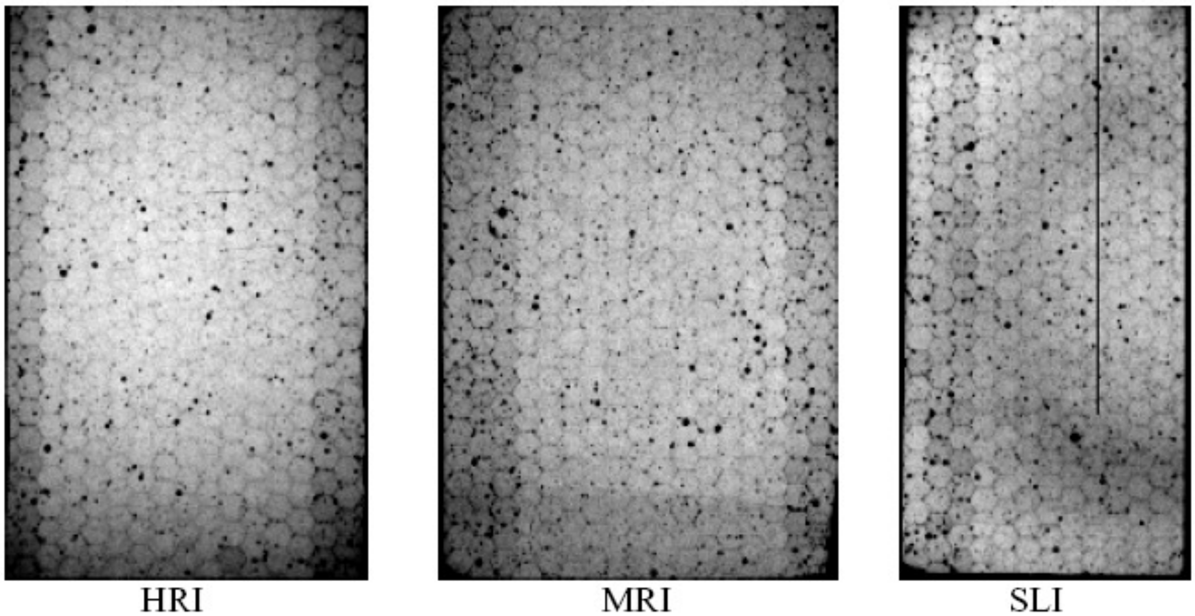
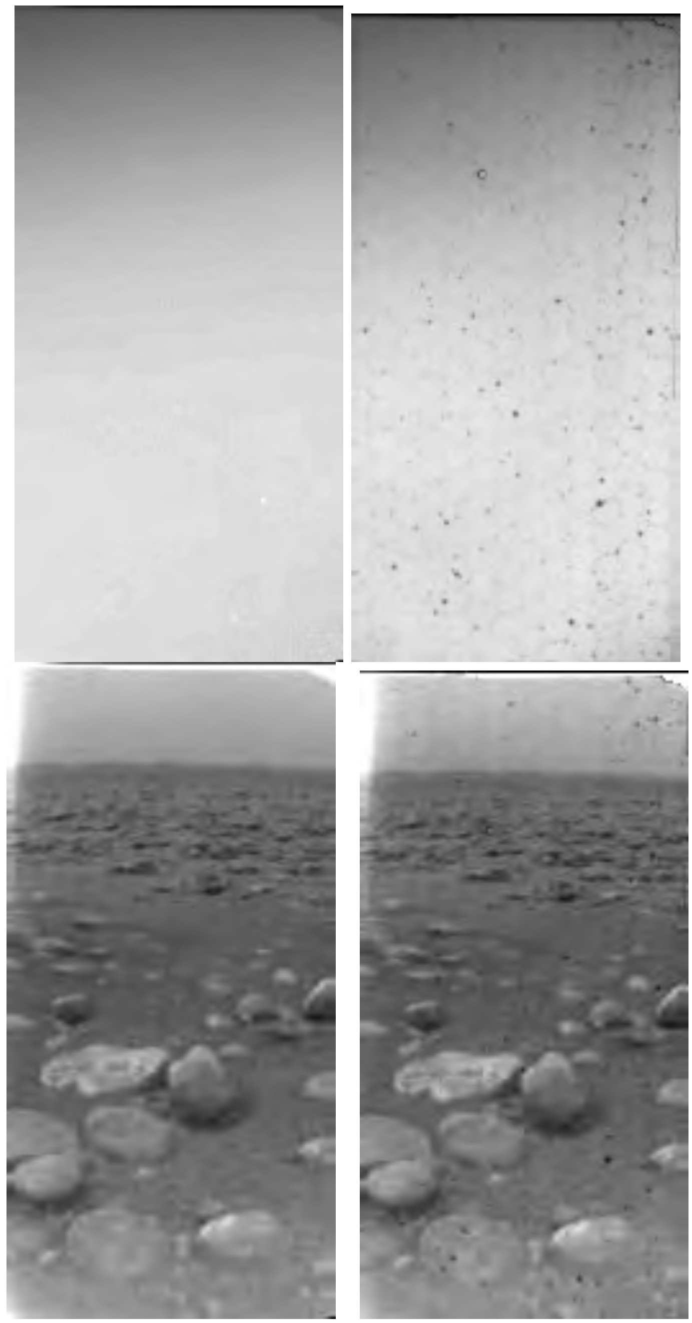


Figure 5.8-6: Response of DISR imagers to a uniform (flat) illumination. The 'chicken wire' pattern is due to the seams between individual fiber optic strands. In these views the imperfections are exaggerated; the actual deviation is about ± 8% from the mean. The black areas around the edges and strip down the SLI are non-responsive, 'bad' pixels, which are replaced.

Image # 2, 143 km altitude



SLI's

Image # 970, on Titan's surface

Figure 5.8-7: Comparison of DISR Titan images with the flat-fields incorporated (left), and with them removed (right) at two descent altitudes. Notice the 'chicken wire' pattern caused by the fiber optic bundles, as well as inclusions are visible in the images with no flat fields.

The flat fields were developed at ~245ºK, and are relatively temperature independent. However, some mild blemishes are introduced by the flat fields at the coldest temperatures. See the Image Calibration document (Reference 6) for details.

A more significant effect is movement of the fiber optic bundle during launch, SOI, entry and descent. Since the bulk of the responsivity changes are due to variations in the fiber optics, application of the on-board flat fields after movement of the fibers introduces imperfections in the scene rather than removing them. Erich Karkoschka has characterized these environmentally induced changes using exposures from the top of the descent, which views a relatively uniform appearing atmosphere. His flat-fields will hopefully be incorporated into the archive in 2013.

Data Compression...

The DISR images are hardware compressed using a discrete cosine transform (DCT) algorithm similar to JPEG compression (a flight qualified JPEG compressor was not available at the instrument development time). The main differences from the JPEG scheme is that DISR works on 16 x 16 pixel blocks (instead of 8 x 8), has fixed quantization value (rather than a table), and discards some low-valued coefficients. One advantage of the DISR compressor is that it incorporates sync markers into each block to allow partial image reconstruction in the event of telemetry dropout. Also, the DCS software compensates on-the-fly for hot and cold pixels as described in section 5.5.1, "DCS automatic bad pixel replacement" of the calibration document, Reference 6.

At the compression ratios used, the DCT image compression is lossy. Detailed discussion of the compression effects is presented in section 5.6, "Imaging system performance" and section 6, "Improved Processing of Compressed DISR Images" of the calibration document, reference 6. Compression ratios for the descent images range from 3.6 to 16.6 with respect to 8 bit/pixel images, and are listed in Appendix 20.

The data compressor operates on 8 bit images. A lookup table, similar to a square root translation, is used to convert the 12 bit images to 8 bits (and simultaneously accentuate darker features) prior to compression (see Appendix 25). The images are all flat-fielded, have bad-pixel replaced and are 'square rooted' to remove as many artifacts as possible before being compressed.

As discussed in section 6 (Improved Processing of Compressed DISR Images) of the Image Calibration Document (Reference 6), there are characteristics of the DISR images that make them less than optimal for compression and reconstruction including CCD noise, imprecise dark current knowledge and flat field temperature variations. To help compensate for some of these difficulties improved processing steps were devised by Erich Karkoschka. There are two basic levels of images available in the DISR archive, those reconstructed using the original reconstruction software (which are in the DATA & BROWSE directories), and those with the "Improved Processing" steps outlined in section 6 of Reference 6 which are in the EXTRAS/PROCESSED_IMAGES directory of the archive.

Section 6 (Improved Processing of Compressed DISR Images) of the calibration document (Ref 6) also provides more detail as to the workings of the DISR data compressor.

Image Data Transmission...

The DISR image data dominates the instruments telemetry allocation. Early on in the program it was recognized that redundantly transmitting the images would significantly limit the total amount of science data that could be obtained by the instrument. Therefore it was decided that the images would not be sent redundantly, on both telemetry channels, but that they would be split between channels in hopes of getting additional coverage and stereography. Sadly the loss of one telemetry channel during the descent caused the loss of half the DISR images. However it was still possible to get complete surface coverage, as evidenced by the movies and posters which can be found in the EXTRAS and HIGHER_LEVEL_DATA directories of the DISR archive. Although, many of the image triplets (SLI, MRI, HRI) are incomplete.

Image Decompression & Reconstruction...

Because the image compression is not lossless there is some element of freedom in how they are reconstructed. This is discussed in some detail in section 6 (Improved Processing of Compressed DISR Images) of the calibration document (Ref 6). The variations occur primarily at the 16 x 16 pixel block boundaries and in relatively low contrast features within the blocks. Besides the two levels of images already contained in the archive (and described above), another higher level set with slightly improved photometric accuracy should be available in the near future.

Since the 8 bit to 12 bit conversion is not a one to one mapping, some freedom is also available in reconstructing the 12 bit images from the 8 bit transmitted images. The table in Appendix 25 gives the available low, high and midpoint 12 bit values corresponding to each 8 bit transmitted value for one image. Also, since the square root tables have no overlap some freedom is available near quantization boundaries to compensate for variations from CCD noise, flat field temperature variations, dark current uncertainty, etc.

One deficiency with the images currently residing in the Archive is that the decompression software used did not treat the threshold and rounding of the data as accurately as possible (that is, the Discrete Cosine Coefficients, DCTs). Since the contrast in the majority of the images is quite small, these inaccuracies translate into significant photometric variations in the images. These inaccuracies have been compensated for in the E & G images, residing in the EXTRAs directory of the Archive, but the 'raw' images residing in the DATA directory have not been corrected.

The noise in the 12-bit images is mostly photon noise, which is SQRT(DN/30) for DN = 0 to 4095 since the analog-to-digital converter gives 1 DN for every 30 electrons measured. There are about 700 distinguishable signal levels using the 1-sigma photon noise as the step size from one level to the next. Since 8-bit data can distinguish only 256 levels, a factor of three is lost in the standard 12-to-8 bit conversion. The standard conversion has three distinguishable levels for each 8-bit data number. Roughly, 8-bit-DN = 4 SQRT(12-bit-DN), which is why this conversion is sometimes called the square-rooter.

The damage of the 12-to-8 bit conversion described above is only valid for features of the size of 1 pixel. For features larger than 1 pixel it is worse since the photon noise decreases as more pixels are averaged, but the digitization noise remains the same if intensity levels are similar. Even worse, photon noise is easily recognized and interpreted as such, but digitization noise creates features that run parallel to isophotes and that can easily be confused with real features.

Thus, images using the standard 12-to-8 bit conversion scheme are of low quality and their interpretation is compromised by difficulties of distinguishing real from artificial features.

In order to significantly improve the 12-to-8 bit conversion, an adaptive scheme was used for most images. The software determined a low and a high 12-bit DN using the image histogram in such a way that most of the recorded data numbers fall between both values. Then, the density of 8-bit DNs was increased by up to a factor of about 10 between the low and high DN, which means that the density of 8-bit DNs below the low DN and above the high DN had to be decreased since there are only 256 8-bit DNs available. The decrease of density was never more than a factor of 2. This means that the density of 8-bit DNs jumped by up to a factor of about 20 at both transition points. It also jumped somewhat within each of the three regions.

The low and high DN determined by the software was transmitted, and we know exactly how the software created the adaptive scheme for each set of two numbers. Thus, the 12-to-8 bit conversion scheme is known for each image, and the scheme for each image will be added to the archive. Using each scheme, the compressed 8-bit images can be converted back into 12-bit images. The compressed 8-bit images do not have integer data numbers since they are the result of a DCT transform. Thus, for each adaptive scheme, one can define a continuous function that maps the 8-bit fractional DNs into 12-bit fractional DNs.

During the descent, the MRI and HRI images had generally very narrow histograms, which meant that the adaptive scheme adopted had large improvements in the density of data numbers. Thus, the 12-to-8 bit conversion was almost lossless, and the noise in these images is essentially the photon noise of the CCD. On the other hand, the SLI images had wide histograms, due to the bright sky above the horizon and the dark surface looking halfway down, so that the adaptive scheme could not improve much above the standard scheme. About half of the SLI images during the descent used the standard scheme, while the remaining ones used the adaptive scheme with only slight improvements relative to the standard scheme. Thus, most of the noise in the SLI images is digitization noise in the 12-to-8 bit conversion, not photon noise of the CCD.

One important aspect of the adaptive scheme is that it decreases the 8-bit amplitude of features that have DNs below the low DN or above the high DN of the scheme, by up to a factor of 20 relative to features between both limits. For bad pixels such as constantly bad pixels on the CCD or cosmic ray hits, this is beneficial. Bad pixels can have contrasts close to 100 %, some 100 times larger than typical contrasts in the scene due to Titan's surface features, which are typically around 1 %. Since the compression algorithm transmits most DCT coefficients for the features of largest contrast, but few coefficients for the features of lowest contrast, the compression algorithm will create a compressed image that gives very accurate detail on bad pixels but has little data left for real features. Since the adaptive scheme reduces the amplitude of bad pixels by large factors, the compression works much better and will focus mostly on real features.

The adaptive scheme also had a negative effect on a few MRI and HRI images taken at low altitude. Ideally, the software should have determined the high DN just above the DNs of real features but well below the DNs of bad pixels. However, for these few MRI and HRI images, the software set the high DN a little lower than ideal. This means that the brightest features had DNs above this limit and thus have error bars an order of magnitude larger than error bars for the remaining part of the scene. This fact is important in interpreting these images. For example, in raw images some bright ridges have very bright spots that may seem like snow-covered peaks. However, the DNs for these bright spots are above the high DN of the adaptive scheme. The error bars for the DNs of the bright areas is so large that they may have the same brightness as the ridges elsewhere, or they may be even much brighter. Correct interpretation of raw images requires knowledge of the low and high DN of the adaptive scheme.

Photometric Calibration...

The details of the photometric calibration done on the DISR are presented in section 4.2.1 ("Image Absolute Responsivity Reductions") of the Image Calibration Document (Reference 6). In this section we will present an example of how to determine the Radiance and Irradiance for an image pixel.

From Reference 6 (equation 1) the count rate (r) of an imager pixel in DN/s is:

$$r = A\int I(\lambda)RSR(\lambda)d\lambda$$

where:

A is the absolute responsivity in (DN/s)/[W/(m2-sr)],
$I(\lambda)$ is the spectral radiance of the source seen by the imager in W/(m2-u-sr),
$RSR(\lambda)$ is the relative spectral response of the imager pixel (dimensionless), and
λ is the wavelength in microns.

The Radiance (R) in W/(m2-sr) is then:

$$R = \int I(\lambda)\ RSR(\lambda)\ d\lambda = r / A$$

And the Irradiance, E is:

$$E = \int R(\Omega)\ d\Omega$$

where:

Ω is the solid angle of the field of view of the pixel of interest.

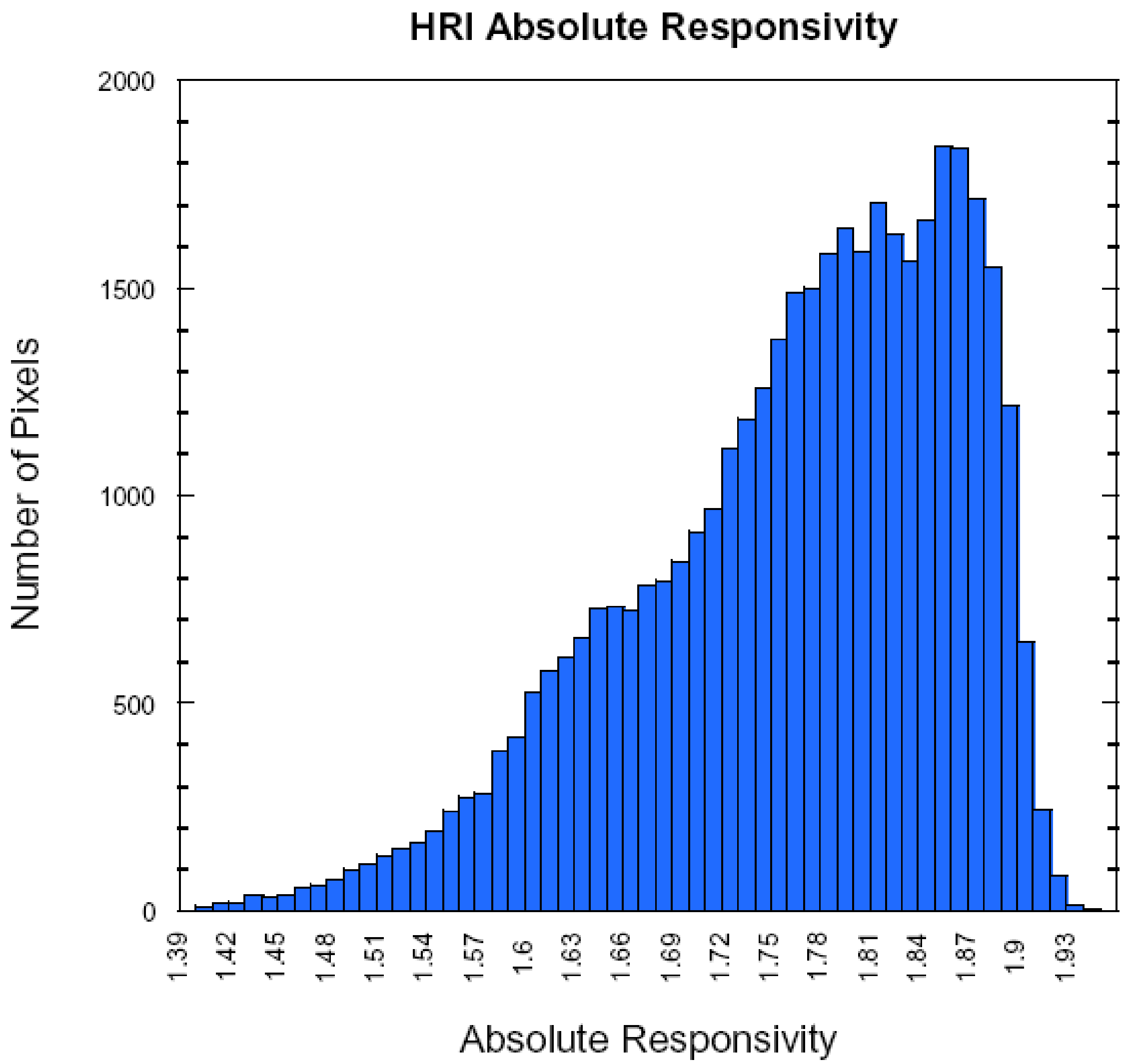


Figure 5.8-8: Absolute Responsivity Histogram for the HRI. The average is 1.74 x 10^6 (DN/s) / (W/sqm-str). The shape is similar for the MRI and SLI distributions.

HRI pixel example...

Using the same HRI pixel chosen as the image dark current example in section 5.7 above, we again summarize the data from the DISR archive:

Type: HRI exposure.
Dataset: #21 (Filename: IMAGE_0021_000324_7662)
Pixel: Row #125, & column #80, HRI(124, 79), near the center of the 160 wide by 256 high HRI
The signal level of this pixel is 2177 DN.
The CCD temperature is 259.2ºK.
Null Column 2 = 81 DN
Null Column 3 = 75 DN
Exposure Time = 7 ms

To determine the signal rate, 'r' we must first remove non-source contributors. Bleed through from the other CCD instruments can be neglected for imager data (but not for spectrometer or solar aureole data). This observation was taken with the Surface Science Lamp off, so there is no contribution from the SSL. Dark current for this pixel, during this observation, has been calculated to be 43.1 DN, as shown in section 5.7. The other significant contributor is shutter effect, which is described above.

To calculate the shutter effect for this pixel, during this observation we must average the data generation rates for all the pixel positions that this measurement must pass through (i.e. all pixels below the pixel of interest, HRI(0:124,80)).

The average signal in HRI (0:123,79) = 2125.75 DN for the 7 ms exposure.

Shutter signal = n_pix * (Ave_DN / exp_time) * (0.5 ms / 253 pixels)

Shutter signal = 125 * (2125.75 / 7 ms) * (0.5 ms / 253)
= 75.0 DN

So, the net signal for this pixel, for this observation is the observed minus dark current minus shutter effect:

DN = 2177 - 43.1 - 75.0 = 2058.9 DN, and the signal rate becomes:

r = DN / exp_time = 2055.1 / 0.007 = 294,129 DN/second

From the Absolute Responsivity (AR) table for the HRI (DLI1) at 259.71ºK (nearest this observation) we obtain A:

A = 1,842,400 (DN/s) / [watts/(m^2 sr)]

The AR tables are located in the DISR Archive under:
/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/IMAGERS/ABSOLUTE_RESPONSIVITY

We are fortunate to have an AR table near our temperature of interest. However it is possible to interpolate between tables using the relations given in section 4.2.2 (Image Absolute Responsivity Reduction Results) of the calibration document (Reference 6), shown below for the HRI:

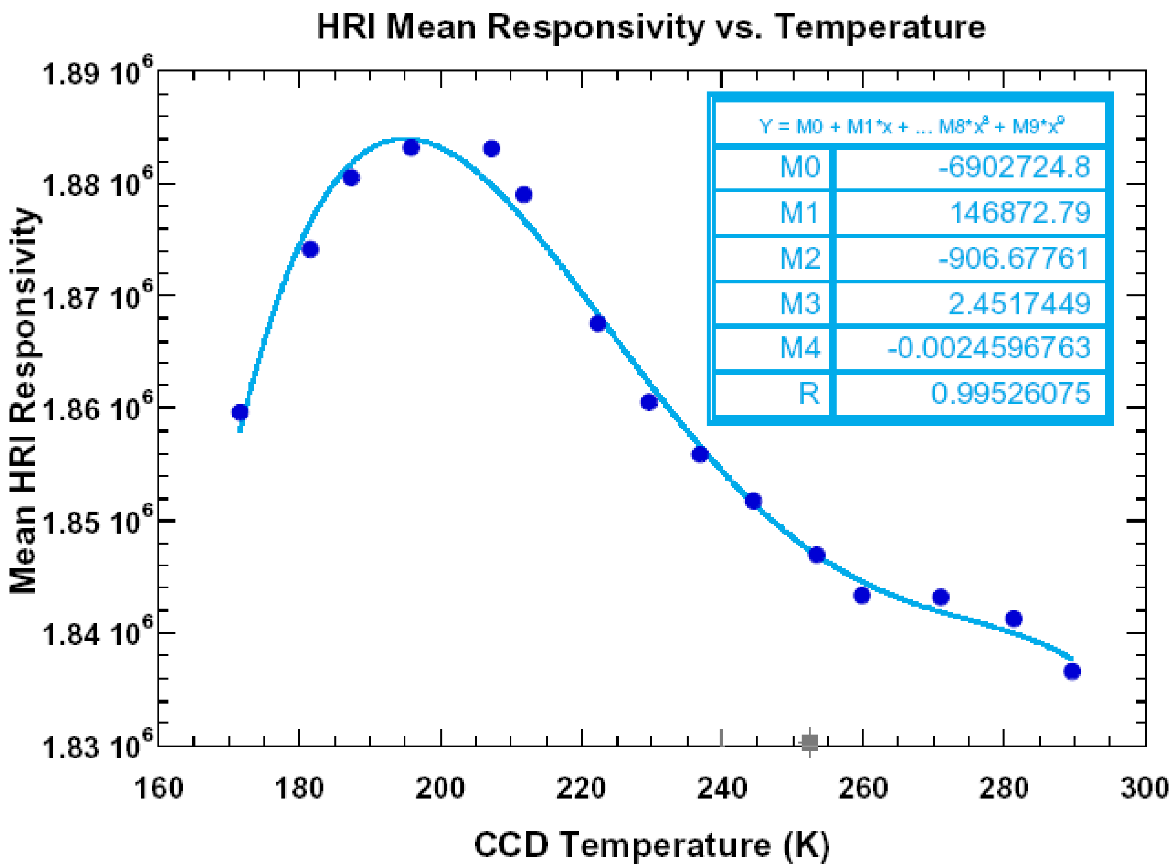


Figure 5.8-9: Temperature model of the absolute responsivity for all good HRI pixels. Dots are the measurements, and the curve is a fourth-order polynomial fit.

$$A = M0 + M1*T + M2*T^2 + M3*T^3 + M4*T^4 ,$$

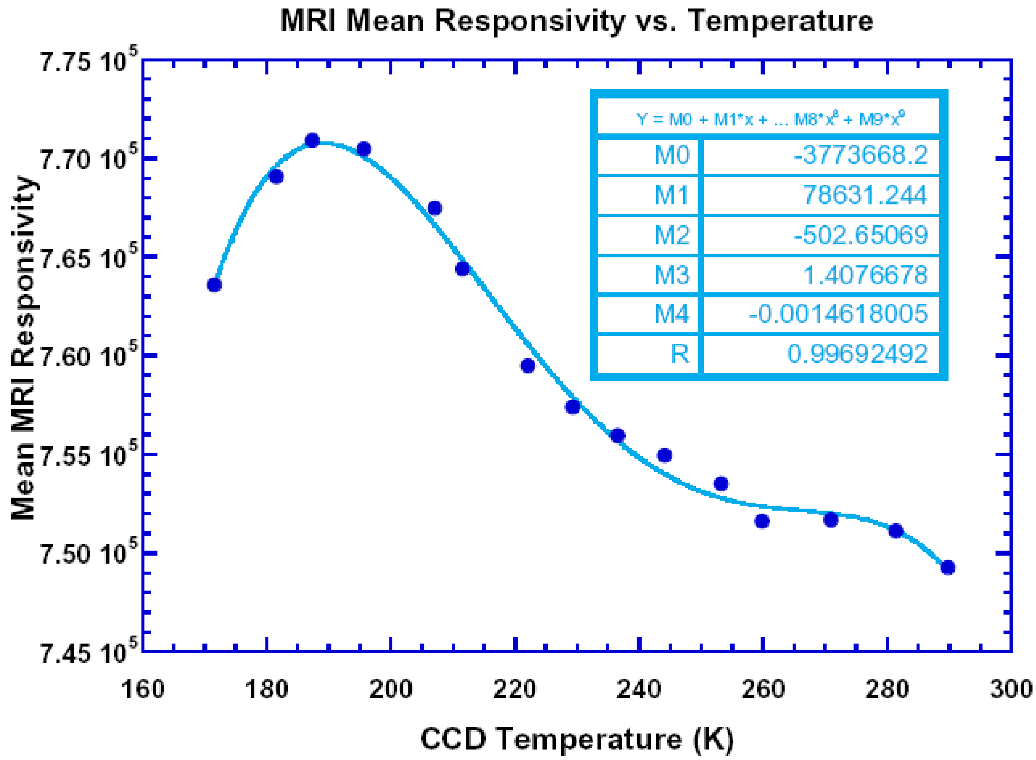
where the M's are from the table in the plot, T is the CCD temperature of the observation, and A is the Absolute Responsivity in (DN/s) / [W/(sqm sr)]. And so...

$dA/dT = M1 + 2M2T + 3M3*T^2 + 4M4*T^3$, for our observation at 259.2ºK..

dA/dT = -324 (DN/s) / [W/(sqm sr)] per deg Kelvin.

Corrected: A = 1,842,400 + (259.2-259.71) * (-324) = 1,842,565 (DN/s) / [watts/(m^2 sr)]

For completeness we include the AR temperature sensitivity plots for the other two imagers below:



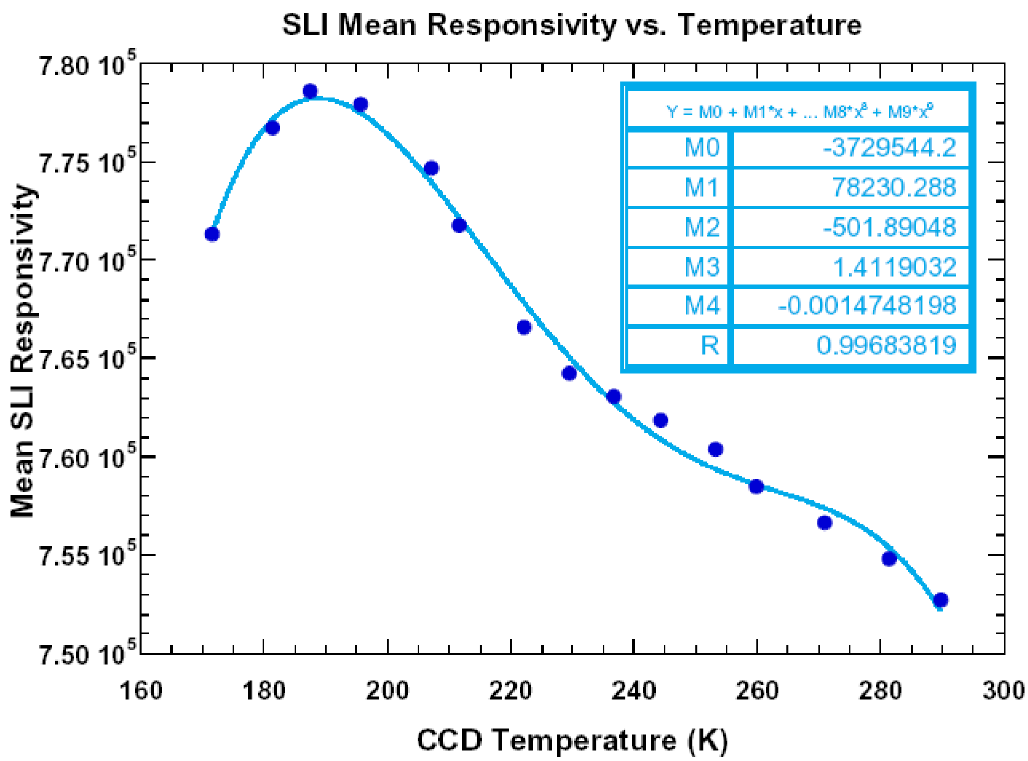


Figure 5.8-11: Temperature model of the absolute responsivity for all good MRI & SLI pixels. Dots are the measurements, and the curve is a fourth-order polynomial fit.

Completing our calculation of the radiance experienced by our example HRI pixel...

$$R = \int I(\lambda)\, RSR(\lambda)\, d\lambda = r / A = 294{,}129 / 1{,}842{,}565 = 0.160 \text{ watts}/(m^2 \text{ sr})$$

Because the DISR imagers are panchromatic, but not imaging spectrometers, it is not possible to exactly determine the spectrum at each pixel. However because we have coordinated downward looking spectrometer observations throughout the descent we can tell something about the albedo variations across the scene. We know that Titan's albedo is dominated by absorption from methane and aerosols, giving its reflectance a distinctive spectral shape. Titan's albedo is also affected by the absorption of its surface, especially for observations at low altitudes, and at wavelengths outside the methane bands toward the near IR. By using DLVS observations in concert with the DISR imager observations it should be possible to constrain the brightness, and possibly even something of the character of Titan's surface.

Below is a plot showing the relative spectral response of the images overlaid with the normalized downward looking flux from the visible spectrometer. The relative amplitude of the peaks at 940 nm, 830 nm & 740 nm (and even some bluer wavelengths) are characteristic of dark and light patches seen in the DISR images.

Relative Spectral Response (RSR)...

The Relative Spectral Response (RSR) is a function of temperature, generally shifting up in wavelength as temperature increases, as can be seen in the figure below.

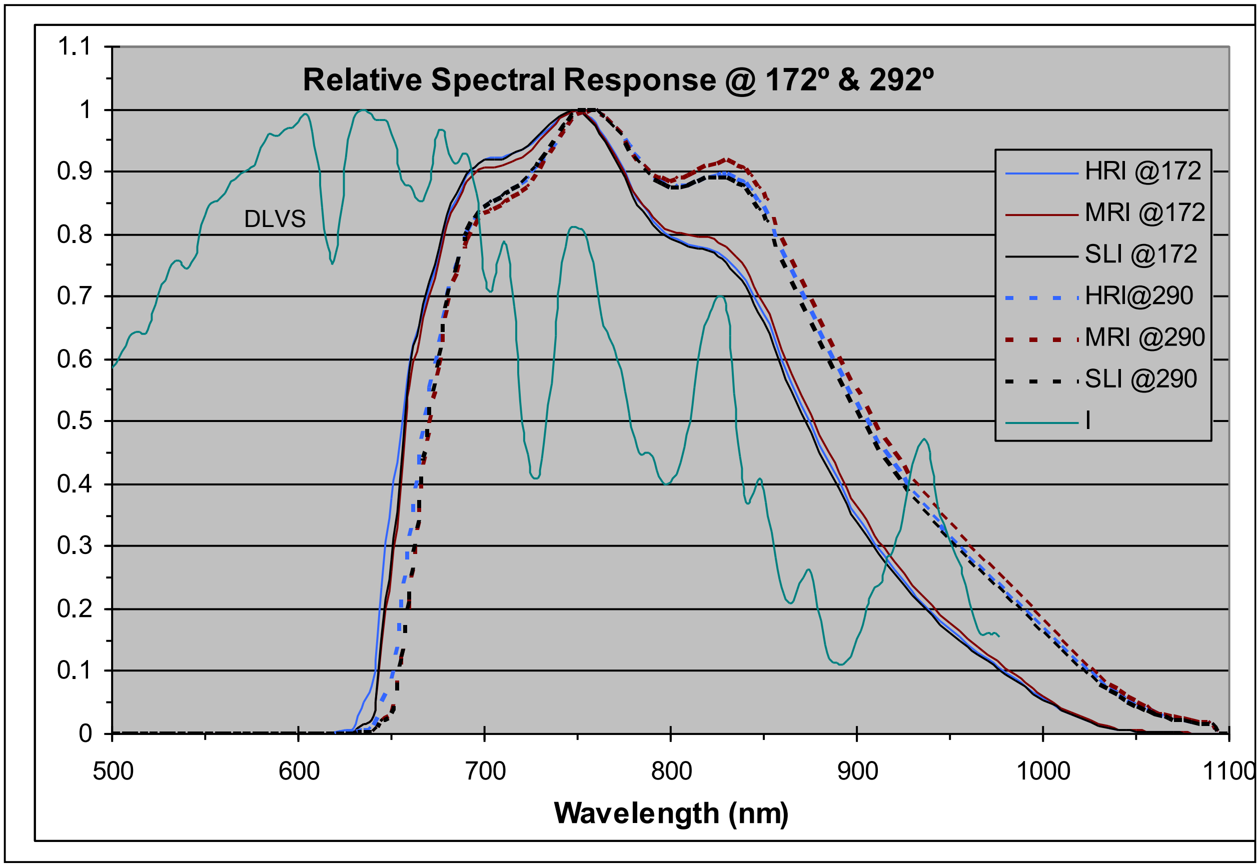


Figure 5.8-12: Pixel average, Relative Spectral Response curves for the 3 DISR imagers at the temperature extremes. The green line is the downward looking intensity at 143 km altitude from the DLVS, normalized to 1.0 at its peak (i.e. divided by 1.555). The dotted lines are the imagers' response at 290°K, and solid lines their response at 172°K (also normalized to 1 at their peak).

There are generally 3 ways to determine the relative spectral response curve for each imager at the temperature of interest.

The most straight-forward way is to interpolate between the RSR tables closest to the temperature of interest. A linear interpolation yields a result that is generally better than 0.5% accurate, however ignores the pixel-to-pixel variations.

A slightly more accurate method is to use the method described in section 4.1.2.2 ("Development of the model at all Temperatures") of the Imager Calibration Document (Reference 6). That method takes advantage of the relative consistency of the RSR between pixels and purports a temperature dependence curve based on a quadratic extrapolation from the RSR curve at 239ºK (which is provide in Appendix 27) as described by the equation and quadratic coefficients shown below. This method also ignores pixel-to-pixel variations.

$$RSR(\lambda,T) = RSR(\lambda,T_0)\left(a + b \cdot T + c \cdot T^2\right)$$

where:

RSR(λ,To) is the Relative Spectral Response Curve at 239ºK (Appendix 27),
a, b & c are the coefficients from the table below, and
T is the CCD temperature of the image observation.

RSR temperature dependence coefficients for quadratic extrapolation from 239ºK (To).

a	b	c
0.769592	5.84289E-04	1.548489E-06

The most accurate way to determine the RSR for an image observation is to use the method outlined in section 4.1.2.3 ("Use of the model (or how to get the RSR for any pixel)") of Reference 6, which preserves the pixel-to-pixel variations. An example of this method is presented in section 4.1.2.4 of Reference 6.

Imager Geometry and Irradiance...

In order to complete the calculation of the Irradiance seen by our sample HRI pixel, we must determine the pixels field of view. The relatively rectangular pixel arrangements of the individual imagers map to a rather non-rectangular fields of view as projected on an azimuth - nadir angle grid as shown in the following figure.

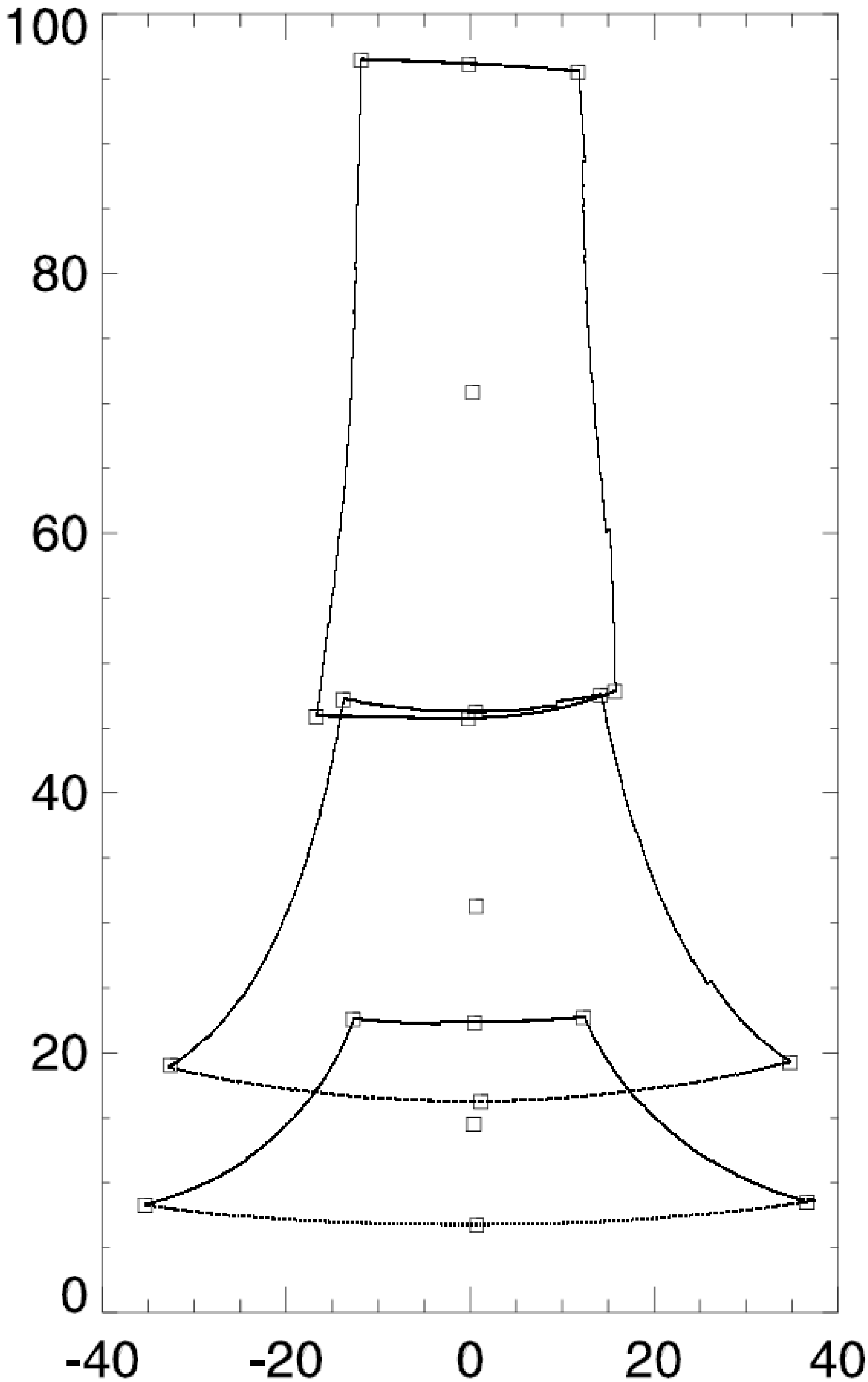


Figure 5.8-13 – Outline of the DISR 3 Field of View in Azimuth (from +Z) and Nadir angle. Corners and centers are indicated by squares.

In general, distortions should be removed from the images before determining the pointing geometry. Section 2.1 through 2.3 of Imager Cal document (Ref 6) describes this procedure ("DISR Image Distortion and Geometry Calibrations").

The imagers' pointing geometry are discussed in section 2.4 ("Geometry Calibration") of the calibration document (Reference 6). The equations presented presume that have been processed by the sharpening software described in section 3 ("Deconvolution of DISR Images") of Reference 6, however using the following row and column conversion equations we can map the DISR archive data into arrays that can be used directly in the equations provided in section 2.4 of Reference 6:

c = 2 * Co, and
r = 2 * (Ro -1)

where,

Co is the column number (starting with column 1) of the pixel of interest,
Ro is the row number (starting with row 1) of the pixel of interest, and
c & r are the column and row numbers corresponding to those of the sharpened images.

Note that there are approximately twice as many rows and columns in the sharpened images and that the top and bottom rows are typically not used because they contain many bad pixels.

The azimuth for a given pixel is described as:

$$\phi = \arctan\left[\frac{\tan\alpha}{\sin\theta o - \tan\beta\cos\theta o}\right]$$, and the nadir angle is given by:

$$N = -\arctan\left[\frac{\sqrt{\tan^2\alpha + (\sin\theta o - \tan\beta\cos\theta o)^2}}{\cos\theta o + \tan\beta\sin\theta o}\right]$$

where α and β are the dihedral angles associated with the pixel columns and rows and *θo* is the central zenith angle. Here the azimuth angle is defined as degrees clock-wise (CW) from above (to the DISR's right), opposite the header convention. The angles α and β are given by:

$$\alpha = m\left(c - \frac{(n_c + 1)}{2}\right)$$

$$\beta = m\left(r - \frac{(n_r + 1)}{2}\right)$$

where m is the pixel size, n_C and n_r are the number of columns and rows in each image given in the table below and c & r are our converted column and row number described above.

Image Geometry Parameters	MRI	SLI	HRI
m – Size of sharpened pixel (o)	0.06	0.1	0.0308
θo – Nominal Zenith Angle of Central Pixel (o)	148.5	109.4	166
n_C – Number of Columns (sharpened)	353	257	321
n_r – Number of Rows (sharpened)	509	509	509

To determine the field of view of our sample pixel we will average the pixel-to-pixel center spacing of the adjacent pixels:

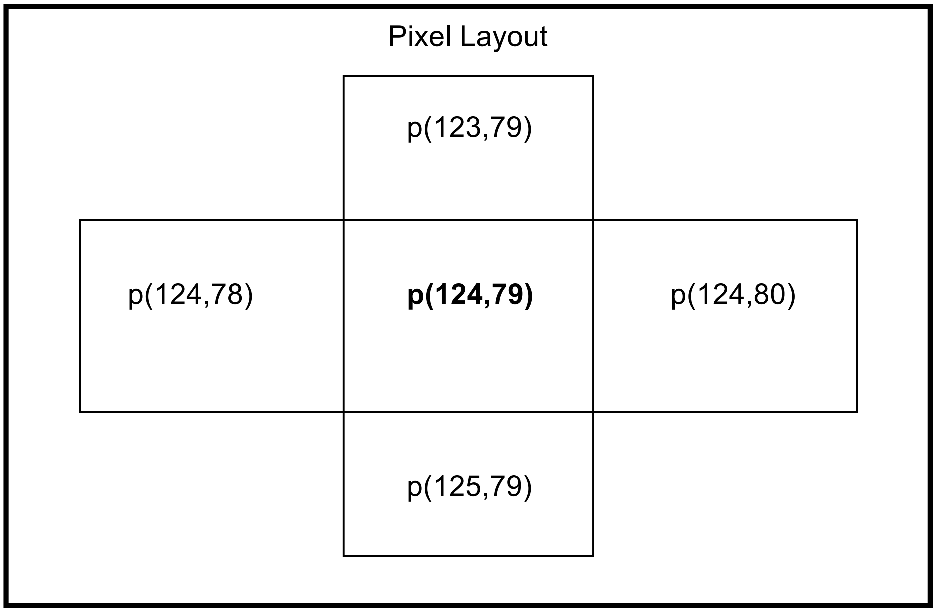


Figure 5.8-14

Coordinates of pixels surrounding target pixel (deg)

Pixel Coordinates			
Row	Column	Azimuth	Nadir
79	123	-0.39	13.66
79	124	-0.39	13.72
79	125	-0.39	13.78
78	124	-0.65	13.72
79	124	-0.39	13.72
80	124	-0.13	13.72

Distances from surrounding pixels to target pixel

Center to Center Distances			
Direction	From	To	Degs
Column	P(123,79)	P(124,79)	0.062
Column	P(124,79)	P(125,79)	0.062
Row	P(124,78)	P(124,79)	0.260
Row	P(124,79)	P(124,80)	0.260

So assuming a roughly rectangular field of view the size of our pixel is:

Pixel FOV = 0.062 x 0.260 = 0.0160 sq degs = 4.874×10^{-6} sr.

And the measured up flowing Irradiance contribution measured by this pixel is:

$$E = \int R(\Omega)\, d\Omega = 0.159 \text{ watts}/(m^2 \text{ sr}) * 4.874 \times 10^{-6} \text{ sr} = 0.777 \times 10^{-6}\ W/m^2$$

Calculating I/F for an imager pixel...

Using the information we have developed for HRI pixel(124,79), we will now calculate I/F for that pixel (where I is the incident flux and F is the solar flux outside Titan's atmosphere). Our method will be to use the DLVS data from a similar altitude (142 km) as our image observation (134 km) to determine the spectral character of the light in the imager band. And, we will assume no azimuthal variation in intensity. A higher fidelity calculation could be obtained by interpolating within DLVS data for these quantities (the proverbial 'left as an exercise for the reader'). Since the pixel-to-pixel variations are small, we will interpolate in the relative spectral response (RSR) tables to temperature compensate, rather than using the H bin factors described in Reference 6.

We have calculated the spectrally integrated radiance for our pixel above as:

$$R = \int I(\lambda)\ RSR(\lambda)\ d\lambda = r / A = 293{,}586 / 1{,}842{,}565 = 0.159 \text{ watts/(m}^2 \text{ sr)}$$

We use the DLVS spectrum from the archive in file: DATA/DERIVED_DATA_PRODUCTS/DLVS/DLVS_DDP, and extend it into the near IR using the DLIS data from: DATA/DERIVED_DATA_PRODUCTS/DLIS/DLIS_AV_DDP. The relative spectral response curves are available for CCD temperatures of 253.98ºK and 259.71ºK. We linearly interpolate to 259.2ºK. The plot below shows the downward looking spectral irradiance curves (DLVS & DLIS) in blue, and the relative spectral relative spectral response (RSR) plots at the 3 temperatures in black. Note there is not a great deal of temperature dependence over this range.

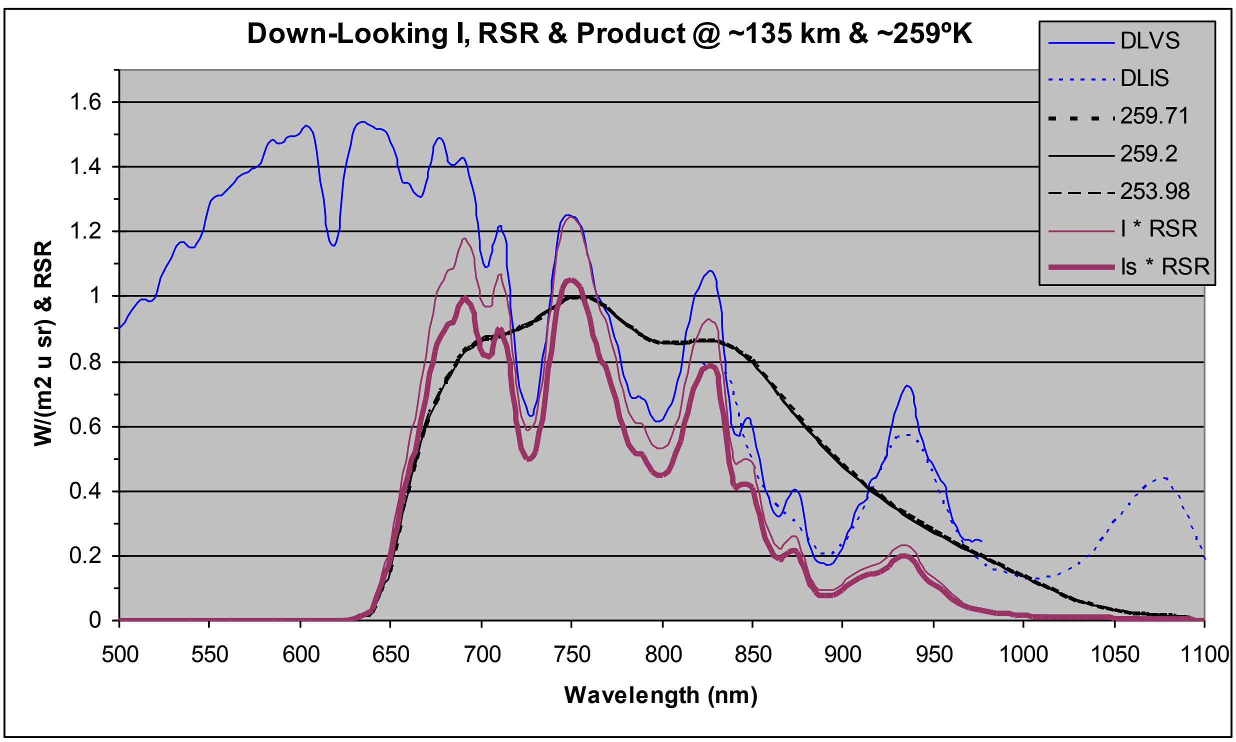


Figure 5.8-15: Over-plots of the downward looking spectral radiance (in W/(m2 u sr)) as measured by the DISR DLVS and DLIS, in blue; The HRI average Relative Spectral Response

(RSR) at 3 temperatures in black; their product (I * RSR) in red, and their product scaled to match the overall measured radiance (0.159 W/m2 u sr) of HRI pixel(124,79), as the heavy red line (Is * RSR).

The radiance calculated using the DISR spectrometer spectral radiance (I) over the RSR of the HRI yields:

$$R = \int I(\lambda)\, RSR(\lambda)\, d\lambda = 0.188 \text{ watts}/(m^2 \text{ sr})$$

$$F = F0 / (\pi * 9.053^2)$$

I/F is calculated for our target pixel by integrating the product of the spectral radiance determined by the downward looking spectrometers (blue lines) and the relative spectral response of the imager (black lines), over the imager pass-band. The resulting spectral radiance (thin red line) is then scaled by the ratio of the result to the HRI measured radiance (0.159 / 0.188), resulting in the heavy red line, which is then divided by the solar radiance (determined by dividing the spectrum in Appendix A (F0) by Pi times the distance from the Sun to Titan squared).

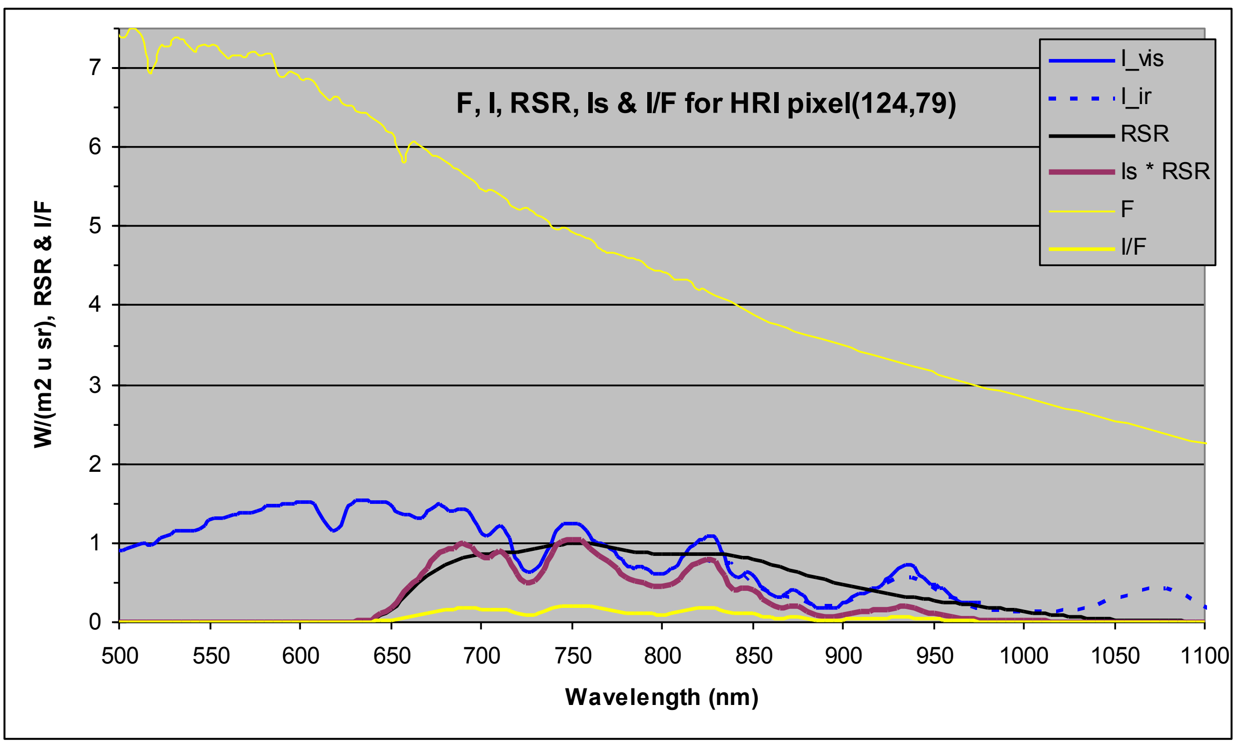


Figure 5.8-16: Plots of Solar spectral radiance at Titan, (F); downward looking radiance spectrum as measured by DISR spectrometers (I) from 142 km altitude; Relative Spectral Response function of HRI pixel(124,79); spectral radiance as measured by this pixel (Is * RSR); and resulting I/F for this pixel.

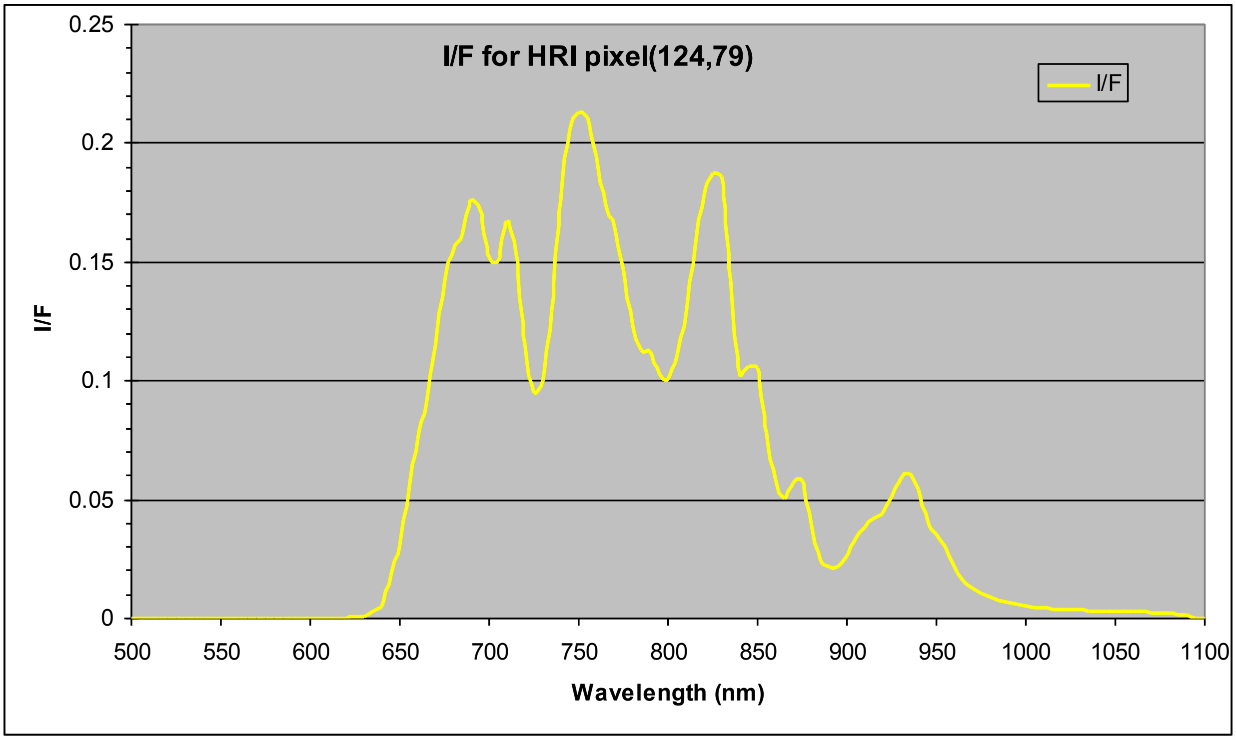


Figure 5.8-17: Expanded view of I/F for HRI pixel(124,79) from 134 km altitude.

Earth to Saturn Cruise Responsivity Effects...

There were very slight changes noted in the responsivity of the Imager systems during the Cruise Phase. Most of the DISR systems displayed a drop in responsivity, typically attributed to yellowing of the fiber optic glass. In the case of the Image systems it appears that the variations in glass transmittance are likely overwhelmed by movement of the fiber-optic bundles during launch. There is a distinctive shift at launch, which appears to produce a gradient pattern. This is likely due to a changed coupling between the calibration lamp and the detector (both of which are conducted via fiber optics). The change since launch has been small, generally less than 1%.

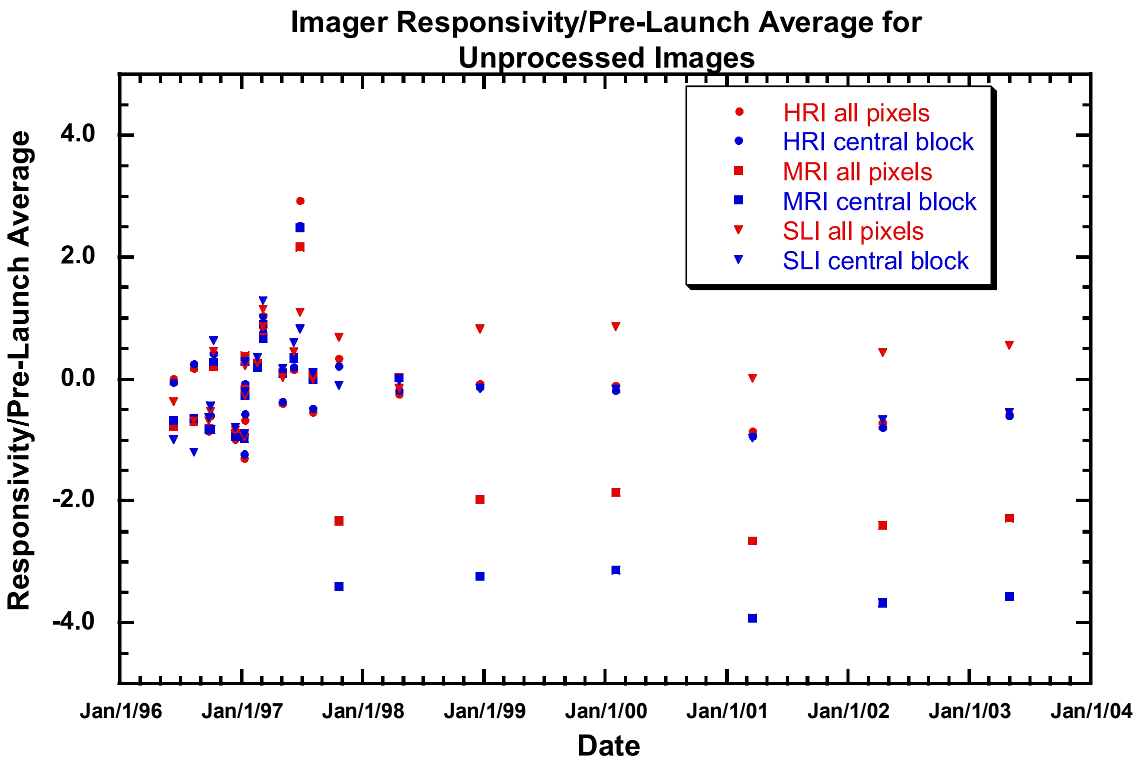


Figure 5.8-18: Imager responsivity variations during Cassini cruse. Two groups are presented for each imager: an average of all pixels and a 64 pixel square central block.

SLI strips...

During the descent 101 Side-Looking Imager strip data sets were acquired. These sets are formed from pixels in the Side-Looking Imager, but they are processed differently from other imager data. Two strips, each 13 columns wide are formed from the pixels in columns 6 - 18 and 109 - 121. For each row on the CCD the 13 columns are summed by the flight software, compressed with lossless techniques and telemetered.

The motivation for these data sets is that they retain the high signal-to-noise-ratio inherent in the image data without using much telemetry volume. The images themselves undergo square-root and compression processing, which reduces their signal-to-noise ratio in exchange for transmitting more images. The Side Looking Imager views the sky looking generally out toward the horizon. This makes the Side-Looking-Imager strips ideal for detecting atmospheric features, such as cloud layers. Generally the signal-to-noise ratio of these data sets exceeds 500 to 1.

Detailed information regarding the SLI strips is available in the archive under:
DOCUMENT/DISR_CALIBRATION_DOCUMENTS/SLI_STRIPS

Note that the strip data set numbers are not corrected for dark current or imager responsivity. Both corrections are important to make full use of the data sets. Many of the data sets are taken at high altitude when the CCD is still warm. The dark current correction can be substantial. The on-board software flat field is also not applied to the data. The data contain the hexagonal patterns introduced by the fiber optic conduit, which feed the image to the CCD.

The dark current may be removed using the standard techniques described in the Dark Data Sets section (5.7). The responsivity may then be applied to remove the effect of the conduit. The result should be photometrically accurate measurements of intensity along strips of the Titan sky from 101 altitudes.

The absolute responsivity is defined as $A = \frac{r}{\int I(\lambda) RSR(\lambda) d\lambda}$, where r is the count rate (data numbers/second), I is the intensity at wavelength λ, and RSR is the relative spectral response at wavelength λ. This can also be written as $\bar{I} = \frac{r}{A \int RSR(\lambda) d\lambda}$.

5.9 Solar Aureole (SA) Measurements

Observations from outside Titan's atmosphere show that it both polarizes and forward scatters light. It was therefore deduced that the atmosphere may contain particles with a small dimension (polarizing) and large dimension (forward scattering) such as may small monomers which aggregate into large open polymers. The SA camera was designed to constrain the size and distribution of these particles.

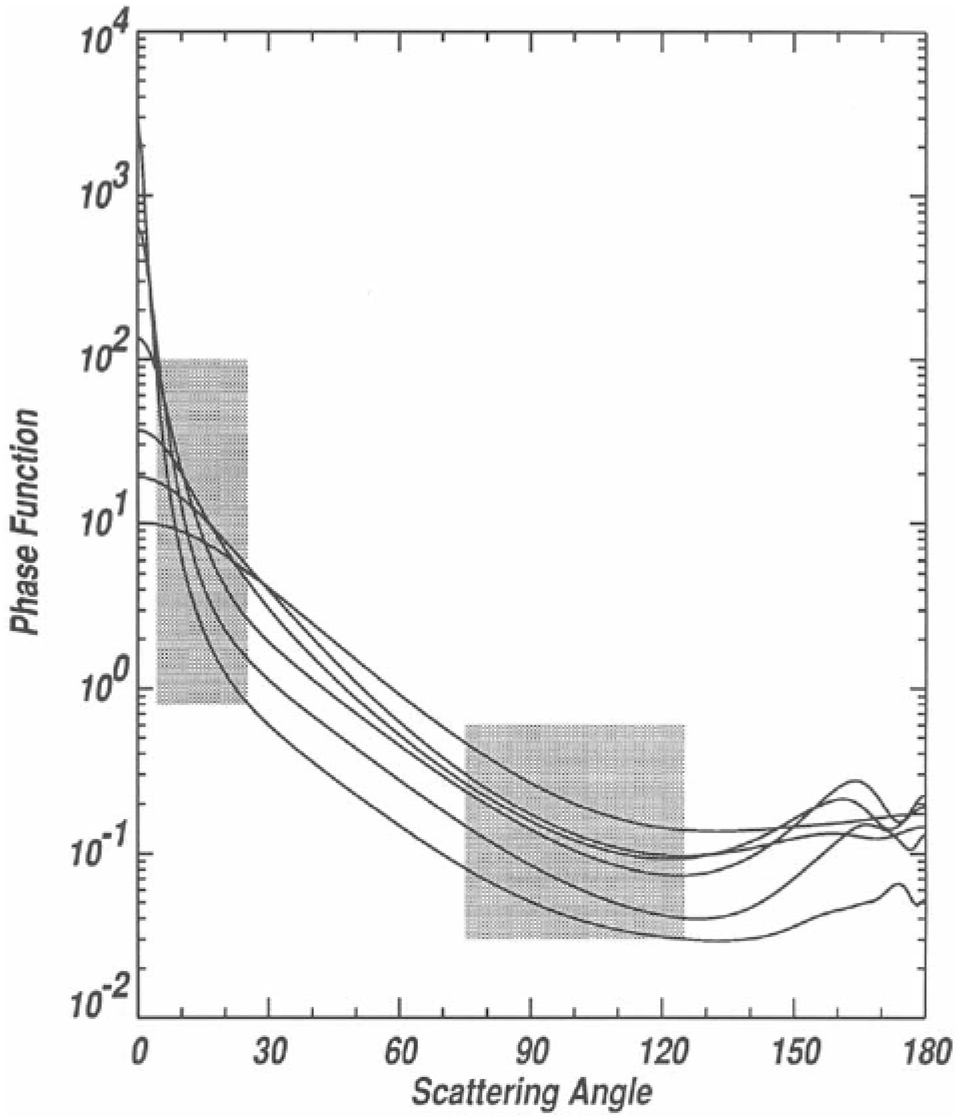


Figure 5.9-1: The SA camera is designed to sample the scattering angle ranges shown in grey. The phase function curves are for particles having 0.063 to 2 micron radii. The smallest particles have the lowest forward-scattering (0°) peak.

The Solar Aureole (SA) camera was designed to obtain Titan sky brightness contours and polarization measurements near and away from the Sun. Unfortunately due to the unexpected reversal in the spin direction of the probe, greater than expected tip-tilt dynamics and intermittent performance of DISR's Sun sensor, the SA data products were difficult to interpret. Although the data volume was not as anticipated, after developing some understanding of the probe tip and azimuth as a function of time, the SA data proved crucial to constraining the properties of Titan's aerosols. At some altitudes a degree of uncertainty still remains lacking a complete 6 DOF probe dynamics model.

Details of the SA system is available in the DISR archive under:
DOCUMENT/DISR_CALIBRATION_DOCUMENTS/SOLAR_AUREOLE (Reference 13).

The SA system is designed to collect vertical sky intensity strips, 6 degrees wide by 50 degrees in zenith at two wavelengths (500 nm & 935 nm) and with two polarizations (horizontal and vertical) totaling 4 cameras. The image scale is about one degree per pixel. A shadow bar was incorporated to block out the direct beam of the Sun. The strips were to be collected 6 degrees away from the Sun, diametrically opposed, at 174 degrees from the Sun. The slits are centered at 50 degrees zenith angle. All 4 cameras are exposed simultaneously.

The measurements through two orthogonal linear polarizers are not sufficient to uniquely determine the position angle and degree of linear polarization for light of an arbitrary state of linear polarization. Rather, we assume that the light in Titan's atmosphere is partially linearly polarized with the position angle predicted from multiple scattering models (roughly perpendicular to the scattering plane). This is sufficient to determine both the total intensity and the degree of polarization from the measurements. We simply add the horizontal and vertical components of intensity near the Sun to obtain the total intensity as a function of azimuth relative to the Sun and zenith angle.

The following table summarizes the characteristics of the 4 SA cameras. The "Full data set columns" refers to the position of the individual cameras on the DISR CCD chip (see section 5.8). 'Blue' designates the 500 nm filters and 'red' the 935 nm filters. 'Parallel' & 'Perpendicular' refer to the orientation relative to the shadow bar.

SA data set columns	0:5	6:11	12:17	18:23
Full data set columns	40:45	31:36	23:28	14:19
Filter	Blue	Blue	Red	Red
Polarization	Horizontal	Vertical	Vertical	Horizontal
Designation sometimes used	Blue Perpendicular	Blue Parallel	Red Parallel	Red Perpendicular

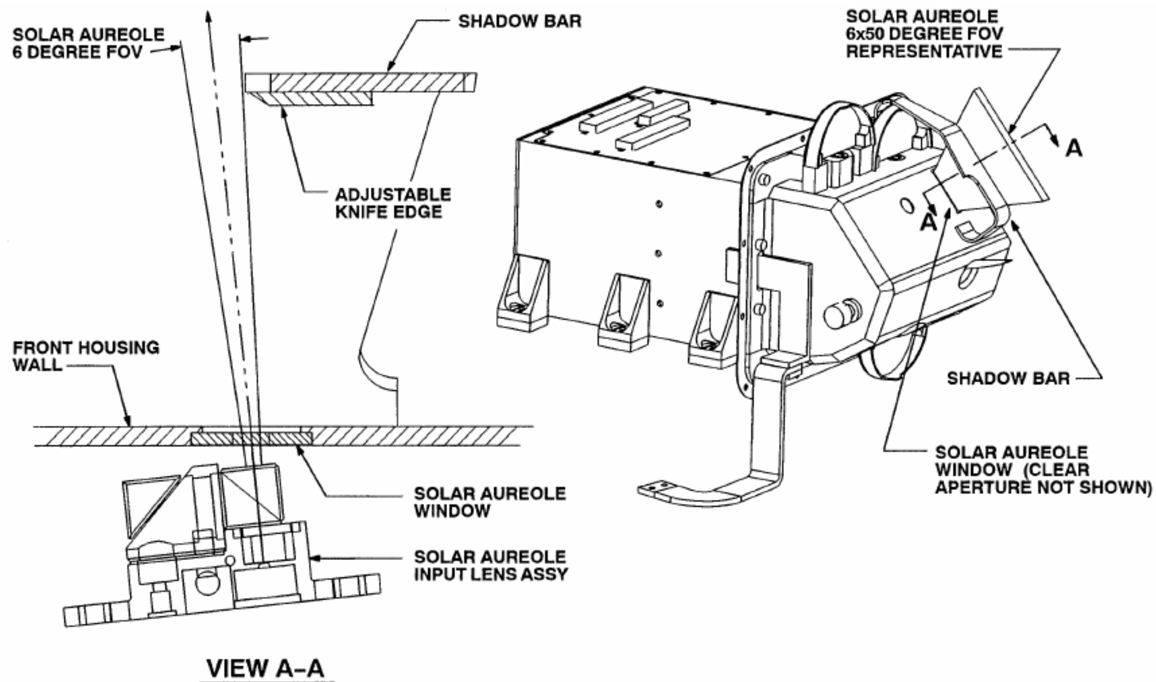


Figure 5.9-2: Layout and Field of View of the DISR SA cameras.

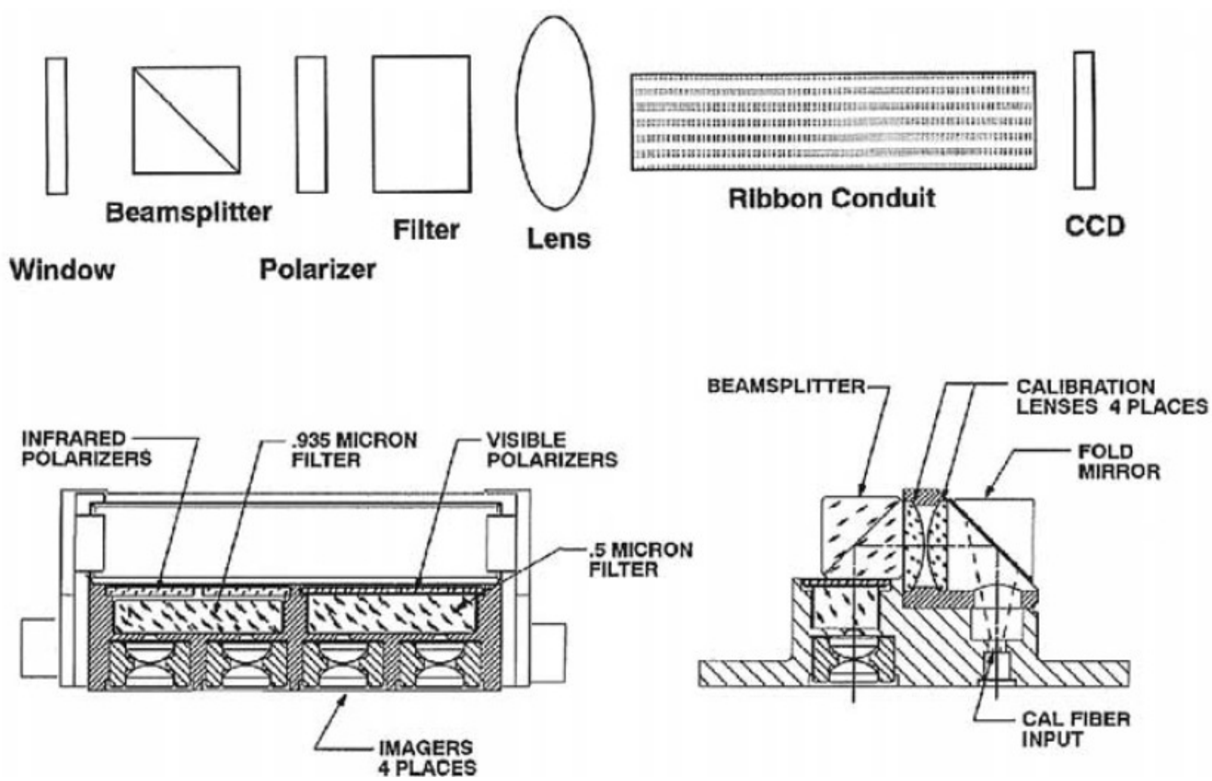


Figure 5.9-3: Schematic layout of the components of the SA system. The beam-splitter is used to introduce light into the cameras from the in-flight calibration lamps.

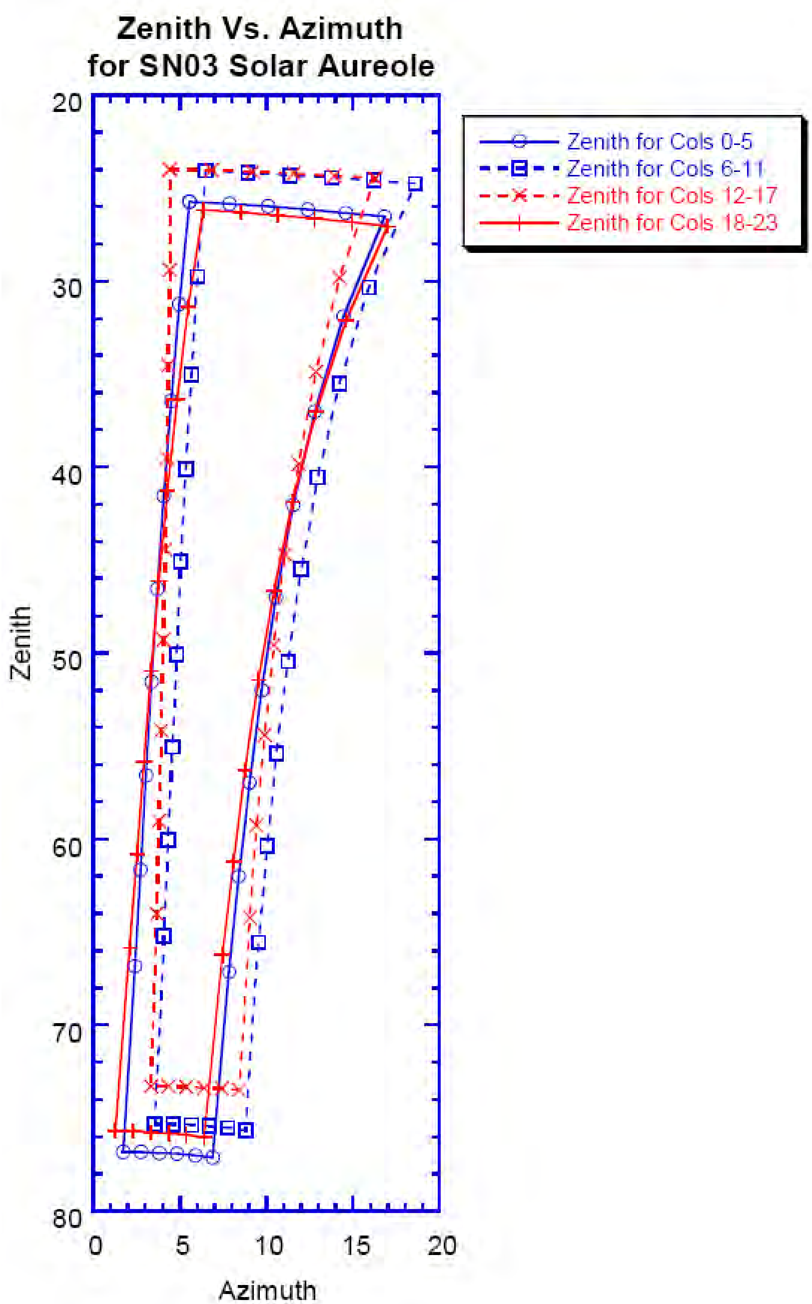


Figure 5.9-4: Location of the SA camera FOVs with respect to probe azimuth and zenith angle.

The Azimuth and Zenith angles corresponding to each Solar Aureole Camera pixel is presented in Appendix 33.

Solar Aureole Datasets...

The Solar Aureole (SA) datasets are located in the DISR PDS archive under: DATA/SOLAR.

There are two types of data in the archive: summed and un-summed. The summed data consists of 5 columns, one as the 'row' index, and the other 4 as column sums of the Blue-Horizontal, Blue-Vertical, Red-Vertical and Red-Horizontal channels respectively.

The un-summed data consists of 25 columns of data (by 50 rows). Column #1 is the row index. Columns #2 through #25 are the 24 columns of raw data in the same order as the summed data (BH, BV, RV, RH).

The following table provides file type discriminators for the SA archive data:

Dataset Type	RECORD_BYTES	File Size (KB)
Summed	24	2
Un-summed	174	9

A summary of the SA data collected at Titan is presented in Appendix 34.

Solar Aureole Camera Photometry...

The response of the SA camera can be expressed as:

Equation 5.9-1:

$$DN = t_i * Abs\_Resp(T)\int\int I(\lambda,\theta,\phi,altitude)RSR(\lambda,T)d\lambda d\Omega + DN_{dark}(T,t_i) + Noise(T,t_i,DN_{nom})$$

where

- DN is the response from the instrument in data numbers,
- t_i is the integration time of the observation,
- Abs_Resp is the Absolute Responsivity of the SA as a function of CCD temperature,
- I is the spectral radiance,
- RSR is the Relative Spectral Response of the SA channel,
- λ is the wavelength,
- Ω is the solid angle,
- T is the CCD temperature (aka Tccd),
- DNdark are the counts due to CCD dark current, and
- Noise is the CCD noise in DN.

As described in section 4.2 ("Computing Solar Aureole Calibrated Intensities in Each Pixel") of the SA calibration document (Ref 13). The equation above can be re-written to calculate the spectral radiance at wavelength λ_0 (and accommodate the calibration data) as:

Equation 5.9-2:

$$I_w = (DN - DN_{dark} \pm DN_{noise}) / (t_i * AR_{mean} * AR_{pix} * \int I_s * RSR_f * RSR_{nfm} * Bump\ d\lambda)$$

where

- I_w is the spectral radiance [W/(m²-u-sr)] at the wavelength of interest (λ_0),
- DN is the observed data number by the SA camera in the pixel of interest,
- DN_{dark} is the CCD dark current for the observation as described in section 5.7,
- DN_{noise} is the variation in SA signal due to noise as described below,

t_i is the exposure time of the observation (in seconds).
AR_{mean} is the mean absolute response (a function of Tccd) in (DN/sec) / [w/(m2 u sr)],
AR_{pix} is the per-pixel modifier to the mean absolute responsivity for each SA camera,
I_s is the normalized spectral shape function, which evaluates to 1 at λ_0
RSR_f is the Relative Spectral Response of the SA channel's filter,
RSR_{nfm} is the Relative Spectral Response of the rest, the 'non-filter model',
Bump is the bump in the CCD quantum efficiency in the red SA channels, and
λ is the wavelength (in microns).
The calibration parameters are evaluated at the observation temperature, T.

I_s (aka I_shape) is the spectral shape of the spectral radiance (unitless and normalized to 1.0 by definition) at the specified altitude in the Titan atmosphere. It is determined by dividing the Titan model by the intensity at that wavelength as in equation 5.9-2. It is important to note that the computation of calibrated intensities at a specific wavelength is an iterative process. The I_shape is model dependent, so a proposed model must be introduced that creates an I_shape that then must result in correct SA intensity predictions. This I_shape must be consistent with the polarizing affects of both Titan's atmosphere and the SA instrument as noted in section 4.3 ("Combining Intensities...") of the calibration document (Reference 13). A good start is the spectral shape as determined by the upward looking spectrometers at the altitude of interest.

Noise and Uncertainties...

The SA noise is given by:

DN_{noise} = Read noise + Quantization Noise + Shot Noise = 0.57 + 0.29 + sqrt(DN*30)/30 DN

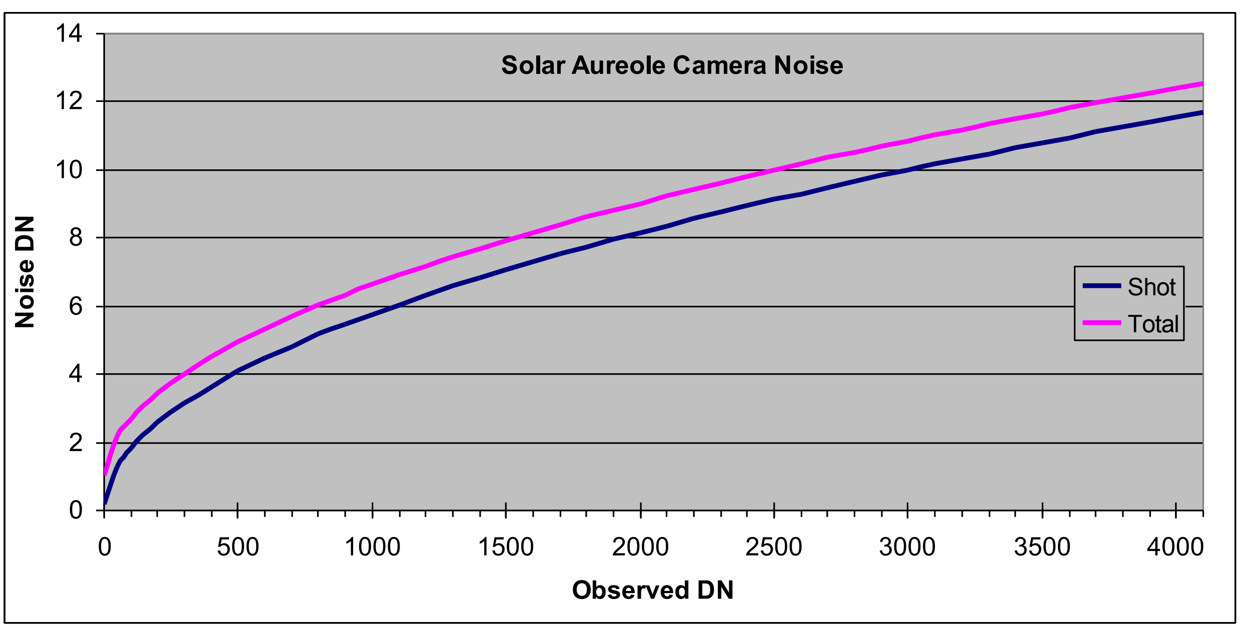


Figure 5.9.5 - Solar Aureole Camera noise as a function of observed data number.

Beyond the noise there are uncertainties due to impurity of the calibration fit. They are discussed in section 13 ("Appendices") of the calibration document (Reference 13) and summarized in the table below:

Type of Data	Relative Calibration Along:	Accuracy
Summed Blue	Column	1%
Summed Red	Column	1%
Un-summed Blue	Column 2	Within noise
Un-summed Red	Column 2	Much within noise, some within 1%, all within 2%
Un-summed Red	Column 0	Within 3%
Un-summed Blue	Row 23	Most within 1%, some within 2%
Un-summed Blue	Row 48	Most within 1%, some within 2%
Un-summed Red	Row 23	1%
Un-summed Red	Row 48	2%

There are a number of instrumental effects that complicate the SA measurements. These include changes in the optical parameters with temperature and the discovery of optical retardance in the system. Fortunately all of these effects were properly calibrated before launch. The polarization can be retrieved from the SA data, and the polarization and intensity can be successively compared to the predictions of radiative transfer models which include a 3x3 Stokes matrix. The methods are described and the data are compared to models in Tomasko, et al., Reference 12.

Absolute Responsivity...

The average absolute responsivity varies significantly with temperature for all the SA channels. The blue and red channel variations have different character as can be seen in the plot below, suggesting that the effect is coupled to the input optics, however the model was developed relative to the CCD chip temperature, which should be used in these equations. Details are in section 10 ("Absolute Response") of the calibration document (Reference 13).

The channel mean Absolute Responsivity is given by:

$$AR_{mean} = A0 + A1*T + A2*T^2 + A3*T^3 + A4*T^4 + A5*T^5 + A6*T^6 \quad \text{(eq. 5.9-3)}$$

where

T is the CCD temperature at the time of observation, and
A is from the table below:

	Blue Horizontal	Blue Vertical	Red Horizontal	Red Vertical
A0	-1.320628900000E+08	-1.043157230000E+08	-6.342293175000E+07	-4.764707846875E+07
A1	3.439118281250E+06	2.708450062500E+06	1.392982078125E+06	1.053106603516E+06
A2	-3.693190771484E+04	-2.898806738281E+04	-1.200406482697E+04	-9.126064826965E+03
A3	2.100620784760E+02	1.643101100922E+02	5.120302107930E+01	3.914550912380E+01
A4	-6.678061112761E-01	-5.205441340804E-01	-1.080477217911E-01	-8.309265802382E-02
A5	1.125490496634E-03	8.742839563638E-04	9.032962566380E-05	6.989951356218E-05
A6	-7.858712436359E-07	-6.084150783181E-07	0.000000000000E+00	0.000000000000E+00

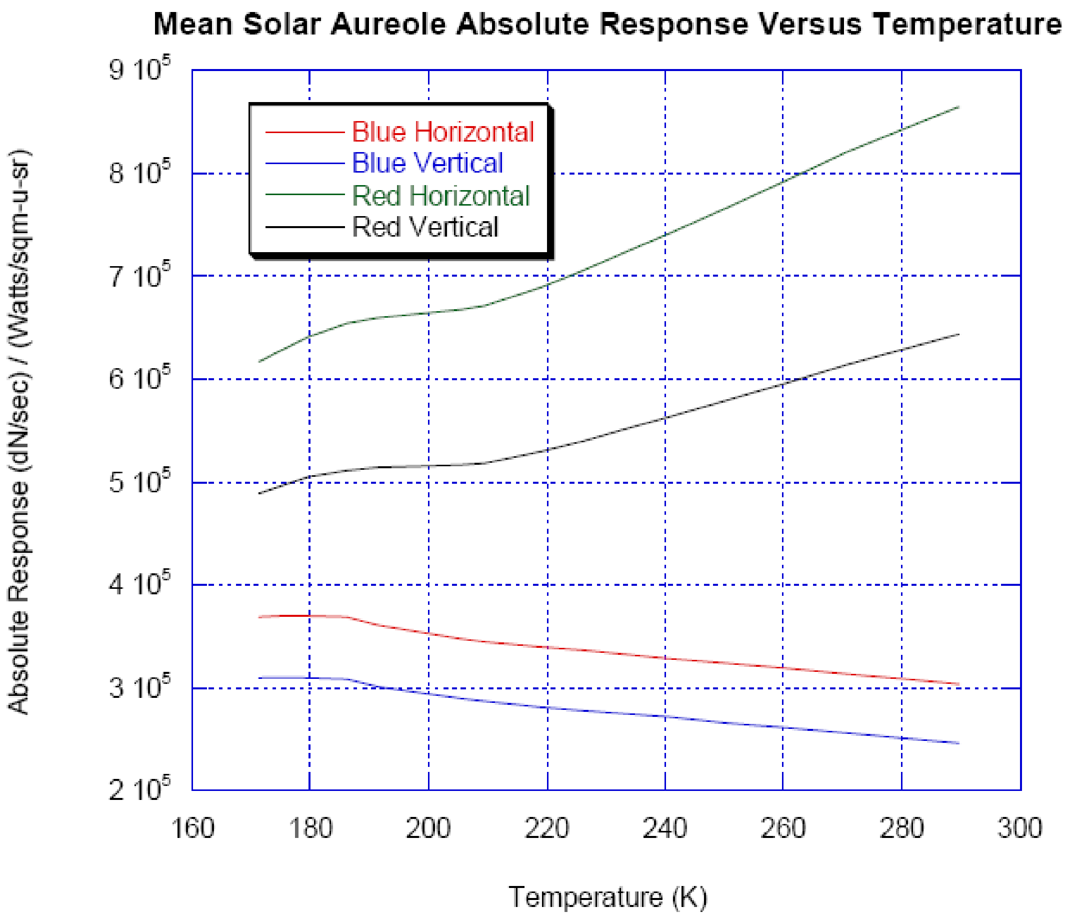


Figure 5.9-6: Mean absolute response for each SA camera vs. CCD temperature.

Each SA pixel varies from the camera mean, of course. To determine the actual Absolute Responsivity for a particular pixel it is necessary to multiply its mean value by its 'Map' value which is determined from this polynomial:

$$AR_{pix} = M0 + M1*T + M2*T^2 + M3*T^3 \qquad \text{(eq. 5.9-4)}$$

where

AR_{pix} is the per-pixel scaling factor for pixel(row, column),
T is the CCD temperature at the time of the observation, and
M is the coefficient from the tables in Appendix 32 for the row & column of interest.

Relative Spectral Response...

The plots below show the Relative Spectral Response for each of the SA channels:

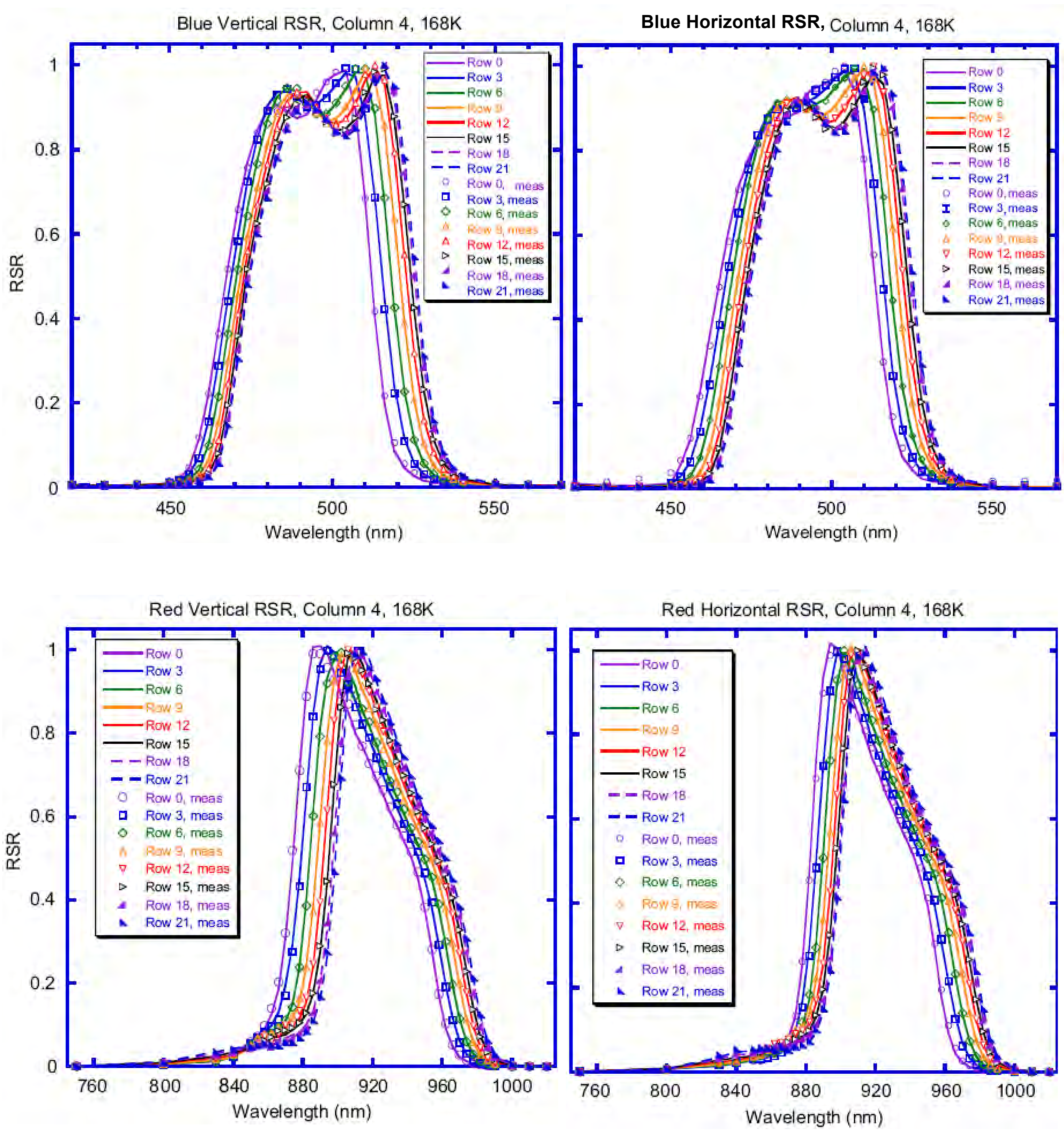


Figure 5.9-7 – Relative Spectral Response Plots for the SA channels.

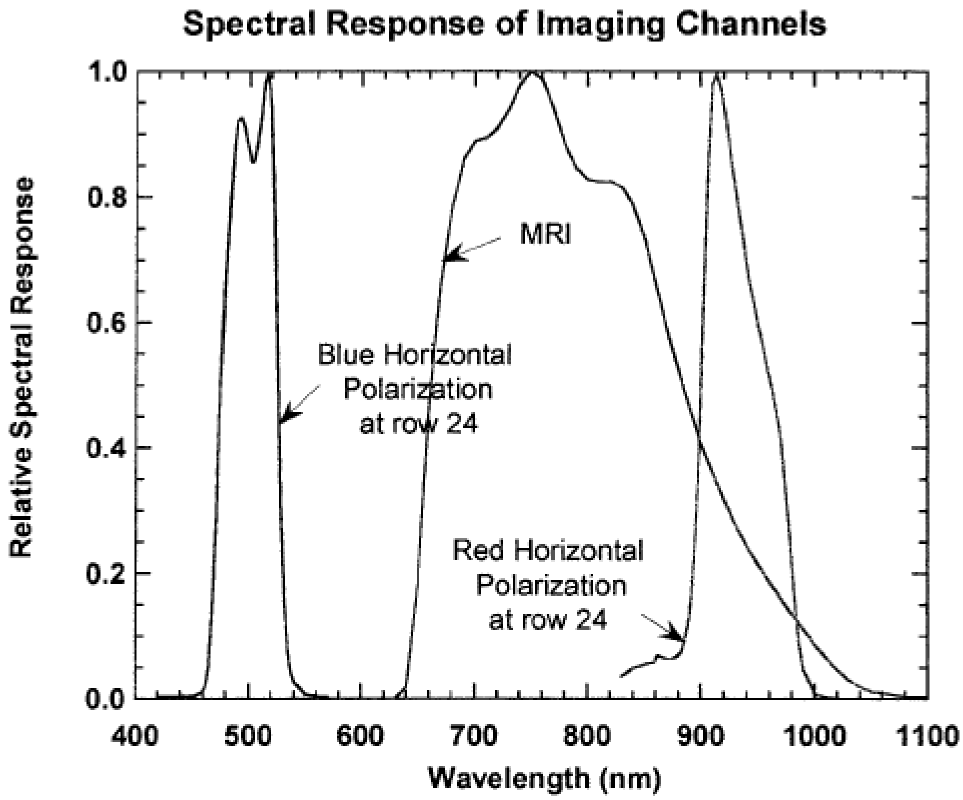


Figure 5.9-8: Comparison of the RSR for the SA cameras with that of the Medium Resolution Imager on the DISR.

As with the SA's Absolute Responsivity, the Relative Spectral Response of the cameras is the product of two terms, a filter term, and non-filter model term:

$$RSR_{SA} = RSR_f * RSR_{nfm} \quad \text{(eq. 5.9-5)}$$

RSR_f is the Relative Spectral Response component from the narrow band-pass interference filters on each system. RSR_f is normalized to 1.0 at its peak, and is considered temperature independent (as temperature is compensated for in the nfm term). RSR_f is found by interpolating in the tables in Appendix 31 for the row and column of interest. Note that most columns within a specific channel (i.e. blue-vertical) have the same curve, with a few exceptions (Red-Vertical, column 0 and Red-Horizontal columns 0 & 1), which have their own tables in Appendix 31.

RSR_{nfm} is dependent on both SA column number and temperature (and, of course wavelength), and has the form:

$$RSR_{nfm} = (M0 + M1*\lambda + M2*\lambda^2 + M3\lambda^3) + (224.7-T)*(a + b*\lambda + c*\lambda^2 + d*\lambda^3) \quad \text{(eq. 5.9-6)}$$

where

T is the CCD temperature at the time of the observation,
λ is the wavelength of interest,
M are the map coefficients from Appendix 33 (different than the AbsResp M's!!), and
a thru d are the coefficients from the table below.

Table: SA RSR temperature coefficients.

Channel	Polar	a	b	c	d
Blue	Hor	2.05192050E+00	-1.21127860E-02	2.38543920E-05	-1.56729180E-08
Blue	Ver	2.67177940E+00	-1.59196380E-02	3.16325900E-05	-2.09609370E-08
Red	Hor	4.16278530E+00	-1.33554800E-02	1.43166060E-05	-5.12789290E-09
Red	Ver	4.66941200E-01	-1.46212600E-03	1.56549540E-06	-5.73364770E-10
Red	Hor_0	5.28510430E+00	-1.68045650E-02	1.78443640E-05	-6.32867930E-09
Red	Hor_1	4.94097690E+00	-1.58300100E-02	1.69381230E-05	-6.05314650E-09

The bump...

A known bump in the CCD quantum efficiency can be seen in the red SA RSR, so it is modeled empirically in the initial NFM as a lorentzian function with a center wavelength of 854 nm, a full-width at half maximum response of 15 nm, and a peak amplitude of 0.4, as follows:

Equation 5.9-7:

$$Bump'(\lambda) = 1 + \frac{0.4}{1 + \left(2 * \frac{(854-\lambda)}{15}\right)^2}$$

The coefficients of the initial NFM quadratic fit of the quantum efficiency roll-off for the red horizontal and vertical channels are as follows.

Table: Bump Coeff's for Red SA channels

	Horizontal	Vertical
nfm0	6.790040E+01	2.531123E+01
nfm1	-1.337283E-01	-4.310580E-02
nfm2	6.615752E-05	1.800659E-05

So the bump term becomes:

$$Bump = Bump'(\lambda) * (nfm0 + nmf1*\lambda + nmf2*\lambda^2) \quad \text{(eq. 5.9-8)}$$

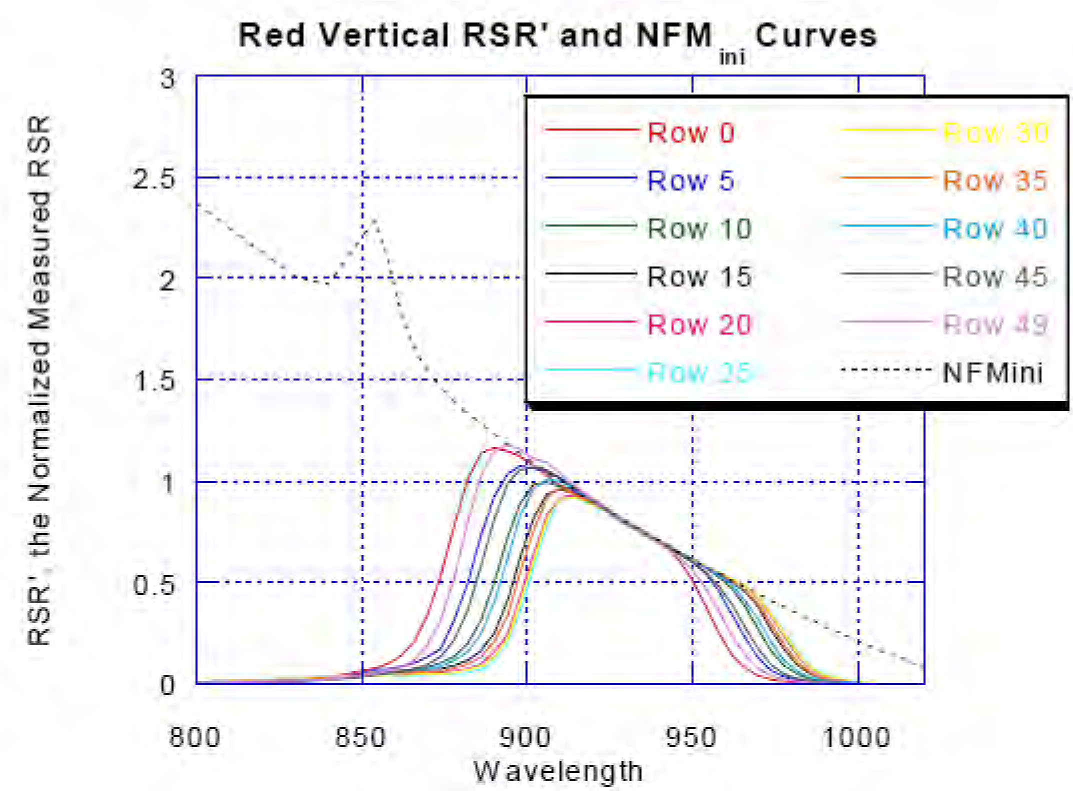
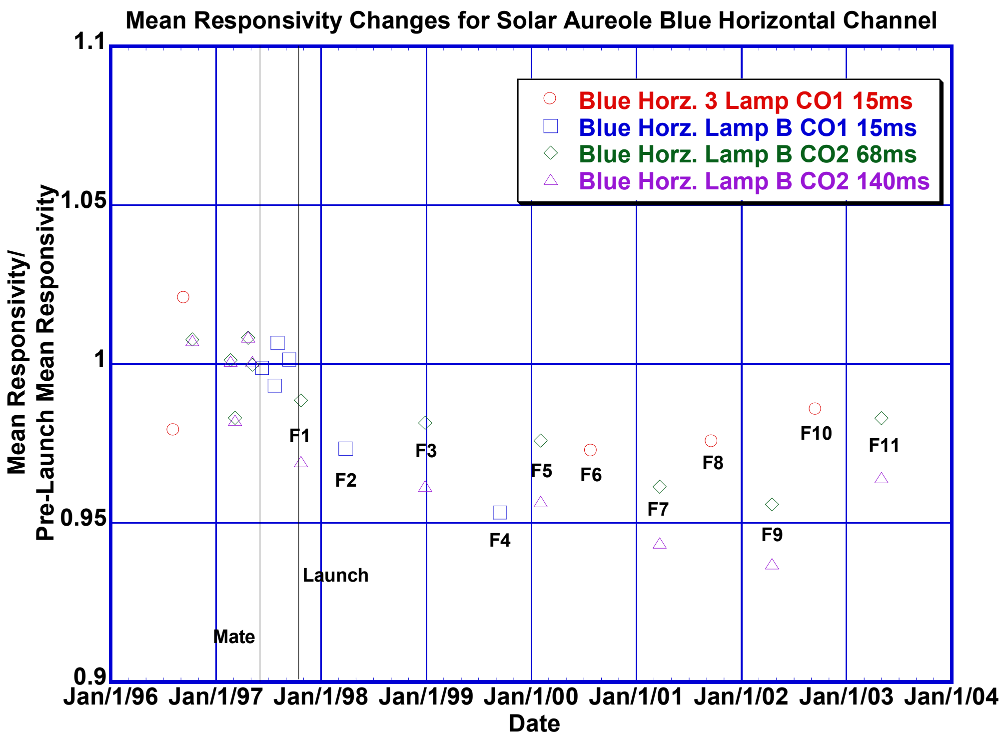


Figure 5.9-9: Red-Vertical SA channel including Bump & Non-Filter Model.

Cassini Cruise Phase Effects...

As discussed in section 5.6, many of the DISR detector systems exhibited changes in the absolute responsivity during the trip from Earth to Titan. The dark current effects are discussed in section 5.7. The observed changes in the Solar Aureole Camera system are small, and may be a combination of yellowing of the fiber optic bundles, and/or movement of the fibers during launch. The observations are presented below.

The changes in the SA system are varied, but generally less than 5%. They are likely due to a combination of movement of the fiber-optic strands that conduct light from the calibration bulbs to the detector (as seen in the imagers) and yellowing of the fiber optic glass (as seen in the violet photometers). The calibration lamp fibers are thin and flexible. Their movement would not indicate a change in the responsivity of the cameras. The situation is complicated by the fact that for many cruise exposures only one of the three calibration lamps (B) was used (to extend the life of the others). It is left to the reader to decide how to use this information, but generally the stability of absolute responsivity of the DISR CCD instruments has been better than about 1%.



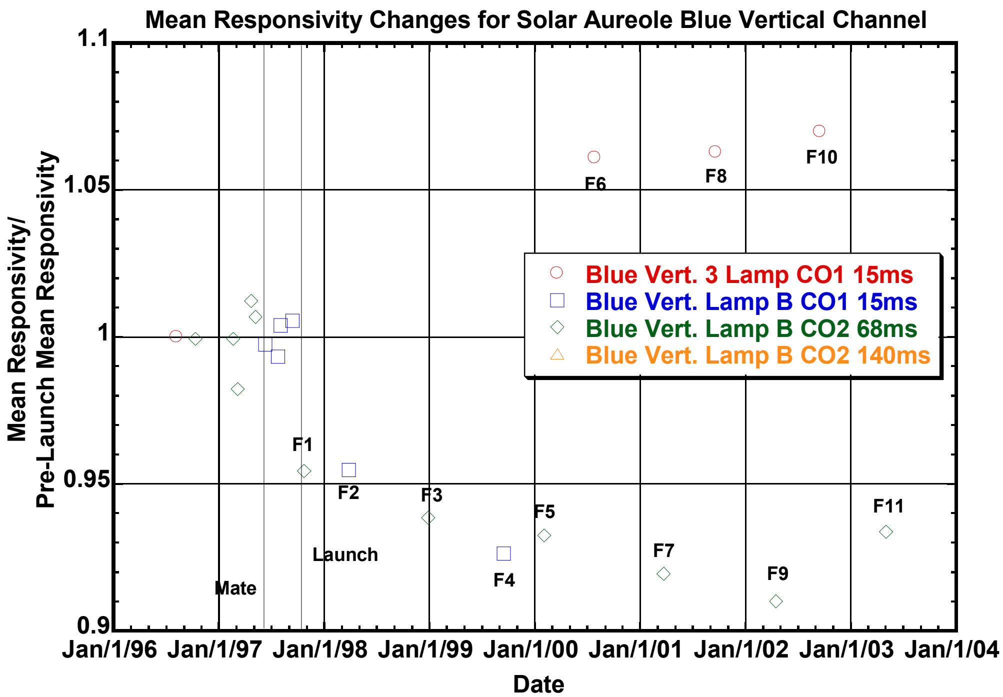


Figure 5.9-11: Absolute Responsivity history of the Blue Solar Aureole Camera channels for the cruise phase to Saturn, normalized to the pre-launch average. Horizontal on top, Vertical on bottom.

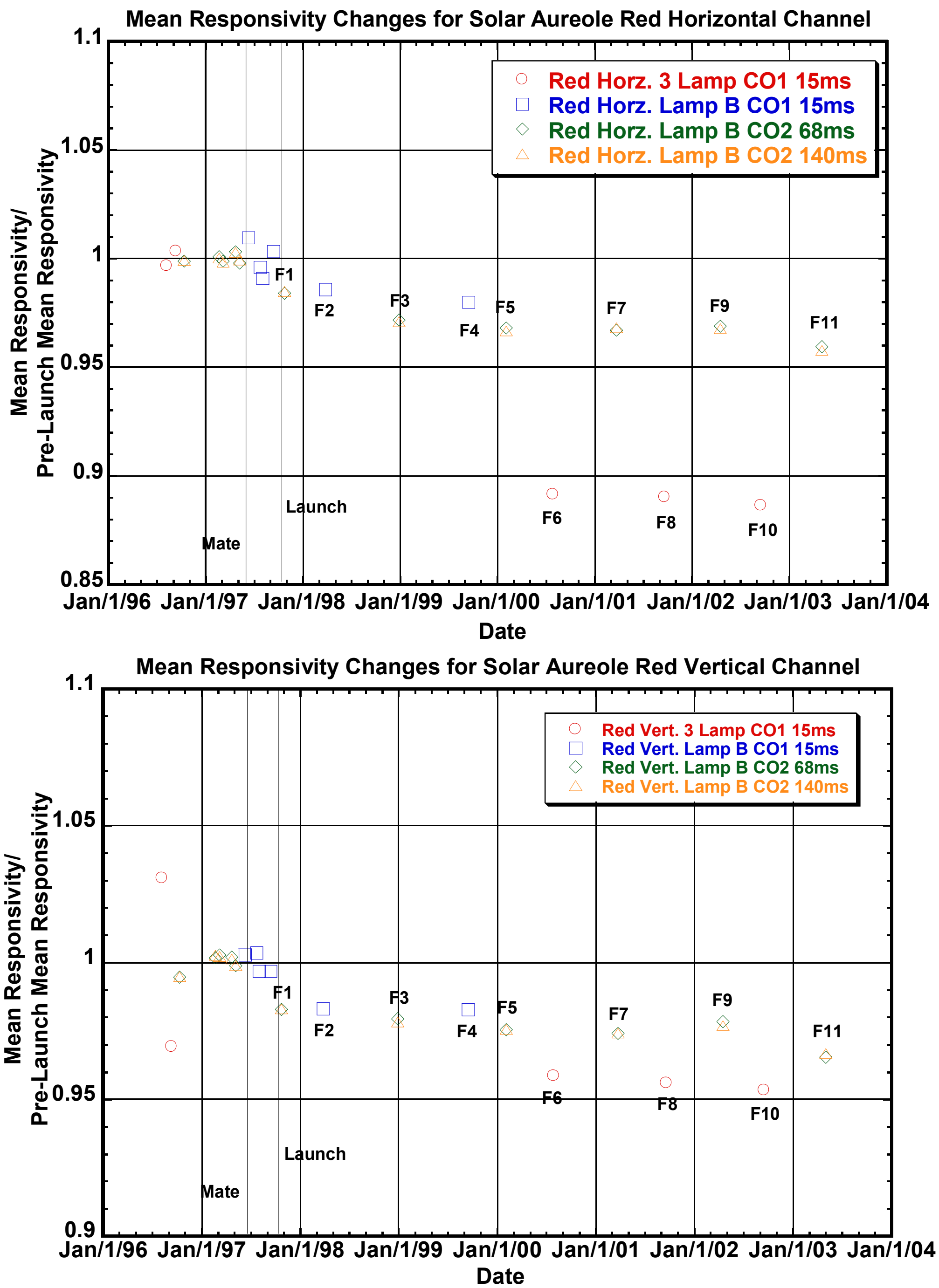


Figure 5.9-12: Absolute Responsivity history of the Red Solar Aureole Camera channels for the cruise phase to Saturn, normalized to the pre-launch average. Horizontal on top, Vertical on bottom.

5.10 Visible Wavelengths Spectra

The DISR contains two visible wavelength spectrometers (actually near IR also, from 480 to 960 nm). One spectrometer looks up and is aptly named the Upward Looking Visible Spectrometer (ULVS) and the other looks down and as you might expect is called the Downward Looking Visible Spectrometer (DLVS). The ULVS views about ½ the sky (π/2 sr) using the same window as the ULV (see section 5.6.1), and thus has the same view obscurations of the DISR shadow bar (see section 5.6.3) and baffles. To decrease noise and increase bandwidth the 8 columns are summed into two columns (i.e. 4 columns each), which are transmitted (x 200 spectral rows).

The DLVS is in essence an imaging spectrometer, with 20 pixels of linear spatial resolution oriented vertically (10º to 50º Nadir angle), and about 4 degrees wide. The FOV is asymmetric and results in the Zenith-Azimuth map shown below. The data is transmitted in one of 4 modes: 20 columns (raw), 10 columns (summed by 2's), 5 columns (x4s), or 'near-surface', which provides two special, SSL illuminated columns (summed by 2's). As with the ULVS there are 200 spectral resolution pixels.

Details of the Visible spectrometers are available in the archive under:
DOCUMENT/DISR_CALIBRATION_DOCUMENTS/VISIBLE_SPECTROMETERS
One would be well advised to also review Reference 15 (Karkoschka) for calibration updates.

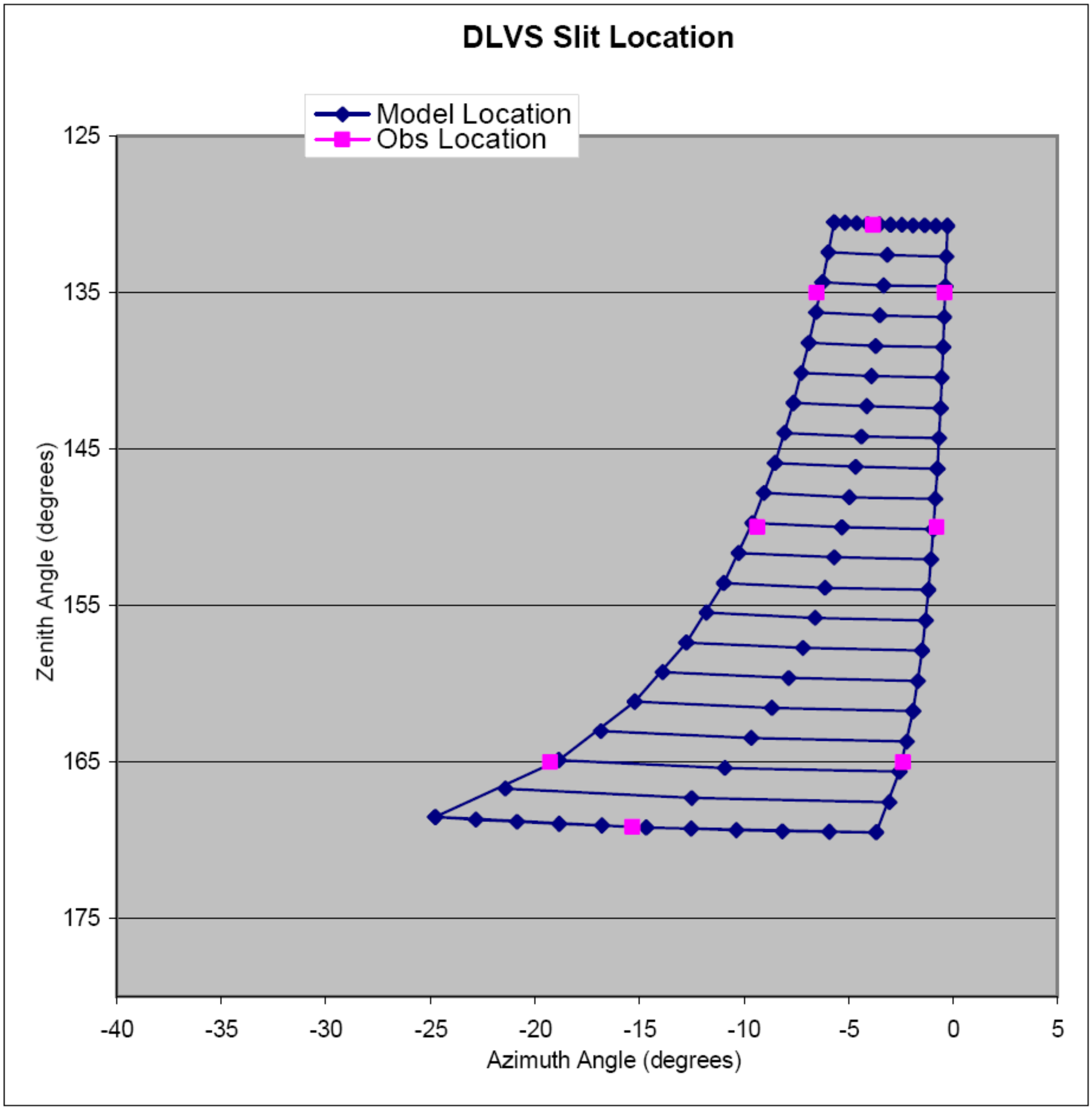


Figure 5.10-1: Fields of view for the 20 DLVS spatial pixels. Pink points are the lab calibration grid observations on which the FOV model is based. Pixel(0,0) is in the lower right corner.

Visible Spectrometer Archive Data...

The Visible Spectrometer archive data is located in directory: DATA/VISIBLE

The data is presented in tables that are n+1 columns wide by 200 rows deep, where n is the number of columns after summing. So for the ULVS data (DETECTOR_ID = "ULVS") there are 3 columns, the first is the row (or spectral pixel) number and the other two columns are the sum of CCD columns 38 to 41 (right half of the sky as viewed by the DISR), and the sum of CCD columns 42 to 45 (left half of the sky as viewed by the DISR).

For DETECTOR_ID = "DLVS" the number of columns may be 21, 11, 6 or 3, where the n columns are:

In the 20 column case - the raw observed DN for CCD columns 14 through 33.
In the 10 column case - the sum of CCD columns 14+15, 16+17, 18+19, ..., 30+31, & 32+33.
In the 5 column case - the sum of columns 14 thru 17, 18 thru 22, 23 thru 26, 27 thru 30, and 31 thru 33.
In the 2 column case - the sum of columns 18+19, and columns 20+21.

As an example we will use DLVS dataset VISIBLE_0543_013223_1446. Below is the abbreviated data in its original format, as seen in the Archive (without the header row). The first column is row index (i.e. row(n)), the next 20 columns are the spatially oriented data (in DN) with the first column being the most nadir. The rows increase from reddest (1) to bluest (200).

DLVS 20 column data (VISIBLE_0543_013223_1446.TAB)																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	13	15	13	15	15	14	14	11	13	16	15	14	15	15	15	14	15	14	15	15
2	14	14	15	14	16	15	14	12	15	15	14	14	15	15	16	15	15	16	15	15
3	12	14	14	14	15	13	15	11	15	15	15	15	14	14	15	17	14	15	15	14
≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡
198	186	191	189	194	199	200	201	210	206	215	221	219	218	226	223	224	231	222	208	190
199	160	172	174	177	184	181	183	187	196	199	198	195	205	204	204	208	209	205	200	178
200	142	152	153	159	160	161	159	168	168	173	176	174	178	180	184	182	184	182	172	153

The table below is the same data, as if it were collected in 10 column mode (with each 2 columns summed together, 1+2, 3+4, etc).

DLVS 10 column data (column summed by 2's)										
	1	2	3	4	5	6	7	8	9	10
1	28	28	29	25	29	29	30	29	29	30
2	28	29	31	26	30	28	30	31	31	30
3	26	28	28	26	30	30	28	32	29	29
≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡
198	377	383	399	411	421	440	444	447	453	398
199	332	351	365	370	395	393	409	412	414	378
200	294	312	321	327	341	350	358	366	366	325

The table below is the same data as if it were collected in 5 column mode. The first column is the sum of columns 1-4 of the raw, 20 column data, etc.

DLVS 5 column data (column summed by 4's)					
	1	2	3	4	5
1	56	54	58	54	59
2	57	57	58	56	61
3	54	54	60	56	58
≡	≡	≡	≡	≡	≡
198	760	810	861	832	851
199	683	735	788	765	792
200	606	648	691	668	691

The same data collected in 'near-surface' (2 column) mode. It provides 4 rows of data where the Surface Science Lamp signal is strong, summed into two columns. Note it is the same data as columns 3 & 4 of the 10 column case, & correspond to 18-12° & 22-24° nadir angles (Ref 15).

DLVS 2 column data (2 columns summed by 2's)		
	1	2
1	29	25
2	31	26
3	28	26
≡	≡	≡
198	399	411
199	365	370
200	321	327

The same is true of the ULVS data, but it is only available in 2 column mode, with the first 4 columns summed together, and the last 4. Below is a fictitious ULVS raw dataset:

ULVS 8 column raw data (unavailable)								
	1	2	3	4	5	6	7	8
1	28	29	25	29	29	30	29	29
2	29	31	26	30	28	30	31	31
3	28	28	26	30	30	28	32	29
≡	≡	≡	≡	≡	≡	≡	≡	≡
198	383	399	411	421	440	444	447	453
199	351	365	370	395	393	409	412	414
200	312	321	327	341	350	358	366	366

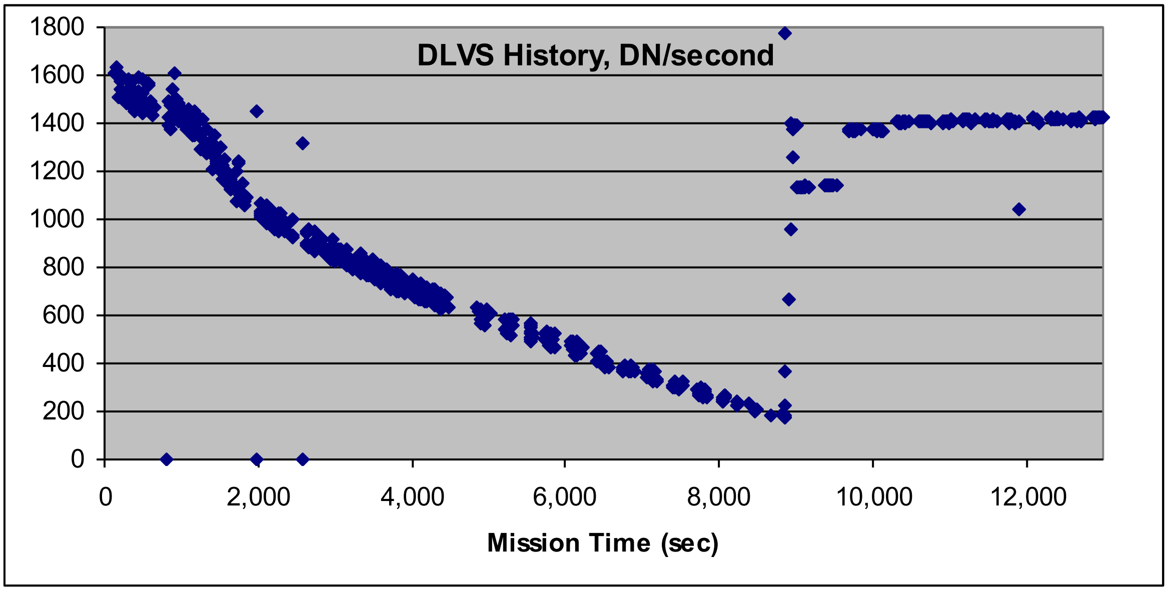
And below is how the data above would be transmitted:

ULVS data (summed by 4's)		
	1	2
1	111	117
2	116	120
3	112	119
≡	≡	≡
198	1614	1784
199	1481	1628
200	1301	1440

The following table provides file type discriminators for the DISR Visible archive data:

Dataset Type	DETECTOR_ID	RECORD_BYTES	File Size (KB)
ULVS	"ULVS"	22	5
DLVS, 2 Column	"DLVS"	22	5
DLVS, 5 Column	"DLVS"	46	9
DLVS, 10 Column	"DLVS"	86	17
DLVS, 20 Column	"DLVS"	166	33

A summary of the Visible Spectrometer data is presented in Appendix 40. The following plots present the the average per-column data rate history during the Titan descent for both Downward & Upward Looking Spectrometers from Appendix 40 (in Data Number per second). The stray points at ~1000, 2000 & 2500 seconds are from the calibration cycles.



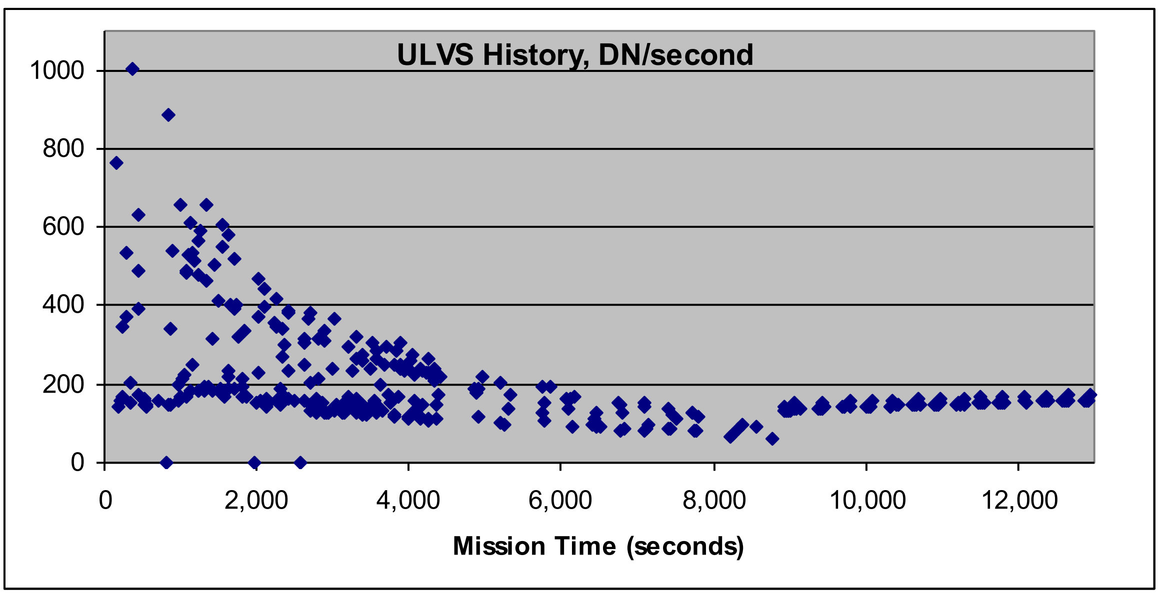


Figure 5.10-2: Downward & Upward Looking Visible Spectrometer average data from Appendix 40.

In order to use the Visible Spectrometer data from the PDS archive several pieces of information are needed:

1) The wavelengths corresponding to the pixels (which are a function of temperature).
2) The spectral resolution.
3) The absolute responsivities of each pixel.
4) The relative response over the field of view.
5) The pointing directions for the DLVS pixels.
6) Cross talk correction from the DISR Imagers
7) Fringe corrections for the ULVS measurements
8) The dark and bias signals.

Visible Spectrometers Wavelength Scale...

The wavelength corresponding to each visible spectrometer pixel is a function of optics temperature. The relations from the Visible Spectrometer Calibration Document (Reference 10) are given below with a brief example of how they are applied.

For both spectrometers the column average wavelength corresponding to a given spectral pixel (dataset row) is:

$$\langle WL \rangle = a + b*pixel + c*pixel^2$$

where:

<WL> is the average wavelength in nm of the pixels in across the row.
pixel is the row number of the in the dataset, starting at 0 (0 to199).

for the DLVS the coefficients are:

$$a = 976.0126 + 0.003233571 * \text{Optics Temperature},$$

$$b = -2.310039 + 9.257741\text{x}10^{-6} * \text{Optics Temperature},$$

$$c = -0.001014741 + 2.289958\text{x}10^{-8}*\text{Optics Temperature}.$$

for the ULVS the coefficients are:

$$a = 966.0061 + 0.002924244 * \text{Optics Temperature},$$

$$b = -2.329799 + 5.265123\text{x}10^{-6} * \text{Optics Temperature},$$

$$c = -0.001017838 + 2.616148\text{x}10^{-8} * \text{Optics Temperature}.$$

There is also variation across the columns which can be calculate from:

for the DLVS:

$$\text{Wavelength (Column, Pixel, Temperature)} = \langle WL \rangle + (\text{Column}-9.5)*(0.07663108 + 3.398037\text{x}10^{-4} * \text{Pixel} + 2.081074\text{x}10^{-7}*\text{Pixel}^2)$$

and for the ULVS:

$$\text{Wavelength (Column, Pixel, Temperature)} = \langle WL \rangle + (\text{Column}-3.5)*(-0.09893011 - 6.962504\text{x}10^{-6}*\text{Pixel} - 3.571207\text{x}10^{-6}*\text{Pixel}^2)$$

where:

Wavelength is the wavelength corresponding to the pixel at (row, column) in nm,
<WL> is the column average wavelength (nm) calculated as above,
Column is the spatial pixel column number (0 to 19 for DLVS, 0 to 7 for ULVS), and
Pixel is the dataset row index (from 0 to 199).

The optics temperature profile during the Titan descent is shown in section 5.5 (and Appendix 38). A table of the DLVS column average wavelengths is presented in Appendix 29.

It should be noted that the laboratory measurements these numbers are based on occurred at around 920 mb pressure, while the observations above Titan occurred from 3 to 1470 mb, which shifts the wavelengths up to 1 nm due to the well-known change of refractive index of air with its density. A correction curve has been published by Erich Karkoschka in Reference 16:

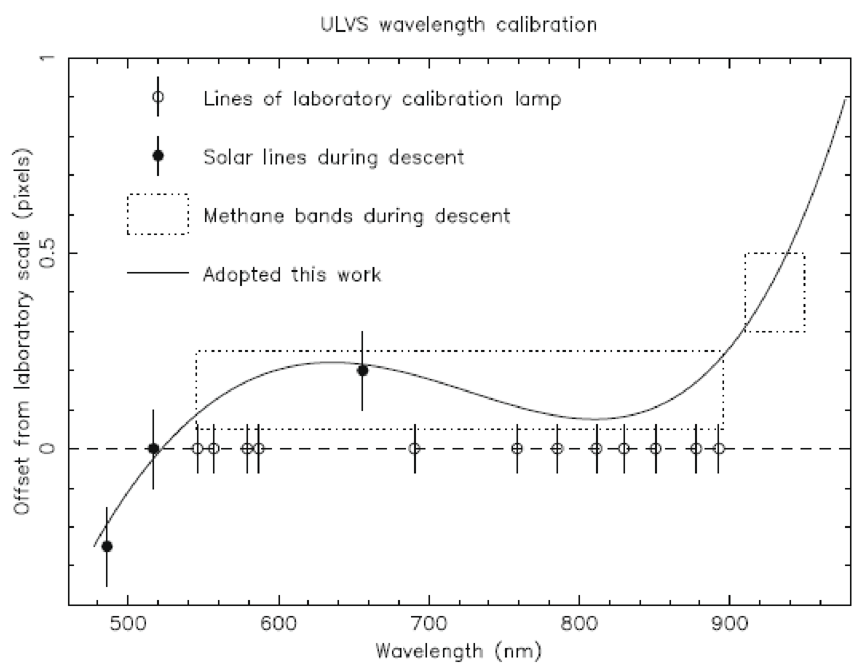


Figure 5.10-3: Offsets of the ULVS wavelength calibration to the laboratory calibration for various lines and bands, and adopted calibration from Reference 16. One pixel corresponds to ~2.6 nm. A positive offset means that the spectral pixel probes a longer wavelength than expected.

The following plot shows the variation in average wavelength scale from their values at 210ºK. The maximum variation over the Titan descent was about ±0.3 nm at the blue end of the spectrometer, and about 0.16 nm at the red end.

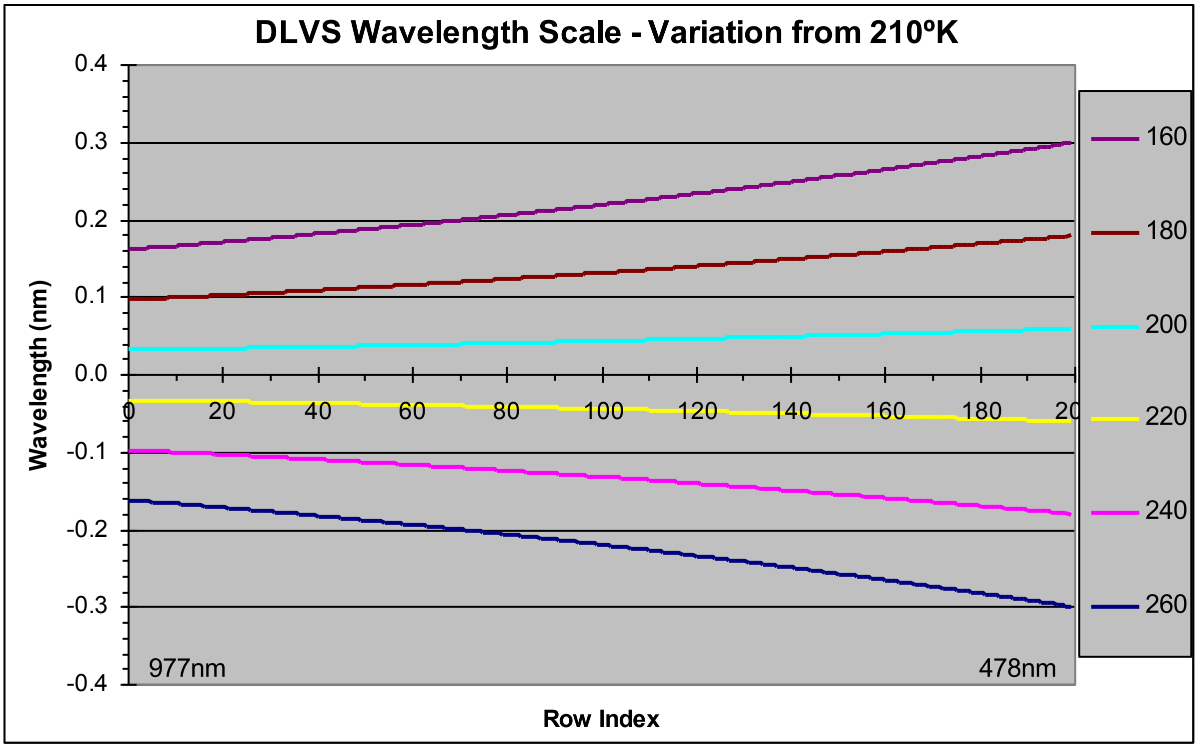


Figure 5.10-4: Variation in the DLVS column average wavelength scale from its value at 210ºK, for temperatures from 160º to 260ºK. The maximum variation of about ±0.3 nm occurs at the blue end of the scale.

The wavelength variation across the rows (in the spatial dimension) is more severe. The corresponding wavelengths vary by about 0.7 nm at the red end of the scale and by almost 1.5 nm at the blue end for our example at 210ºK, shown below. A subset of this data is presented in tabular form in Appendix 29.

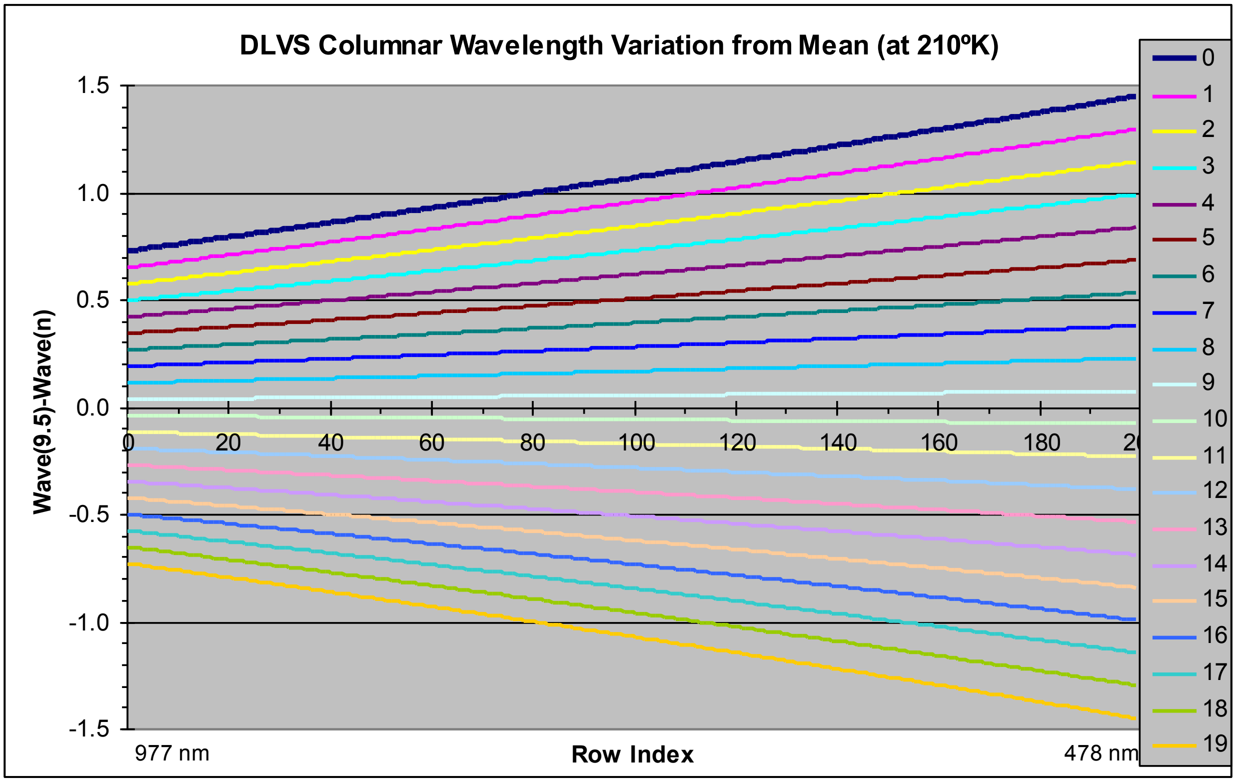


Figure 5.10-5: The variation in wavelength from the column mean for the 20 columns of the DLVS at 210ºK.

Below are the same plots of the wavelength scale variations, except for the ULVS.

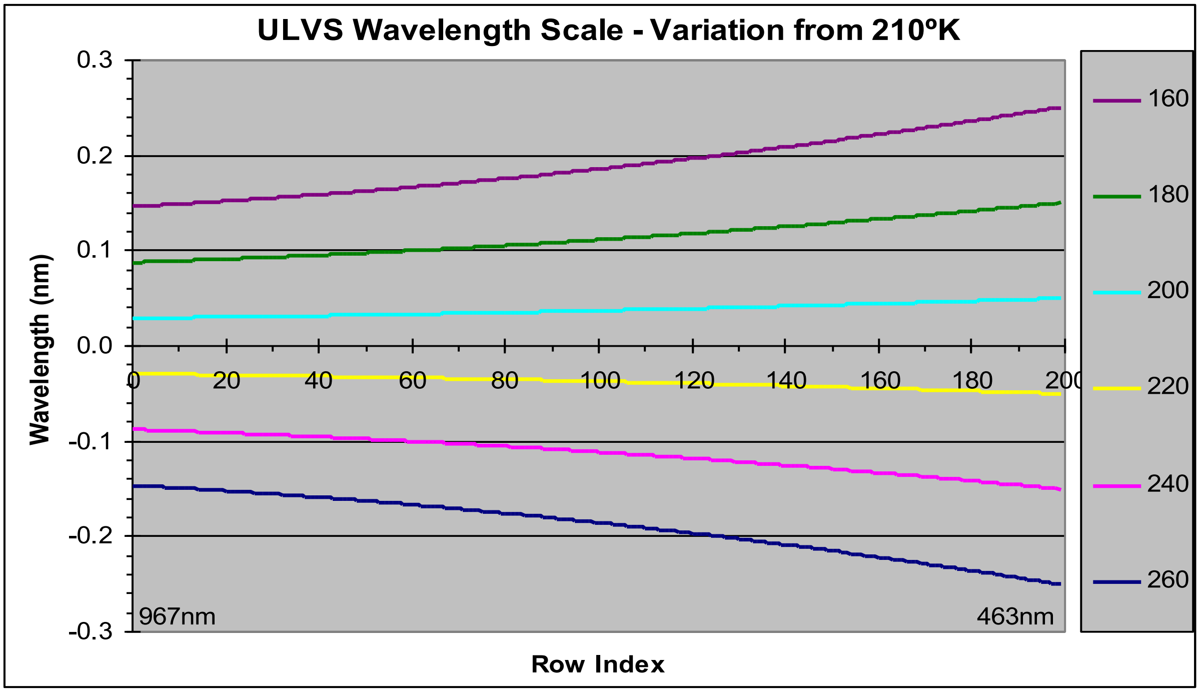


Figure 5.10-6- Variation in the ULVS column average wavelength scale from its value at 210ºK, for temperatures from 160º to 260ºK. The maximum variation of about ±0.3 nm occurs at the blue end of the scale.

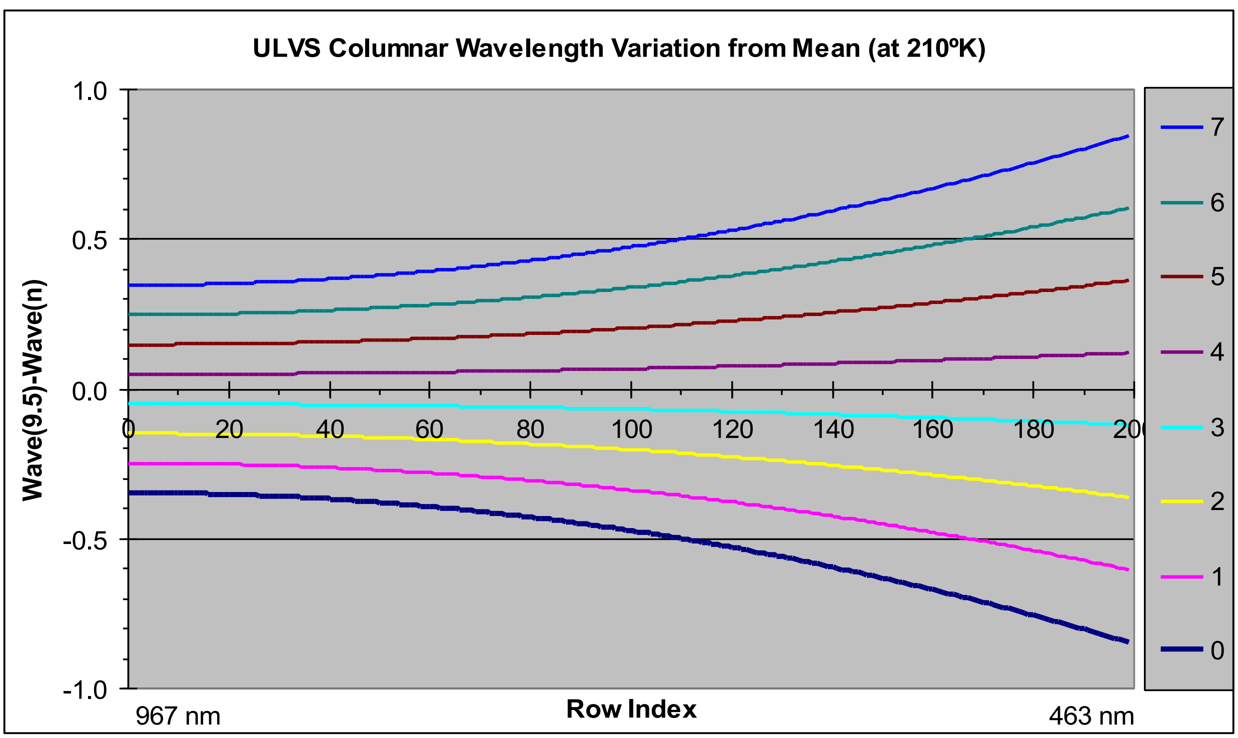


Figure 5.10-7: The variation in wavelength from the column mean for the 8 columns of the ULVS at 210ºK.

Spectral Resolution...

The spectral resolution of each Visible Spectrometer pixel is dependent on its location in the dataset (i.e. wavelength and spatial column), and temperature. The line spread function is described as a Gaussian with the full width at half maximum (FWHM) response:

For the DLVS:

$$\text{FWHMcore} = (9.7249 - 0.0156\lambda + 8.0975\times10^{-6}\lambda^2) * (1.04554 - 4.7941\times10^{-3} * \text{Column}) * (1.1733 - 1.3936\times10^{-3}T + 2.79656\times10^{-6}T^2)$$

where:

FWHMcore is the full width at half max of the Gaussian in nanometers,
λ is the wavelength corresponding to the pixel in nanometers,
Column is the spatial column index of the pixel (0 to 19), and
T is the DISR Optics Temperature in degrees Kelvin.

Similarly for the ULVS:

$$\text{FWHMcore (nm)} = (4.8412 + 3.5474\times10^{-4}\lambda) * (1.02868 - 8.565\times10^{-3} * \text{Column} + 1.060\times10^{-4} * \text{Column}^2) * (1.5808 - 4.598\times10^{-3} * T + 9.057\times10^{-6} * T^2).$$

A summary of the spectral resolution for both the DLVS and ULVS at 210ºK is presented in Appendix 30 in tabular form, and graphically below:

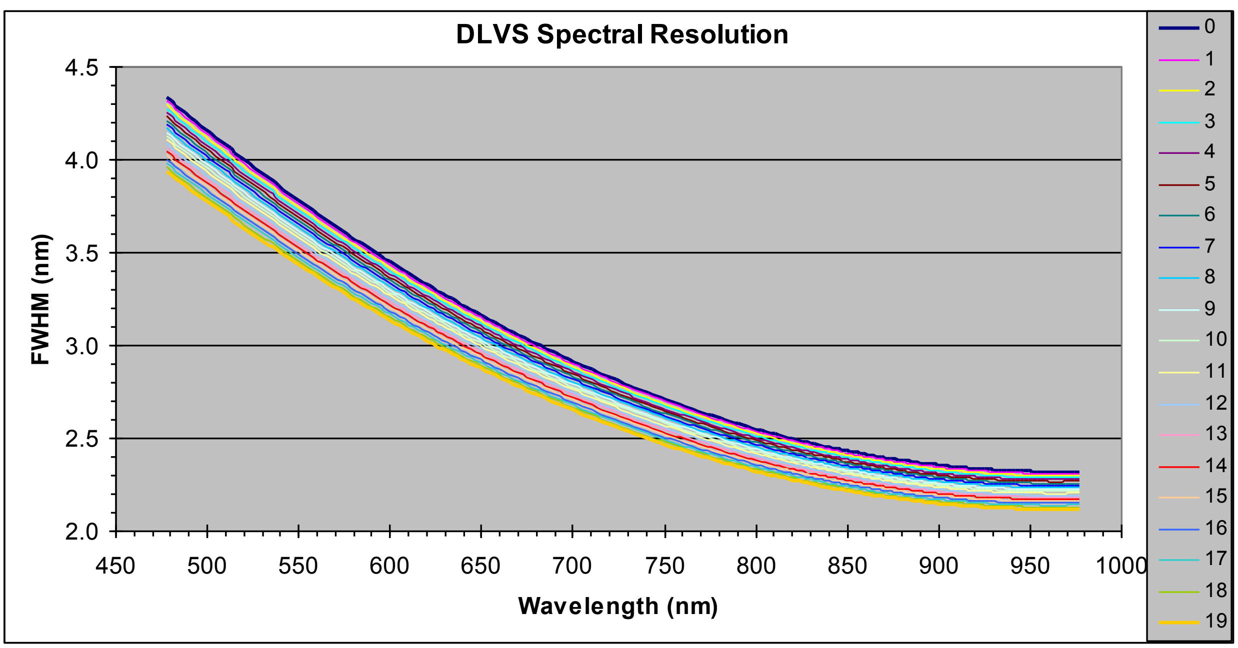


Figure 5.10-8: DLVS spectral resolution at 210ºK for all 20 columns.

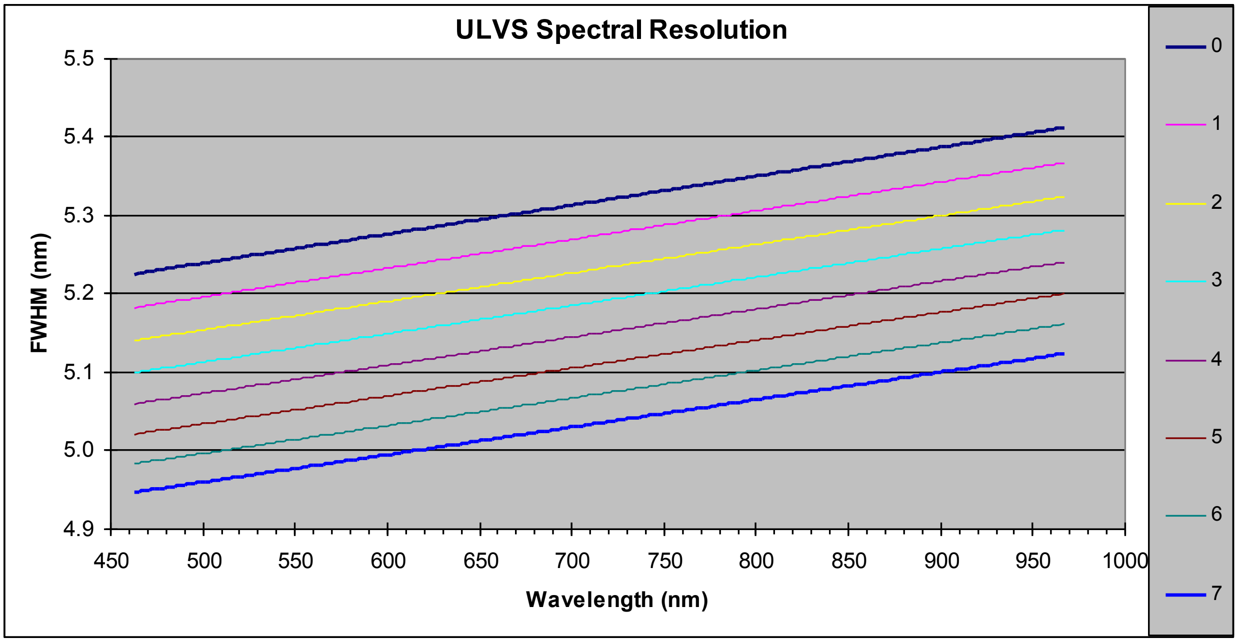


Figure 5.10-9: ULVS spectral resolution at 210ºK for all 8 columns.

Absolute Responsivity...

The absolute responsivity of the Visible Spectrometer pixel are a strong function of pixel number (spectral and spatial location) and temperature, and often vary sporadically from pixel to pixel. Tables of the absolute responsivities in (DN/second) / [Watts/(m^2-micron-steradian)] for each pixel are presented in the Visible Spectrometer Calibration Document (Reference 10).

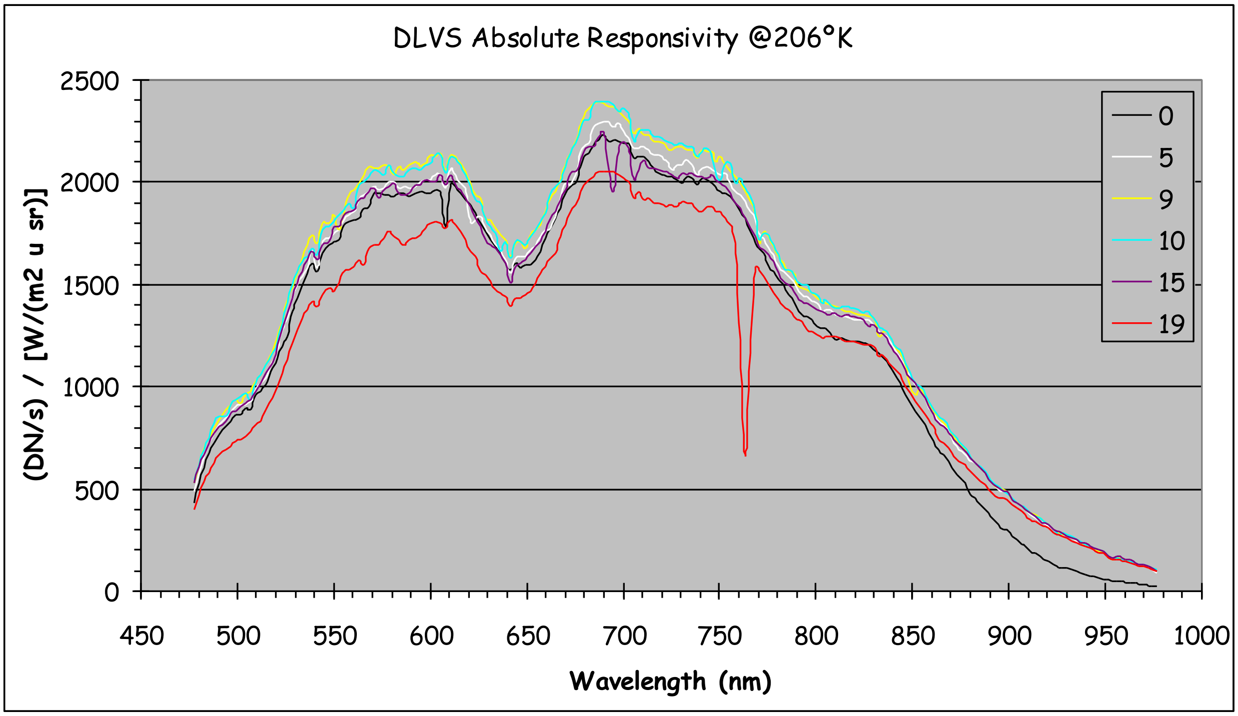


Figure 5.10-11: DLVS Absolute Responsivity vs. wavelength (row) at 205.4ºK CCD temperature (213ºK optics temperature) for selected columns (spatial pixels). From tables 7.2 of Reference 11. Note: there are significant pixel-to-pixel variations in some cases.

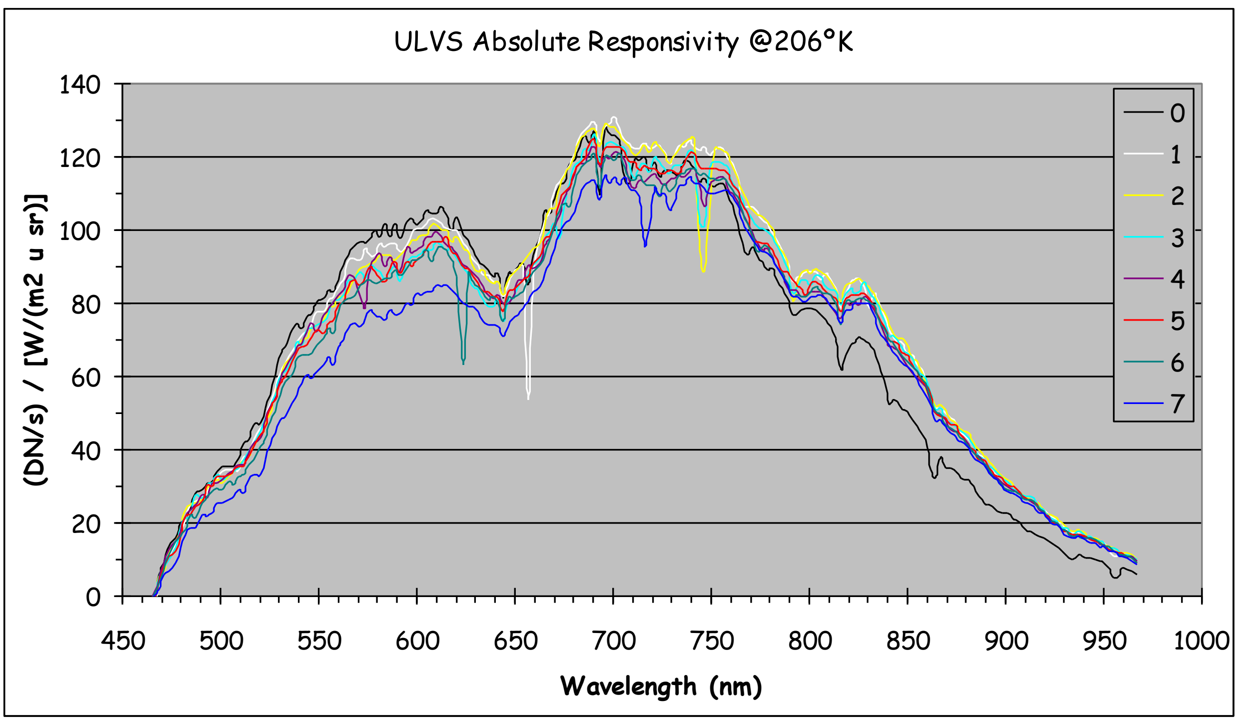


Figure 5.10-12: ULVS Absolute Responsivity vs. wavelength (row) at 205.7ºK CCD temperature (213ºK optics temperature) for all 8 columns (spatial pixels). From tables 7.1 of Reference 11. Note: there are significant pixel-to-pixel variations in some cases.

Relative Spatial Response...

DLVS:

As you will recall, the DLVS has a spectral and spatial dimension. The column dimension is spatial with the relationship:

$$\text{Zenith Angle (in deg)} = 2.0272 * (83.45063 - \text{Column Number})$$

However there is some tilt, introducing a row effect into the spatial dimension.

$$\text{Zenith Angle(Col, Row)} = 169.174 - 2.02724*(\text{Col} - 2.431874 + 0.04087319*\text{Row} - 0.0001213306*\text{Row}^2)$$

The half amplitude azimuth boundaries for the spatial column element are represented by:

$$\text{Azimuth} = A0 + A1*\text{Zenith} + A2*\text{Zenith}^2 + A3*\text{Zenith}^3 + A4*\text{Zenith}^4 + A5*\text{Zenith}^5$$

where the coefficient for the two azimuth limits are presented in the following table:

Coef.	Azimuth 1	Azimuth 2
A0	1.3320E+04	-4.1082E+04
A1	-4.5959E+02	1.3831E+03
A2	6.3344E+00	-1.8567E+01
A3	-4.3601E-02	1.2416E-01
A4	1.4991E-04	-4.1333E-04
A5	-2.0603E-07	5.4757E-07

For a graphic representation see figure 5.10-1, plot of DLVS Zenith vs. Azimuth.

It should be noted that the azimuthal edge cut-off is not sharp, but more gaussianesque. Plots of the spatial shape and a more detailed description of the DLVS azimuth extent is discussed in section 4 (Geometry) of the calibration document (Ref 11).

ULVS:

The ULVS views roughly ¼ of the sky at any epoch. However the spatial response over that π/2 sr is not constant, nor even a pleasant function. Tables of the ULVS's column averaged spatial response for every azimuth (-90 to +90) and every zenith angle (0 to 90) are presented in tables 4.1 of Reference 10a. These values are normalized to 10,000 at the peak response. Those values normalized to 1 at the peak are presented graphically below.

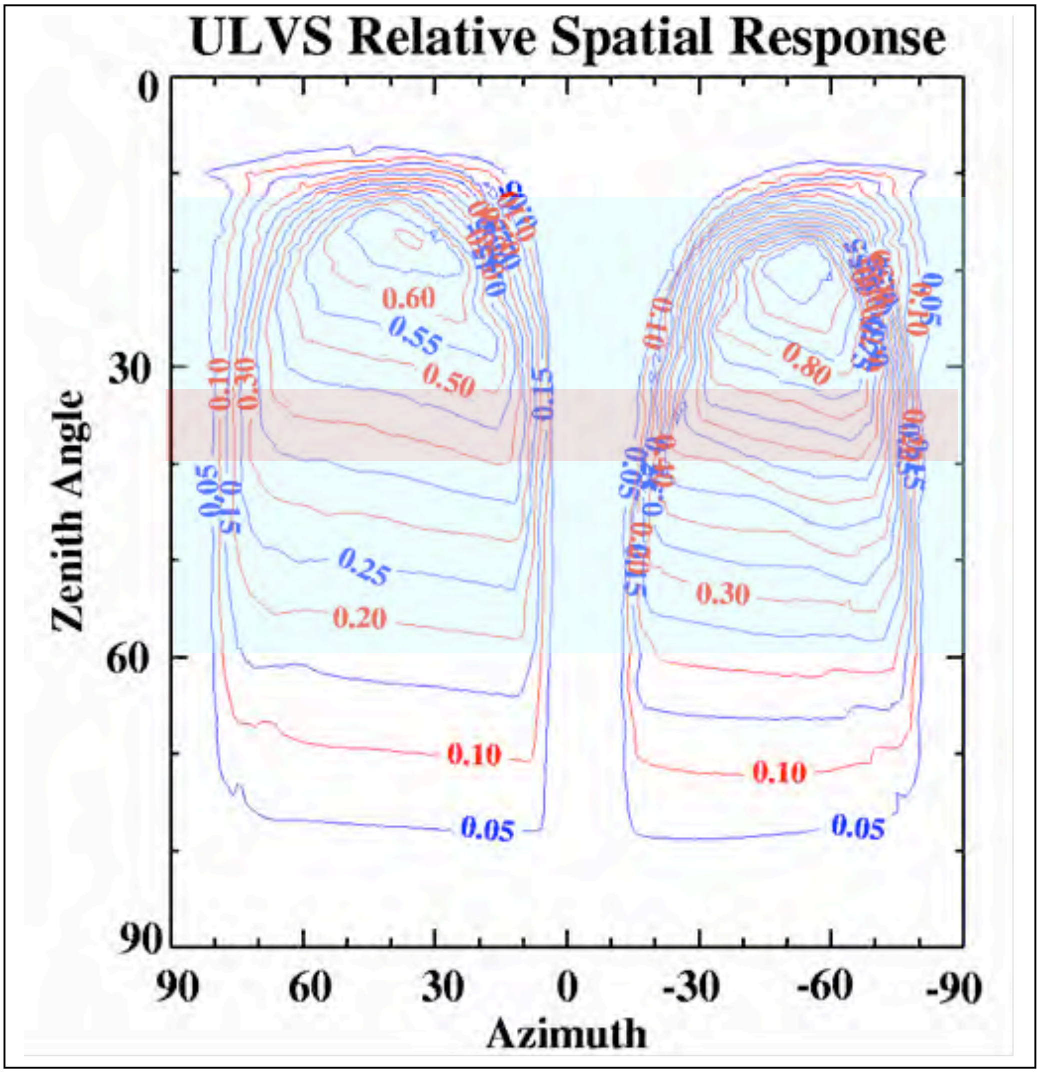


Figure 5.10-13: ULVS relative spatial response, normalized to 1.0 at the peak. The valley near the center of the response is due to the shadow-bar. The red band from 40 to 32 degrees zenith angle show the locus of potential positions for the Sun during the descent for zero probe tilt. Probe tilt can extend this region by ±20°, and cause significant obscuration by the parachute, which nominally extends 5° down from Zenith. The direction of the Sun in this diagram was from left to right at the beginning of the descent (above 124.5 km) and from right to left for the lower part of the descent. Azimuths are defined as CCW + from above.

A word about azimuths, and the Relative Spatial Response plots:

The probe rotated clockwise as viewed from above for most of the descent, which is opposite what was expected. The convention used in the calibration document assigns azimuth angles increasing counter-clockwise when viewed from above, which would result in the Sun progressing in decreasing azimuth angle through the field of view with time. This was true at the beginning of the descent; however after about 550 seconds (i.e. below about 124 km) the probe began to rotate clockwise (from above) and so the Sun's progress increased in DISR azimuth with time for the remainder of the descent.

Furthermore some analyses define the azimuth as increasing in time relative to T0, which is consistent with figure 5.10-13 at all altitudes (i.e. a measurement taken at 60 degrees azimuth would have the Sun on the left side of the plot, and an observation at 300 degrees would have the Sun on the right). Thus this figure presents the instrument's response from the view of the DISR, i.e. when the Sun is on the right side of the plot it is on the 'purge fitting' side of the sensor head. The pink region on the plot shows the variation in SZA during the descent (without probe tip), which began around 40 degrees and ended near 32 degrees at LOS.

Cross Talk...

As a result of the Visible Spectrometers and Imagers sharing the same CCD and fiber optics bundle, having substantially different exposure times, and having no mechanical shutter, there is considerable crosstalk between them. This generally results in contamination by the instruments with the longest exposure times (ULVS & DLVS) by those with the shorter exposure times (Imagers & DLVS). When the spectrometers are reasonably exposed the imagers are overexposed by a factor near 100.

To combat this problem, two additional CCD columns (31 & 49), one on each side of the ULVS were read-out whenever a visible spectrometer measurement was taken. These make up the Visible Extra (DATA/VISIBLE_EXT) datasets. During calibration, crosstalk factors were developed, as described in section 5 ("Cross Talk into the Visible Spectrometer") of the calibration document (Reference 11) which relate the signal in the extra columns to contamination of the spectrometers.

Column 31 lies between the DLVS and the ULVS and column 49 lies between the ULVS and the MRI. Thus the contamination from the MRI into both the ULVS and DLVS is determined using column 49, and contamination from the DLVS into the ULVS is determined using column 31. Contamination of the DLVS by the ULVS is negligible.

Crosstalk factors are presented in Section 5 ("Cross Talk into the Visible Spectrometer") of the calibration document (Reference 11), and are applied on a row by row basis as:

$$dDN_U = f49 * DN_{49} + f31 * DN_{31}$$

where

dDN_U are the additional counts to be subtracted from the ULVS,
f49 & f31 are the Crosstalk factors from the tables, and
DN_{49} & DN_{31} are the counts in the extra columns.

$$dDN_D = f49 * DN_{49}$$

where

dDN_U are the additional counts to be subtracted from the ULVS,
f49 is the Crosstalk factor from the tables, and
DN_{49} is the count in extra column 49.

Separate factors are developed for the DLVS 20,10 & 5 column data, but all are applied on a per-pixel basis (i,e. un-summed). Below is a plot of the crosstalk factors for the DLVS from extra column 49 for the 5 column mode (i.e. 4 columns summed). In the worst case (the column closest to the MRI), about 6% of the number of counts in extra column 49 must be subtracted from the average counts in CCD columns 30-33 (DLVS columns 16-19).

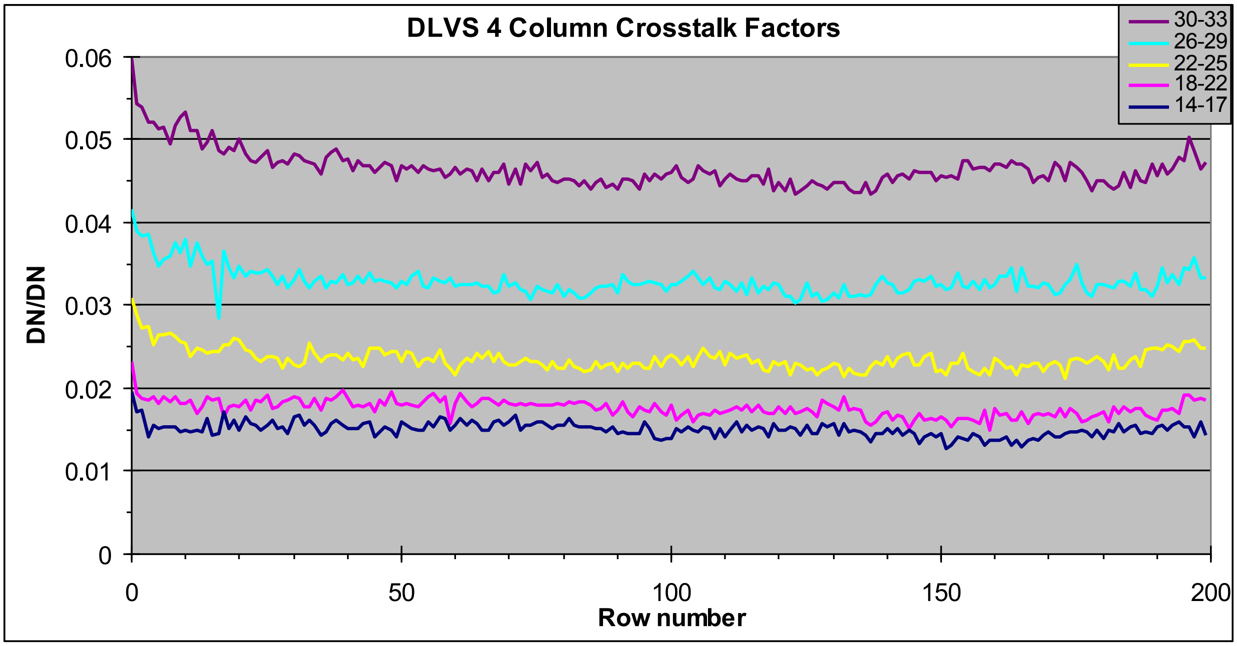


Figure 5.10-14: Crosstalk factors from CCD column 49 to the DLVS columns for the 5 column collection mode.

The crosstalk factors were measured at room temperature, about 295K. They are temperature dependent.

The variation with temperature is caused by motion of the light pattern on the CCD. It is presented below for the ULVS, and should be similar for the DLVS. Factors are defined for the blue (row 199) and red (row 0) ends of the spectrometers and for columns on each side. The factors must then be linearly interpolated to get their values for intermediate pixels. The factors are multiplied to the crosstalk factors to modify them for use at temperatures away from 295ºK.

At the red (row 0) end:

$$Fred\ 0\text{-}3 = 0.98835 - 2.6826\times10^{-3} * Tccd + 9.0812\times10^{-6} * Tccd^2, \quad \text{and}$$
$$Fred\ 4\text{-}7 = 1.2026 + 1.481\times10^{-2} * Tccd - 2.4965\times10^{-5} * Tccd^2.$$

where

Fred 0-3 and Fred 0-4 are the factors for the low (0-3) & high (0-4) columns.
Tccd is the CCD temperature at the time of the observation.

Similarly for the blue (row 200) end of the spectrometers:

$$Fblue\ 0\text{-}3 = 28.387 - 0.34256 * Tccd + 1.4061\times10^{-3} * Tccd^2 - 1.8898\times10^{-6} * Tccd^3, \quad \text{and}$$
$$Fblue\ 4\text{-}7 = 8.897 - 0.10456 * Tccd + 4.4691\times10^{-4} * Tccd^2 - 6.1849\times10^{-7} * Tccd^3.$$

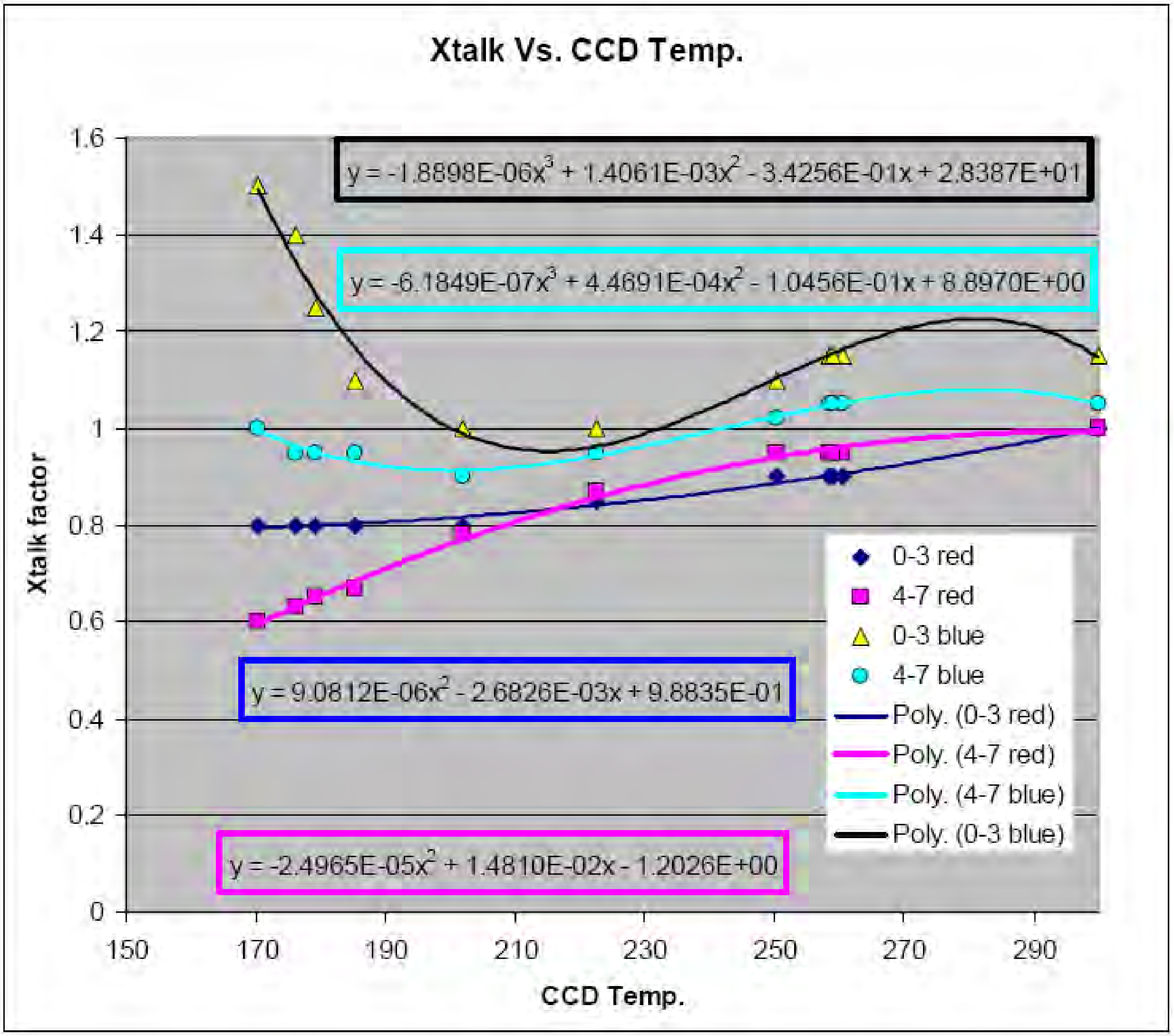


Figure 5.10-15: Temperature dependence of the cross talk factors for the red and blue ends of the spectrometers, and for the left (0-3) and right (4-7) columns.

For the DLVS the crosstalk factors have been further refined in Reference 15 (sect 3.2) as:

$$\text{relative cross talk} = 10.2 / (305-T) - 0.02$$

where T is the measured instrument temperature in Kelvin. This function decreases from unity at T=295 K (room temperature) to 0.06 at T=178 K, indicating that the cross talk is some 16 times less at the coldest temperatures. This factor is multiplied to the cross talk from the calibration report. Since the cross talk in the DLVS is small and only significant in methane bands, the improved correction decreases any uncertainty due to cross talk to insignificant levels.

ULVS Fringes...

A weak 'fringe' pattern exists on the ULVS signal (but not the DLVS). The 'fringes' present an amplitude modulation with wavelength of the ULVS responsivity as show in the plot below. The peak amplitude variation is around ±3%.

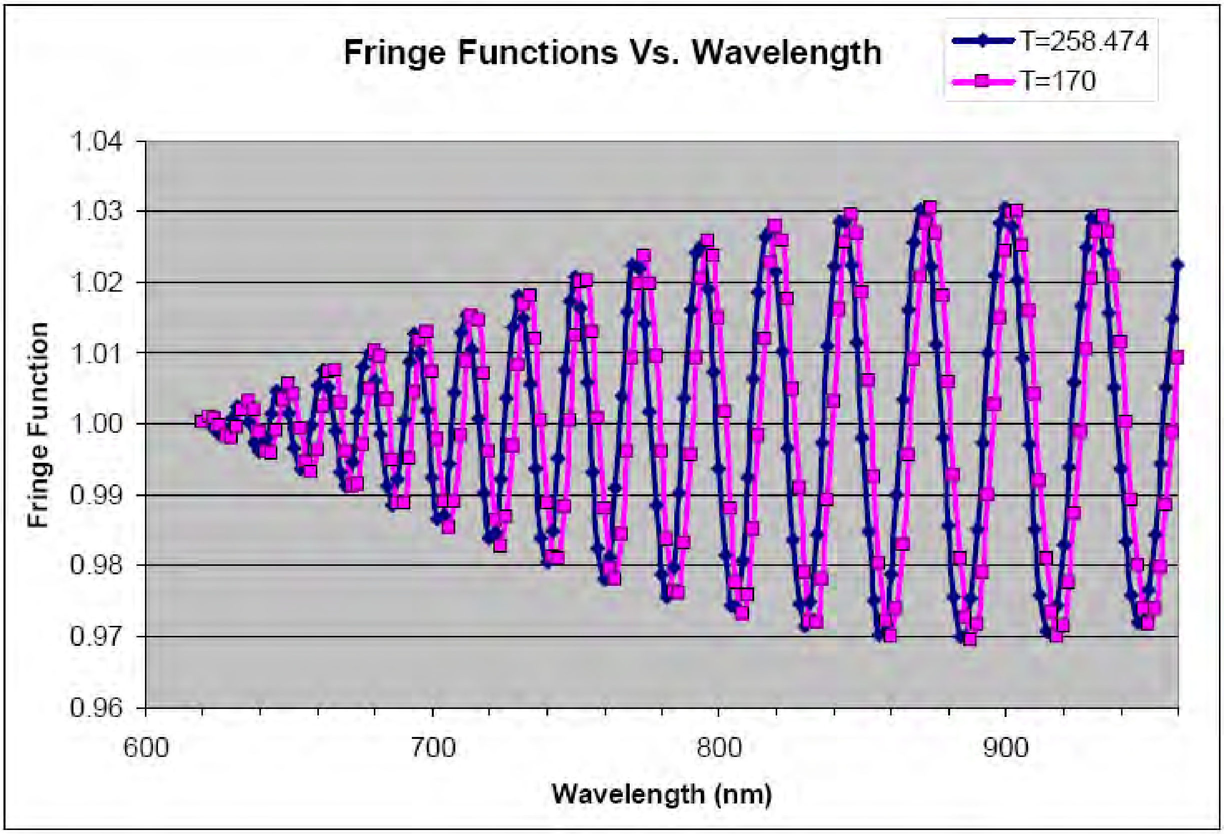


Figure 5.10-16: ULVS fringe function at two temperatures.

The fringe factor corrects the intensity measured by the ULIS:

Corrected Intensity = Measured Intensity / Ff

$$Ff = 1 + (A * \cos(\omega(\lambda-\lambda_0))$$

where:

Ff is the fringe factor at wavelength λ,
A is fringe amplitude given below,
ω is the fringe rate in radians per nm, given below,
λ is the wavelength of the observation in nm, and
λ_0 = 620 nm.

$$\omega = 2\pi / (0.75*p + Tf + 11.0)$$

where

p is the wavelength position:

$$p = 0.34242 - 3.136032\times10^{-4}\,\lambda + 1.05\times10^{-7}\,\lambda^2$$

Tf is the temperature factor = 0.0012 * (258.474 - Tccd) where Tccd is the CCD temperature at the time of the observation.

$A = -6.038085 \times 10^{-4} + 1.2831 \times 10^{-6}\,\lambda - 7.072 \times 10^{-10}\,\lambda^2$

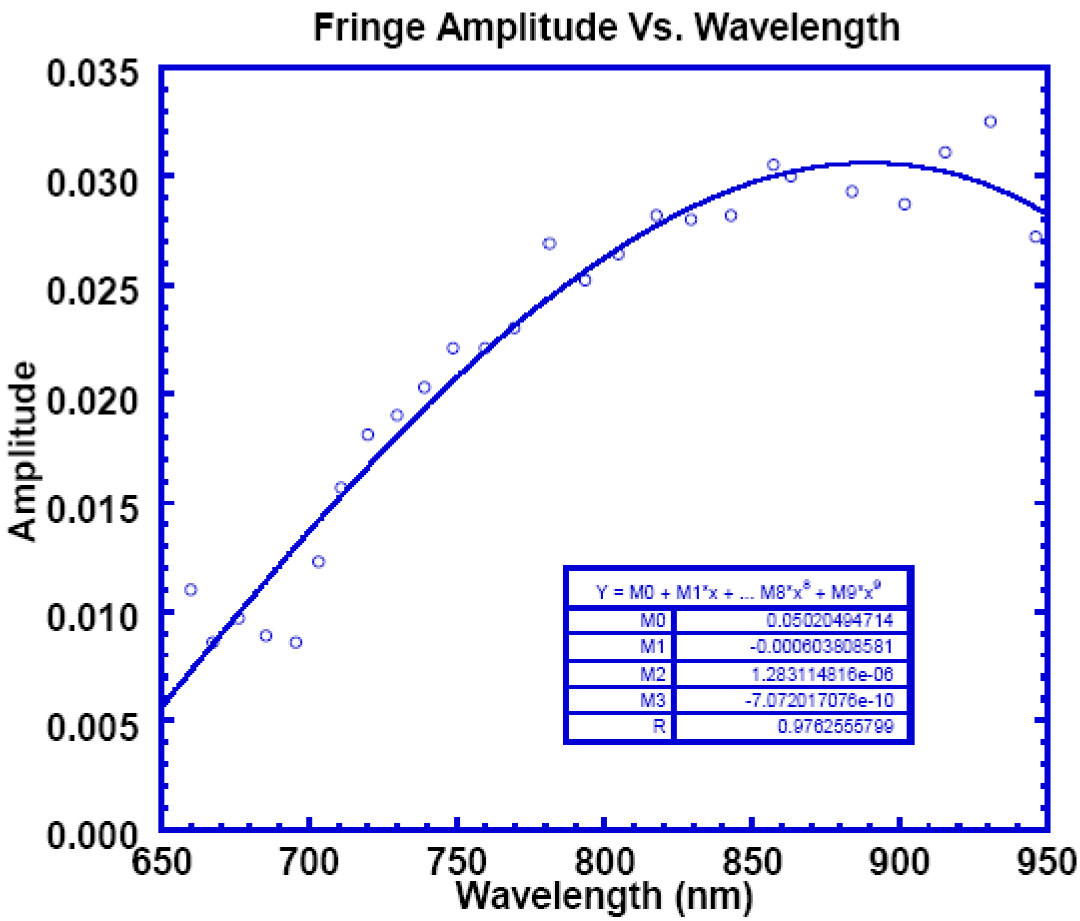


Figure 5.10-17: ULVS fringe amplitude, A as a function of wavelength. This plot shows the derivation of the amplitude function, and local variations from that function (typically a few tenths of a percent).

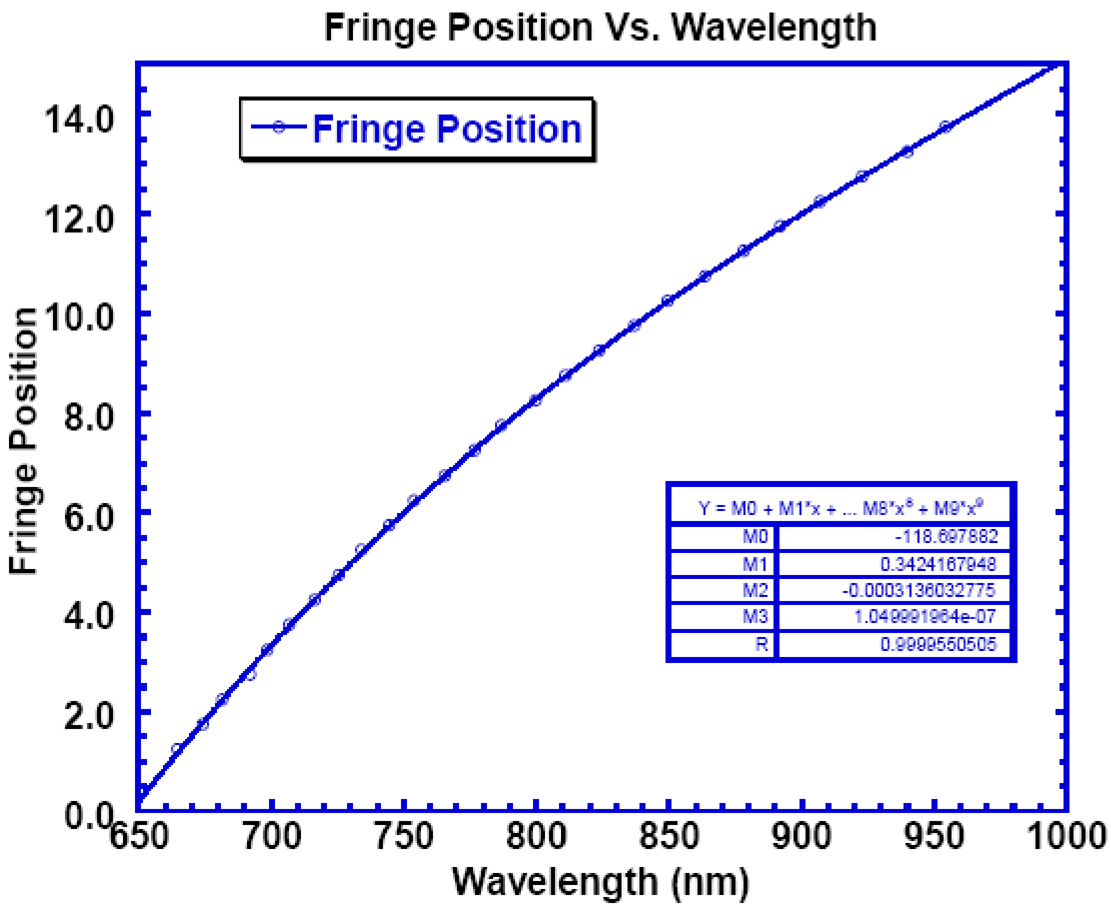


Figure 5.10-18: ULVS fringe position, p as a function of wavelength. This plot shows the derived fringe position function and local variations from that function, which are quite small (typically less than 0.1 nm).

Radiance Determination...

The spectral radiance, I, can be determined for the Visible Spectrometer measurement via the following steps:

1) The net DN/second is determined by subtracting the dark current from the measurement as described in section 5.7, and subtracting the shutter effect as described in section 5.8, then dividing by the exposure time of the measurement. For the DLVS the shutter effect is typically negligible due to the long exposure times.

2) After the net DN/sec are computed for each pixel of interest, the wavelength can be found from the wavelength calibration equations at the appropriate optics temperature as described above.

3) The DN/sec due to crosstalk can be subtracted at the appropriate CCD temperature using the tables given in section 5 ("Cross Talk into the Visible Spectrometer") of the calibration document (Reference 11), as well as the red and blue temperature dependent factors described above. The crosstalk factors are applied using the extra columns associate with the dataset from the archive (hpdisr_0001/DATA/VISIBLE_EXT). These need to be linearly interpolated to the pixel (row) of interest, and subtracted from the DN/sec.

4) The responsivity can be interpolated in the tables 7.1 & 7.2 of Reference 11 for the CCD temperature of interest, and the net DN/sec can be divided by the responsivity at the appropriate CCD temperature for the pixel of interest.

5) Finally, the fringe pattern can be evaluated, and the fringes can be divided out using the amplitude as a function of wavelength, the phase as a function of wavelength, and the phase shift as a function of optics temperature, as described above.

The result is the absolute spectral radiance in watts/sq.m-micron-sr averaged over the field of view of the visible spectrometer.

Cassini Cruise Phase Effects...

As discussed in section 5.6, many of the DISR detector systems exhibited changes in the absolute responsivity during the trip from Earth to Titan. The dark current effects are discussed in section 5.7. The observed changes in the Visible Spectrometer system are small, and may be a combination of yellowing of the fiber optic bundles, and/or movement of the fibers during launch. The observations are presented below.

The overall effect is a drop of about 3% in the ULVS and 2% in the DLVS. Since most of the reduction occurred near launch, it may be that the majority of the change is due to movement of the fiber-optic strands that conduct light from the calibration bulbs to the detector (as seen in the imagers). This would infer that only about 1% of the reduction was an actual change in the spectrometers responsivity.

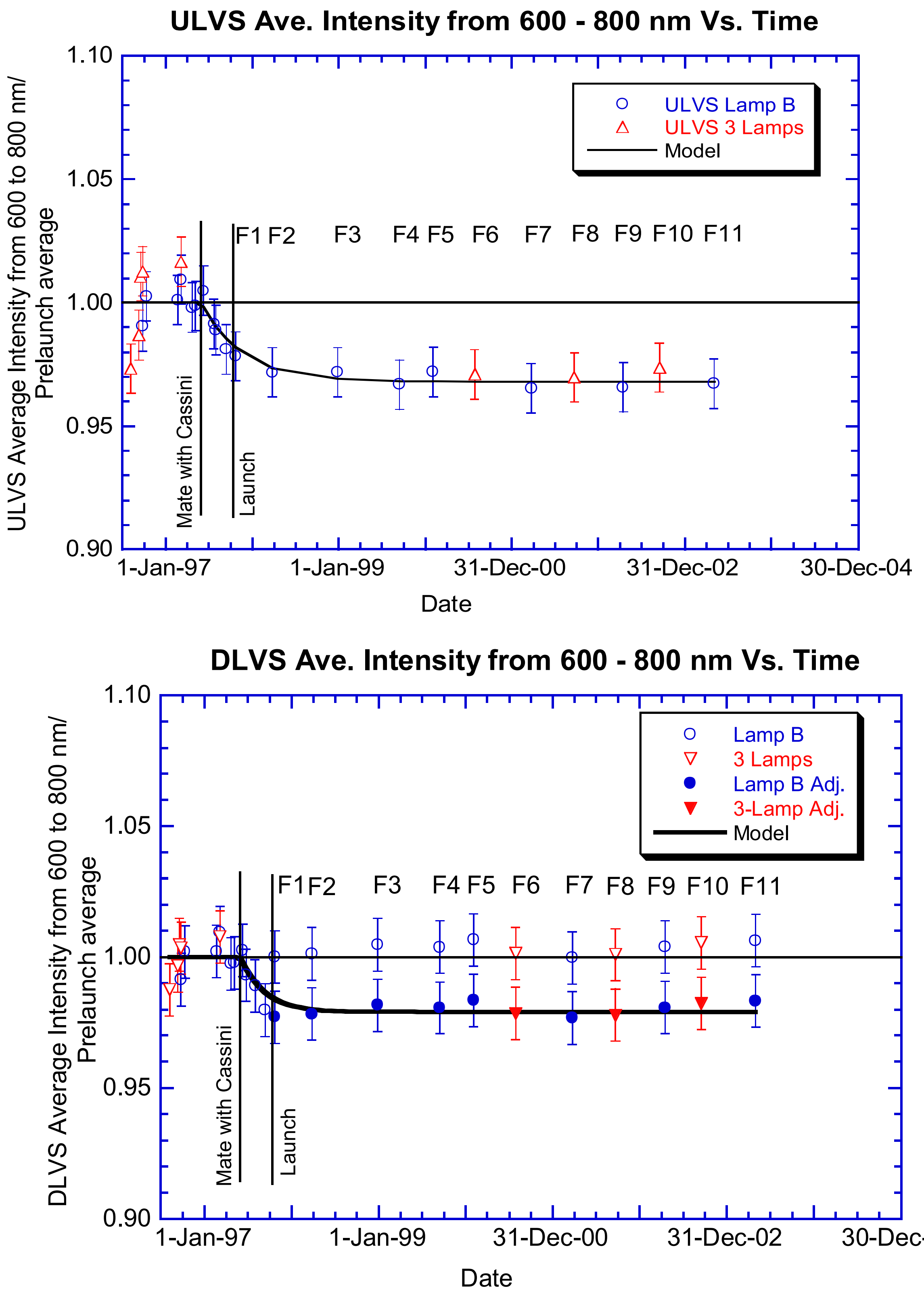


Figure 5.10-19: Normalized change in calibration lamp response for the Visible Spectrometers, Upward Looking on top, Downward Looking on bottom.

5.11 IR Wavelengths Spectra

The IR spectrometer is considerably complex. It is designed to collect exposure-balanced spectra, both upward and downward looking in discrete regions (bins) relative to the Sun. It has an active shutter to allow encompassing dark readings. The upward bins are twice as large as the downward bins, and both are clocked relative to the Sun's position in the sky. The IR calibration document in the archive, "IR_SPECTROMETER_CAL_DOC.pdf" has an informative introduction in section 1 ("General Information"), and I encourage you to read it.

The shutter osculates at something less than 5 Hertz and the spectrometer simultaneously collects upward and downward light readings while the shutter is open and places the values in the proper bins associated with the probes azimuth. The dark readings are also binned. The detector has 150 elements, of which 132 are active for spectral information. The data is digitized into 14 bits, but transmitted as a 16-bit word (i.e. max signal is 65,535 DN, but quantization is only 16,384 levels). The reading is the amount of charge needed to refill the detector well, therefore there is an inversion in the reading, and brighter measurements have lower data numbers (i.e. 0 DN is bright saturated, and 65,535 DN is complete darkness).

The measurement exposure is governed by three numbers: the "Sample Time" is the shutter open time per collection sample and is analogous to the exposure time. The "Collection Time" is the total time data is taken, and is akin to integration time. The "Shutter Time" is the total time the shutter is active per sample (several 'samples' are often taken during one measurement), and is generally about twice the Sample Time (i.e. shutter open plus shutter closed).

The IR spectra come in several modes.

Near the surface the IR exposures were obtained as quickly as possible in order to maximize the spectra of the surface. These spectra were taken in what is called 'Snapshot Mode" where the exposure times are as short as possible (to get reasonable signal to noise), and are not binned, but taken randomly in azimuth (i.e. as soon as possible). Unfortunately since only one telemetry channel was operating, many of the near surface IR spectra were lost. There are, of course several spectra taken with the probe setting on the surface, but they are all of one small area (~8 cm^2) on the surface. A summary of the IR datasets, collected and lost, appears in Appendix 13.

At higher altitudes the IR spectra are generally averaged over one probe revolution, but placed into 'bins' relative to the Sun to acquire azimuthal dependence information. The upward looking spectrometer data is place in 4 bins, and the DLIS data is placed in 8 bins.

During the calibration cycles the IR data are not averaged, but taken as quickly as possible with set exposure times.

In the Spectrophotometric cycles many separate DLIS exposures are taken as quickly as possible while maintaining a good exposure levels to optimize ground coverage.

Appendix 2 summarized the IR data transmitted during the Titan descent.

The following table summarizes the characteristics of the IR data types taken during the Titan descent:

Type of IR	LBL size (KB)	TAB size (KB)	# Data Columns	Regions	Comments
Combo, Binned - ULIS	23	28 to 31	24	4	Typical Data
Combo, Binned - DLIS	23	28 to 31	24	8	Typical Data
Combo, Calibration Cycle	15	6	4	1	Calibration Lamps on and off
Combo, Long (Cal cycle)	14	4	2	1	Long Exposure - Shutter Open only.
Combo, Near Surf.	15	6	4	1	Long Exposure - Short Collection
Combo, NS, no dark.	14	4	2	1	Only shutter open data.
DLIS Spectrophotometric	14	4	2	1	DLIS only, short collection time
Combo, on surface	23	28	24	8	Short Exposure - Long Collection

The first two rows in the table ('Binned' data) are the typical IR spectra taken during most of the descent, especially in the upper atmosphere. The second two rows are the data taken during the (nominally 4, but actually only 3) calibration cycles during the descent. The 'Combo, Near surface" data is the snapshot data taken quickly as the probe approached Titan's surface; it is interspersed with the "Combo, NS, no dark' exposures (darks skipped to speed data taking). During the two Spectrophotometric cycles, only downward looking data was taken, rapidly to get a spectral map of Titan's surface. The values in the last row are the IR datasets taken while the probe was resting on Titan's surface.

The columns of the table help delineate the type of data in the archive. ' LBL size' is the size of the label file in the PDS archive in kilobytes. 'TAB size' is the size of the associated table file in the archive. # Data Columns is the number of columns of data in the table file, and Regions tells the number of azimuthal bins (regions) that the data is broken into.

5.11.1 Binned IR Data Example

Most of the IR spectra taken during the Titan descent were binned into azimuthal regions relative to the Sun.

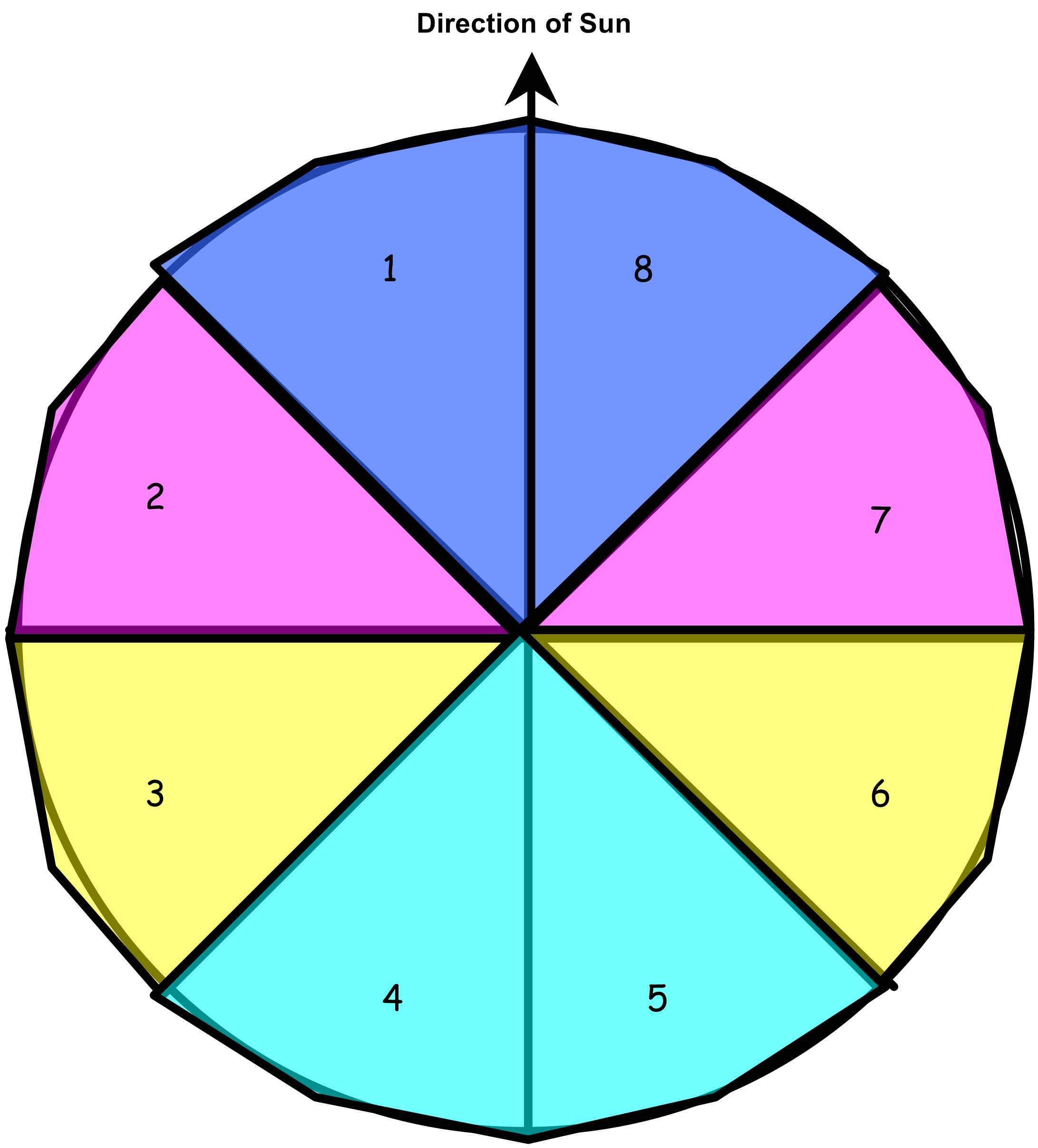


Figure 5.11-1 - Azimuthal regions for binned IR spectrometer measurements. The eight numbers identify the 8 DLIS bins, and the colored regions show the 4 ULIS bins. Note the ULIS bins are not contiguous, but symmetrical relative to the Sun vector.

We will use a dataset taken at about 30 km altitude during the Titan Descent for our example:

Filename:	IR_0048_010745_4377
Mission Time:	4065.4377 seconds
Altitude:	29.60 km (label file), 29.91 km (DTWG 2011)
DLIS bins	8 (#1 through #8)
ULIS bins	4 (#11 through #14)
Cycle Info.:	#45, No-Image
Temperature:	217.7 K (indicated, ~208 K actual)
Detector_ID	"IR_COMBINED"
Lamp State:	0000
Columns:	24
Rows:	150

The table file (IR_0048_010745_4377.LBL) contains 4 tables. The first 150 rows are the Data Table, which contains the measured intensity in DN per sample (inverted as described above, dark 65,000 dn, bright 0 dn). Rows 152 and following contain the 'g' structure described in Appendix 36 and below.

The g structure contains information about the observation's exposure time and azimuthal distribution. It consists of 3 tables, the Regions array (g.regions), the sample Readings array (g.reading), and the Bins array (g.bins).

The Regions array defines, in azimuthal space, where the bins (regions) are relative to the Sun vector. Here is the Regions array for our sample dataset:

region (bin)	Start Az (deg*100)	End AZ (deg*100)	ULIS bin #	DLIS bin #
1	0	4500	11	1
2	4500	7000	12	2
3	9000	13500	13	3
4	13500	18000	14	4
5	18000	22500	14	5
6	22500	27000	13	6
7	29000	31500	12	7
8	31500	36000	11	8

There are eight bins, as shown in the diagram above. The first bin (#1) extends from the Sun 45 degrees CCW as viewed from above, the second from 45° to 90°, etc. The first bin is identified as DLIS bin #1 and so on to DLIS bin #8, The ULIS bins are different as they are not distributed in sequence around the circle, but rather symmetrically about the Sun vector. So the first ULIS bin is designated ULIS bin #11, and corresponds to DLIS bins 1 & 8, therefore extending from -45 degrees to +45 degrees from the Sun vector. ULIS bin #12 is two non-contiguous regions corresponding to DLIS regions 2 & 7 (the pink regions in the above figure), etc.

The next array in the file is the Reading table. It reports, in chronological order, how the data was binned and the corresponding exposure times. The left 6 columns are the Reading table for our sample dataset, and the right 3 columns are to aid explanation.

Rotation	Bin (region)	Start Time (sec * 10,000)	Collection Time (8.064 ms steps)	Shutter Time (8.064 ms steps)	Sample Time (8.064 ms steps)	Lapsed time start to start (s)	Collection Time (s)	Lapsed - collection (steps)
1	3	40654412	342	168	84	2.774	2.758	2.0
1	4	40682152	342	168	84	2.782	2.758	3.0
1	5	40709972	342	168	84	2.774	2.758	2.0
1	6	40737713	342	168	84	4.000	2.758	154.0
1	7	40777710	190	92	46	1.548	1.532	2.0
1	8	40793193	342	168	84	2.782	2.758	3.0
1	1	40821014	342	168	84	2.895	2.758	17.0
1	2	40849964	190	92	46	2.774	1.532	154.0
2	3	40877704	346	170	85	2.798	2.790	1.0
2	4	40905686	346	170	85	2.790	2.790	0.0
2	5	40933588	346	170	85	2.790	2.790	0.0
2	6	40961489	346	170	85	4.040	2.790	155.0
2	7	41001890	190	92	46	1.540	1.532	1.0
2	8	41017292	346	170	85	2.798	2.790	1.0
2	1	41045274	346	170	85	2.943	2.790	19.0
2	2	41074707	190	92	46	2.798	1.532	157.0
3	3	41102689	346	170	85	2.806	2.790	2.0
3	4	41130752	346	170	85	2.814	2.790	3.0
3	5	41158895	346	170	85	2.806	2.790	2.0
3	6	41186958	346	170	85	4.048	2.790	156.0
3	7	41227439	194	94	47	1.573	1.564	1.0
3	8	41243164	346	170	85	2.806	2.790	2.0
3	1	41271227	346	170	85	2.951	2.790	20.0
3	2	41300741	194	94	47		1.564	

The Rotation column reports the spin rotation over which the data was collected. The data is often more that one probe rotation in length. The Bin column shows which azimuth region the data is collected into. The Start Time is the mission time a the start of the collection in seconds times 10,000 (i.e. the first entry is at T0+4065.4412 seconds). The Collection Time is the total spectrometer operation time associated the entry, in 8.064 ms steps (i.e. the spectrometer operated for 342 * 8.064 = 2758 ms during the collection of bin 3 on the first rotation). The Shutter Time is the total number of steps that the shutter was open. For the first entry this was 168 * 8.064 = 1355 ms. The Sample time is the integration time between readings, which is half the sample time, i.e. two readings for each shutter open event. This is a typical data collection scheme called a 1-2-1 where the shutter is closed for one sample period (dark), open for two sample periods (bright), then closed for the final sample (dark). This was obviously done twice during the first collection event to accumulate a Collection Time of 342 steps.

The next three columns elucidate the instruments activity. The Lapsed time is the time between beginnings of data collection from one bin to the next. The next is the total spectrometer operation time during that collection, the difference is the time the instrument spent doing other things between collection events.

The final table in the file is the Bins table, which summarizes the data collected by bin (region), and related it to the Data table columns.

Bin #	0=DLIS, 1=ULIS	0=Open, 1=Closed	Total Shutter open time (sec * 10^4)	# samples	Data Table Column
1	0	0	40965	6	0
2	0	0	22417	6	1
3	0	0	40965	6	2
4	0	0	40965	6	3
5	0	0	40965	6	4
6	0	0	40965	6	5
7	0	0	22417	6	6
8	0	0	40965	6	7
1	0	1	40965	6	8
2	0	1	22417	6	9
3	0	1	40965	6	10
4	0	1	40965	6	11
5	0	1	40965	6	12
6	0	1	40965	6	13
7	0	1	22417	6	14
8	0	1	40965	6	15
11	1	0	81930	12	16
12	1	0	44835	12	17
13	1	0	81930	12	18
14	1	0	81930	12	19
11	1	1	81930	12	20
12	1	1	44835	12	21
13	1	1	81930	12	22
14	1	1	81930	12	23

The information in this table, in conjunction with the data table, can be used to determine the data rate for each bin. The exposure time in seconds per sample is determined by dividing column 3 by column 4 (i.e. 4.0965 seconds / 6 samples for bin #1). Thus the data rate is determined by:

DN/s = (data value closed - data value open) / [Bins(3,i) / Bins(4,i)]

For example, the first pixel of DLVS, bin 1 has a data value open of 52,230 DN/sample (from Data table column 0) & and a data value closed of 52,241 (from column 8), so;

Rate = (52,241 - 52,230) / (4.0965 / 6) = 16.1 DN/s

This is unusually low because this is not an active pixel (i.e. pixels 7 thru 142).

To extend our example let us consider the first 20 active pixels of bins 1, 8 and 11 to determine the net flux over this region. The data is presented in the table below:

Pixel	Row	Bin 1 - DLIS shutter open	Bin 1 - DLIS shutter closed	Bin 8 - DLIS shutter open	Bin 8 - DLIS shutter closed	Bin 11 - ULIS shutter open	Bin 11 - ULIS shutter closed	Bin 1 - DN/s	Bin 8 - DN/s	Bin 11 DN/s
7	8	48918	51264	48868	51258	55190	55738	3436.1	3500.5	802.6
8	9	35460	36932	35370	36830	55083	55898	2156.0	2138.4	1193.7
9	10	46487	47621	46446	47606	54602	55479	1660.9	1699.0	1284.5
10	11	50686	51544	50658	51538	54667	55520	1256.7	1288.9	1249.4
11	12	49814	50338	49786	50328	54459	55252	767.5	793.8	1161.5
12	13	51104	51456	51092	51449	55201	55925	515.6	522.9	1060.4
13	14	50972	51284	50956	51279	55078	55738	457.0	473.1	966.7
14	15	51266	51500	51256	51495	55155	55766	342.7	350.1	894.9
15	16	51366	51544	51361	51538	55002	55487	260.7	259.2	710.4
16	17	51122	51432	51109	51427	52724	53056	454.0	465.8	486.3
17	18	50698	51502	50672	51502	55210	55717	1177.6	1215.7	742.6
18	19	49162	51238	49109	51223	54911	55900	3040.6	3096.3	1448.6
19	20	46534	51434	46437	51424	53987	55618	7176.9	7304.3	2388.9
20	21	41214	50034	41044	50024	53271	55650	12918.3	13152.7	3484.4
21	22	38322	51044	38101	51039	52770	55772	18633.5	18949.8	4396.9
22	23	38310	51536	38080	51532	52339	55807	19371.7	19702.7	5079.5
23	24	40982	51387	40796	51382	52145	55839	15239.8	15504.9	5410.5
24	25	45200	51411	45076	51409	52394	55972	9097.0	9275.7	5240.6
25	26	48252	51362	48178	51358	52547	55746	4555.1	4657.6	4685.5
26	27	50107	51372	50070	51370	52827	55425	1852.8	1904.1	3805.2

The first thing to note is that in general pixels numbers start at zero (0 to 149), while the PDS Data table starts at 1 (1 to 150), so when using the DISR calibration equations it is necessary to make this adjustment.

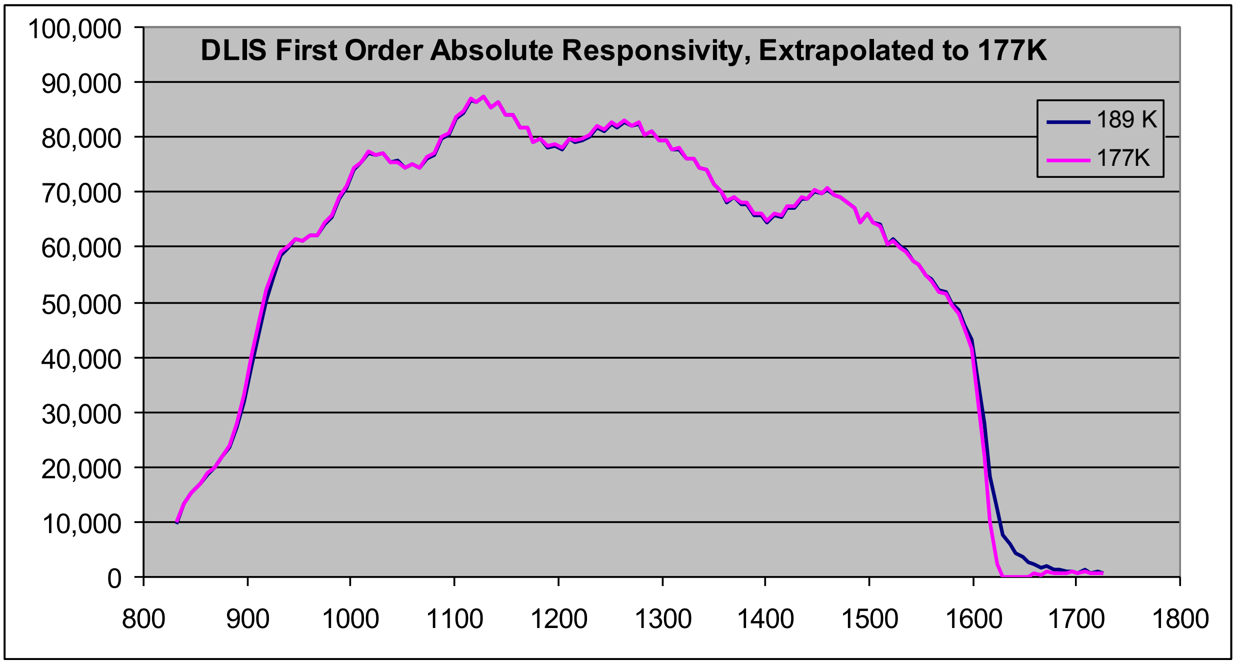
Columns 3 through 8 in the above table are directly from the Data table in the PDS file (IR_0048_010745_4377.TAB). The Data Table column numbers are as identified in the Bins Array for Bins 1 & 11 (columns 0, 8, 7, 15, 16 & 20). The values for DN/s are calculated as described above, also using the information from the Bins Array.

DN/s = (data value closed - data value open) / [Bins(3,i) / Bins(4,i)]

Even though the DN rate for the ULIS is sometimes lower than that of the DLIS, its responsivity is also considerably lower so the observed brightness is higher.

Absolute Responsivity...

To calculate radiance we apply the absolute responsivity as described in section 4.1 ("Response of the DLIS") of Reference 14, the IR spectrometer calibration document in the PDS archive. The Absolute Responsivity must be interpolated (or in this case extrapolated) to the temperature of the observation. Below are graphs of the DLIS and ULIS Absolute Responsivity [in (DN/s) per {Watts/(m^2-u-sr)}] at the lowest lab temperature (189°K) and our observation, 177°K.



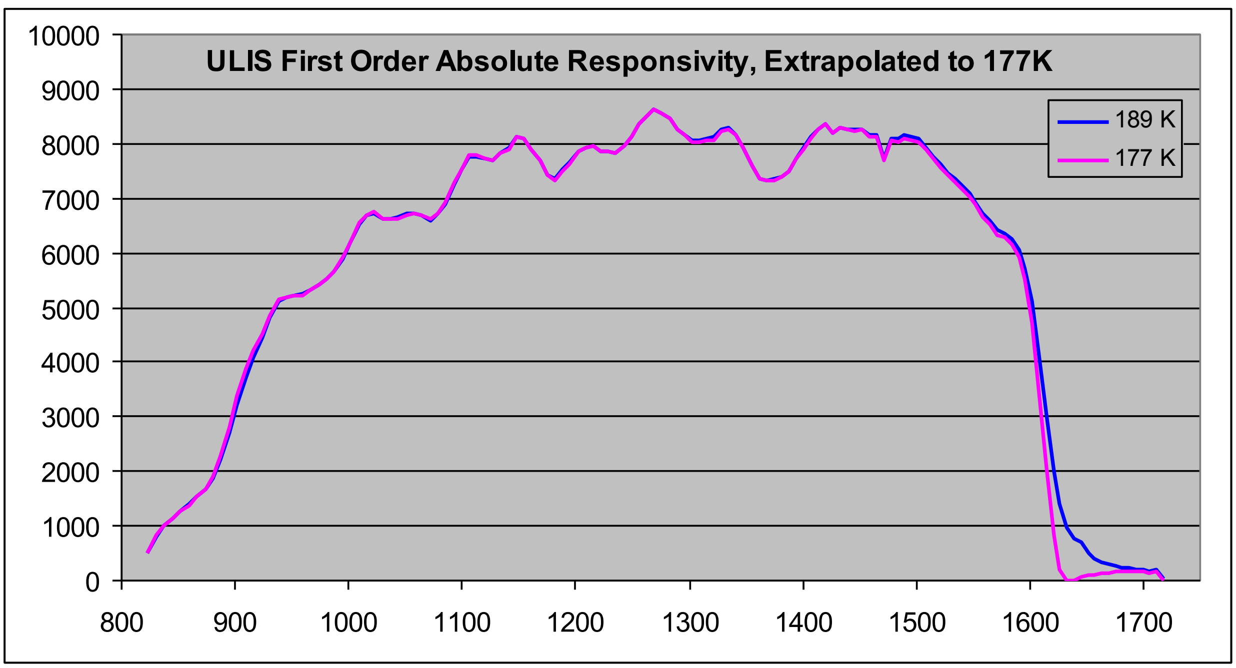


Figure 5.11-2: Absolute Responsivity for IR spectrometers in [DN/s] / [W/(m2-u-sr)] vs. Wavelength (in nm). The blue plot is the coldest measured lab data (189K), and the red line is an extrapolation to our temperature of interest.

Note that the responsivities drop considerably on each end of the wavelength scale, and it is difficult to make meaningful observations outside the range from 840 to 1600 nm. This is just the responsivity to first order light. The IR spectrometers are also responsive to second order light from visible wavelengths. This effect becomes important for measurement above 1400 nm, and must be taken into effect using information from the DISR's visible spectrometers.

In order to apply the absolute responsivities we must know the wavelength for each pixel, which is a function of temperature as described in section 2 ("Wavelength calibration") of Reference 14 as:

$$\text{DLIS wavelength (nm)} = a + b*N + c*N^2$$

Where N is the number of the detector element (pixel) and the count begins with 0 and ends with 149. The values of a, b, and c depend on the temperature of the optics, with

$$a = 784.04 – 0.023725*T + 4.569\text{x}10\text{-}5*T^2,$$
$$b = 7.1568 + 0.0014118*T – 2.8753\text{x}10\text{-}6*T^2,$$
$$c = -0.0030065 -1.4648\text{x}10\text{-}5*T +3.0378\text{x}10\text{-}8*T^2$$

where T is the optics temperature.

The wavelength scale for the ULIS portion of the IR spectrometer is given by

$$\text{ULIS wavelength (nm)} = d + e*N + f*N^2$$

Where N is the detector element and the count begins with 0 and ends with 149. The values of d, e, and f depend on the temperature of the optics, with

d = 766.39 + 0.025199*T,
e = 7.5138 – 8.1082x10-4 * T,
f = -0.0059698 + 5.5991x10-6*T.

Again, T is the temperature of the optics.

In our case the optics temperature can be interpolated from the tables in Appendix 38 as 176.9°K.

An alternate (and more recent) method of determining the DLIS wavelength calibration is presented by Erich Karkoschka in Section 3.5 of Reference 15 as:

$$\text{DLIS wavelength (nm)} = 784.62 + 7.1082N - 0.001086N^2 - 0.000018N^3$$

where N is the pixel index (i.e. 0-149) ranging from 6 to 143 on the light sensitive part of the DLIS. This calibration accounts for changes in the index of refraction of the air during the Titan descent.

In order to calculate the net flux we need to adopt a common wavelength scale. Here we adopt the ULIS scale, and interpolate the DLIS data to that scale.

Wavelength (nm)	ULIS Bin 11 DN/s	Average DLIS Bins 1 & 8, DN/s	ULIS AbsResp	DLIS AbsResp	ULIS 1st Order	DLIS 1st Order	Net Flux
822.2	802.6	805.7	515.3	5338.3	1.56	0.151	1.105
829.5	1193.7	2274.0	822.7	8793.2	1.45	0.259	0.936
836.8	1284.5	2644.8	1014.4	12248.1	1.27	0.216	0.825
844.1	1249.4	1853.7	1132.2	14777.1	1.10	0.125	0.768
851.3	1161.5	1422.3	1277.4	16465.8	0.91	0.086	0.646
858.6	1060.4	959.1	1386.9	18255.3	0.76	0.053	0.559
865.8	966.7	612.8	1531.7	19622.0	0.63	0.031	0.471
873.1	894.9	484.2	1678.7	21337.8	0.53	0.023	0.401
880.3	710.4	387.8	1911.0	23249.9	0.37	0.017	0.279
887.5	486.3	289.8	2257.6	26661.1	0.22	0.011	0.161
894.7	742.6	391.8	2817.4	31586.7	0.26	0.012	0.197
901.9	1448.6	948.8	3373.7	38103.9	0.43	0.025	0.318
909.1	2388.9	2446.3	3868.1	44461.5	0.62	0.055	0.442
916.3	3484.4	5870.5	4203.4	50397.5	0.83	0.116	0.560
923.4	4396.9	11155.1	4520.0	54613.4	0.97	0.204	0.604
930.6	5079.5	16945.7	4864.6	58141.2	1.04	0.291	0.591
937.7	5410.5	19300.9	5147.6	59955.5	1.05	0.322	0.573
944.9	5240.6	16677.3	5189.9	61194.3	1.01	0.273	0.579
952.0	4685.5	11102.5	5203.3	61273.5	0.90	0.181	0.565
959.1	3805.2	6009.1	5218.8	61863.7	0.73	0.097	0.496

Table: IR spectrometer measurement at ~30 km altitude at the wavelength of the ULIS, pixels 7 thru 26, and corresponding in azimuth to ULIS bin 11. Absolute Responsivities are in [DN/s] per [W/(m2-u-sr)] and are extrapolated from the laboratory data to the observation temperature of 117° K. First order radiance in W/(m2-u-sr), and net flux over π/4 radian slice (bin 11) in W/(m2-u).

The following plots present the spectral radiance and Net Flux over the useful range of the DISR IR spectrometers for the example dataset (@30 km altitude) with the second order effects included. The radiance are the azimuthal average. The flux is presented per ULIS bin as shown.

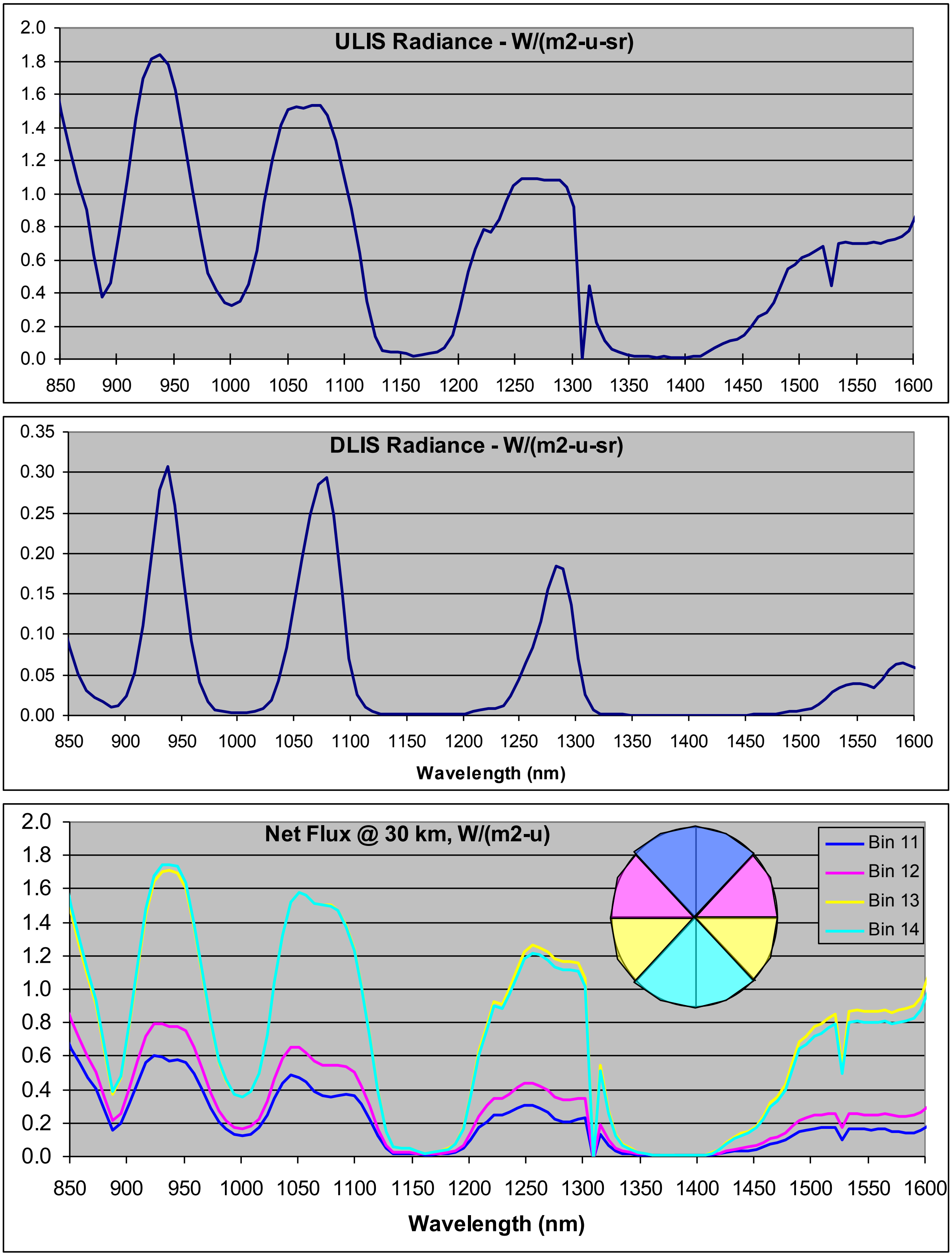


Figure 5.11-3: Up & down radiance spectra and net flux for our 30 km altitude example.

5.11.2 DLIS Near-Surface Example

The following example shows the reduction of the Downward Looking Infra-red Spectrometer (DLIS) data from 1100 meters to the surface. The spectra transmitted during this period are summarized in the following table.

Table 5.11.2 -1: Table of near-surface DLIS spectra including sequence #, epoch, altitude, cycle #, # of rows, type, lamp state, exposure time, collection time and temperature.

Archive Filename	IR	Time	Alt.	Cycle	Rows	Type	Lamp	Exp.	Collect	Temp.
	#	sec	m	#				ms	s	K
IR_0186_022334_6904	186	8614.7	1173	79	4	Comb	0000	1991.8	8.02	189.9
IR_0188_022424_4648	188	8664.5	940	81	4	Comb	0000	1991.8	8.02	189.9
IR_0190_022512_4610	190	8712.5	717	83	4	Comb	0000	1991.8	8.02	189.8
IR_0192_022602_8175	192	8762.8	485	85	4	Comb	0001	1991.8	8.02	189.7
IR_0194_022705_1821	194	8825.2	203	91	2	Comb	0001	999.9	1.02	189.6
IR_0196_022712_0214	196	8832.0	171	93	2	Comb	0001	999.9	1.02	189.6
IR_0199_022725_0398	199	8845.0	112	96	2	Comb	0001	999.9	1.02	189.6
IR_0202_022730_1726	202	8850.2	89	99	2	Comb	0001	999.9	1.02	189.6
IR_0204_022733_5947	204	8853.6	73	101	2	Comb	0001	999.9	1.02	189.5
IR_0206_022737_0187	206	8857.0	58	103	2	Comb	0001	999.9	1.02	189.5
IR_0208_022740_4448	208	8860.4	43	105	2	Comb	0001	999.9	1.02	189.5
IR_0210_022743_8699	210	8863.9	27	107	2	Comb	0001	999.9	1.02	189.5
IR_0213_022749_0091	213	8869.0	3	110	2	Comb	0001	999.9	1.02	189.5

Archive Filename is the name of the file as it exists in the archive's DATA directory (without the .TAB)
IR # is the sequence number of the IR dataset (which is also part of the archive file name),
Time is the mission time of the observation in seconds after T0
Cycle is the Descent Cycle number containing the observation
Rows is the number of rows of data in the dataset
Type is the IR observation type.
Lamp is the lamp condition, 0=off, 1=on for Cal A, B, C, & Surface Science Lamp.
Exp. is the exposure time in milliseconds
Collect is the collection time in seconds over which the observation is averaged.
Temp is the IR detector temperature in degrees Kelvin

Sadly the data taken at 3 meters and 42 meters above the surface did not have the shutter open (dark current exposures). The design was to have one dark current exposure every five measurements, however since many of the spectra near the surface were routed to the lost telemetry channel, 2 of the last 3 surviving exposures were darks.

Appendix 9 is a tabular summary of the raw data from 1173 meters through 486 meters. This data was taken in 4 column format which include columns of 1) DLIS shutter open, 2) DLIS shutter closed, 3) ULIS shutter open & 4) ULIS shutter closed data by wavelength, although only the first two columns (the DLIS data) are shown in the table for each altitude. Since photons remove charge from the device intensity increases with lower data numbers in the raw data (see figure below).

Appendix 10 presents the DLIS raw data transmitted below 250 m, which is in 2 column format where only ULIS and DLIS shutter open data is captured, except that for every 5th measurement, the shutter is inhibited (so a dark measurement is taken instead). The detector array's dark current can be determined by interpolating the shutter closed exposures in time (if the dark current is changing significantly), or averaging shutter closed exposures that are at similar temperatures in order to reduce noise effects.

Below is a plot of the DLIS raw data taken at 1173 m above Titan's surface:

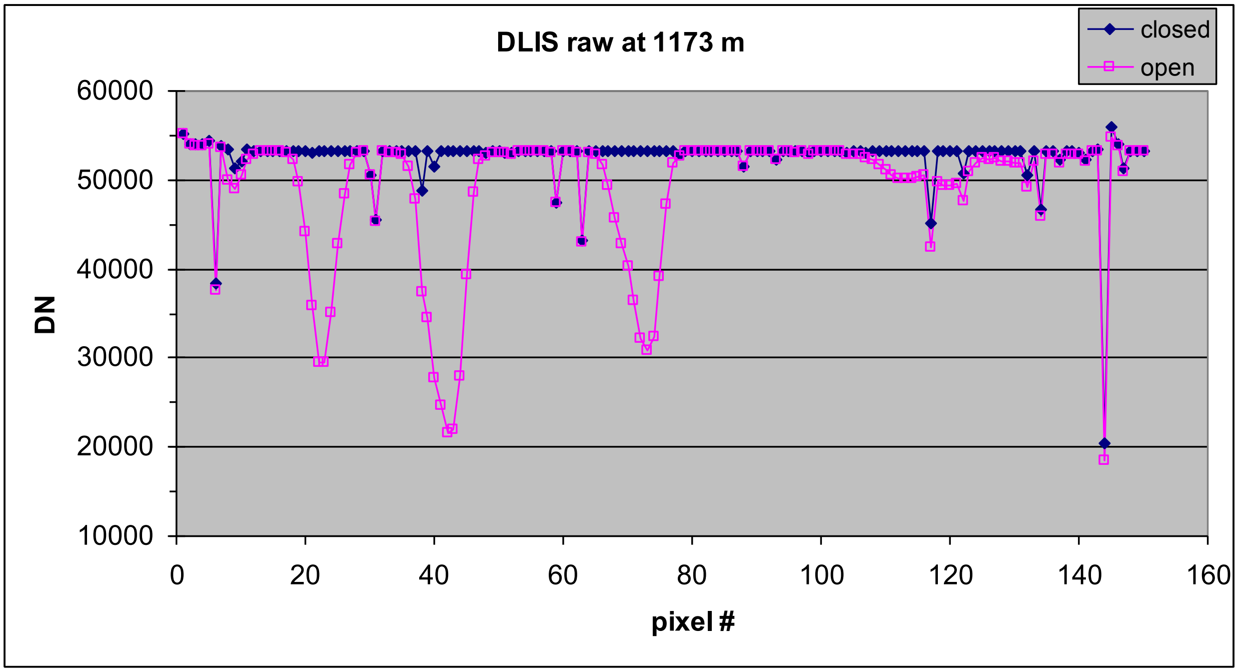


Figure 5.11-4: Raw DLIS data taken near Titan's surface

By subtracting the shutter open data from the shutter closed data, and dividing by the sample (exposure) time we obtain the measured IR signal in DN/second. This is done for the DLIS measurements below 1200 m (Appendices 9 & 10) and plotted below.

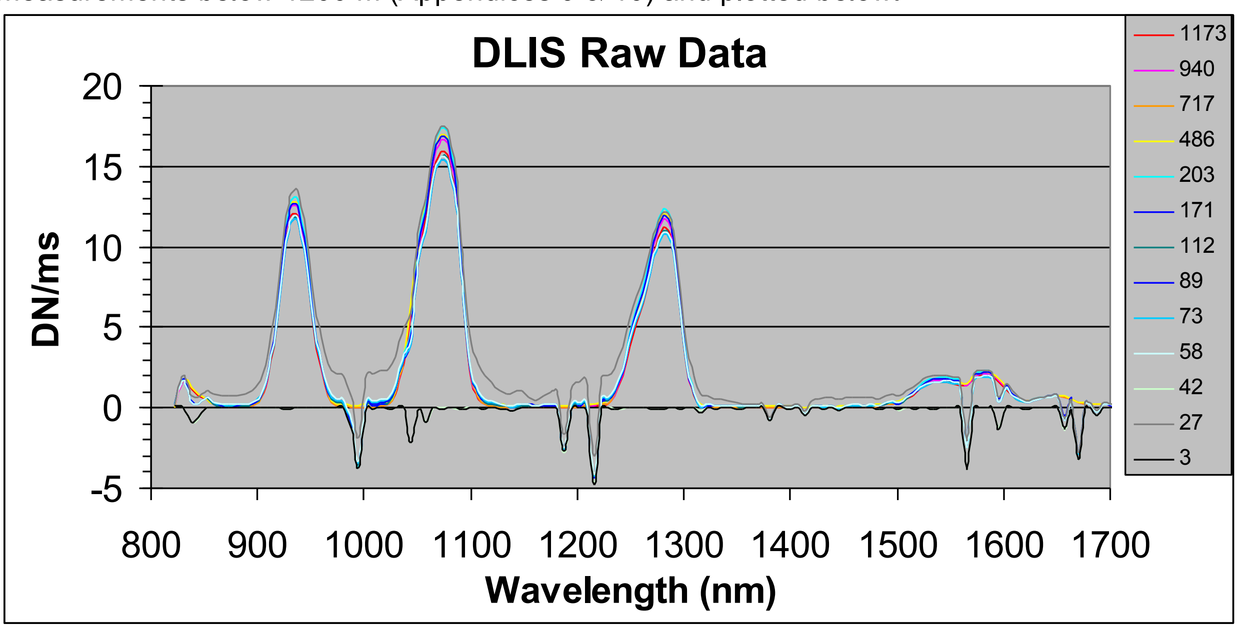


Figure 5.11-5: Raw DLIS data, dark subtracted.

Notice that in some areas the signal goes below zero, and there is considerable noise. This is due to radiation damaged pixels in the array. These can be removed by interpolation. The following plot shows the spectrum with these pixels filtered out.

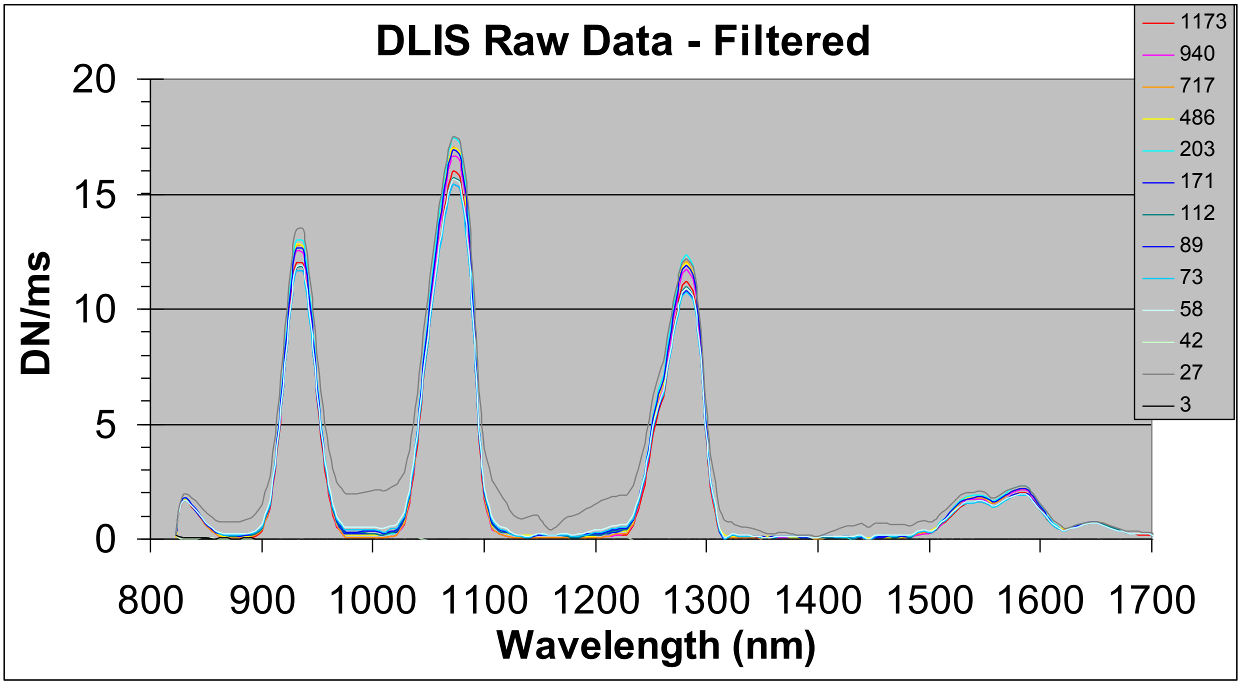


Figure 5.11-6. Raw DLIS data, dark subtracted and with the bad pixel filtered out.

Table 5.11.2 -2: listing of the bad pixels that were removed in the previous plot.

Wavelengths of 'Hot' pixels which were removed (nm).		
815	1188	1657
837	1215	1669
844	1381	1687
988	1413	1711
995	1565	1730
1044	1596	1735
1058	1602	1747

Careful examination of the preceding plot shows that the variation in spectral radiance is different within the methane windows (where the signal is strong) vs. between the methane windows (where the solar energy is absorbed by the atmosphere).

The plot below shows the variation in signal at four of the methane window wavelengths. As the probe approaches Titan's surface (from the right), the signal is fairly constant, perhaps increasing slowly, however at about 200 meters above the surface the signal decreases rapidly, down to around 50 meters, below which it begins to increase rapidly. These variations are open for speculation, but almost certainly the ratio of light from the Sun vs. Surface Science Lamp (SSL), which is on below 600 m, comes into play.

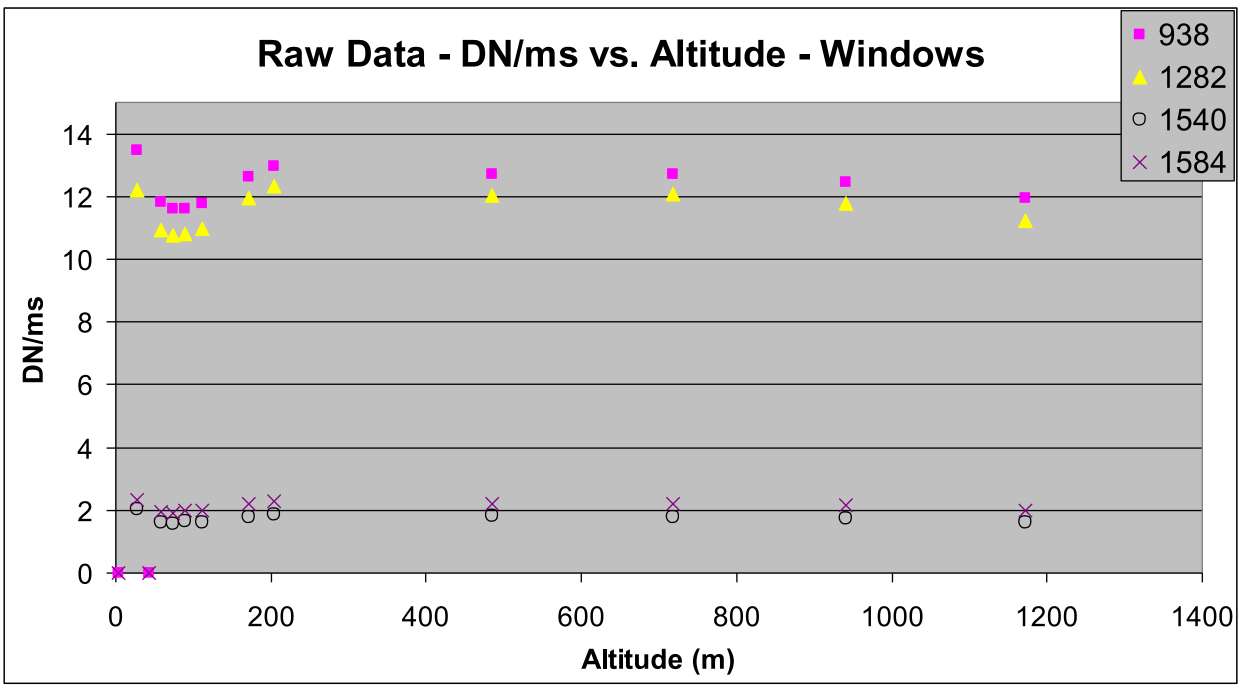


Figure 5.11-7: Raw DLIS data plotted in the methane windows vs. altitude

The situation in the methane absorption bands, where the SSL has less competition from the Sun, is somewhat different. The plot below shows the signal at 4 absorption band frequencies. As the probe descends, the surroundings are consistently dark at these wavelengths, until the SSL comes on (at 600 m). At this epoch the intensity increases and the spectrum shifts, as the increase at 1002 nm is proportional more than at the other wavelengths. The signal remains fairly constant down to around 100 m, at which time the intensity increases and the spectrum continues to spread.

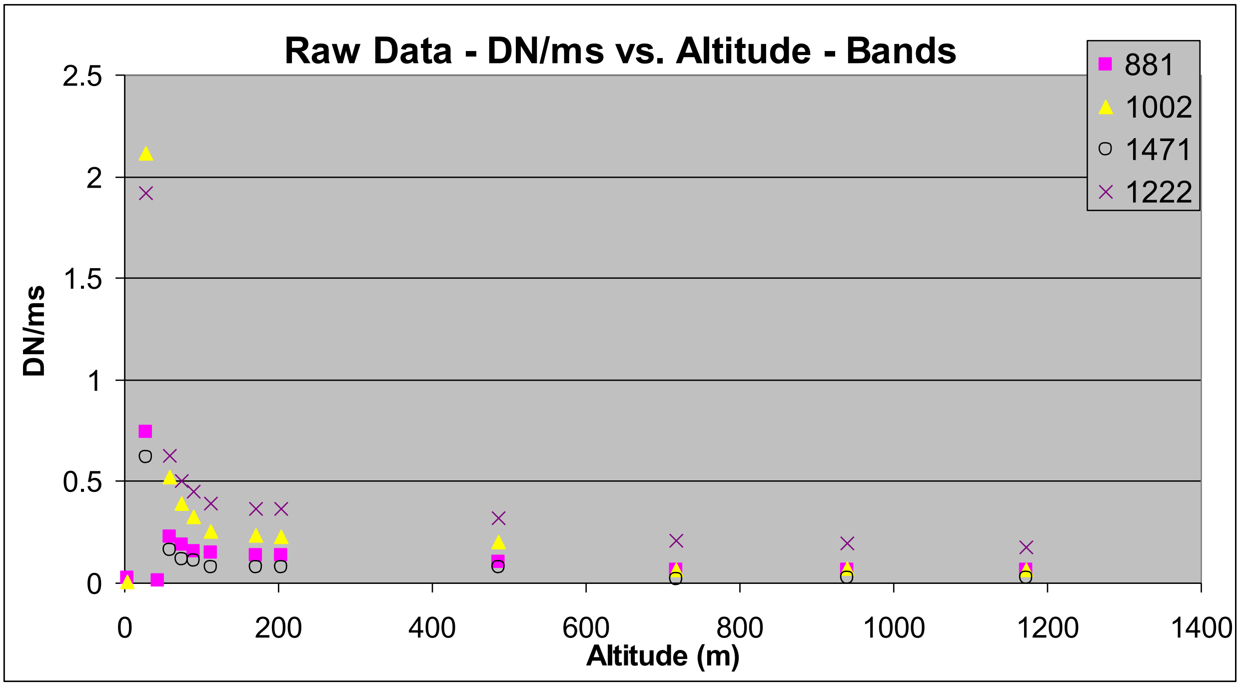


Figure 5.11-8: Raw DLIS data from the methane absorption bands plotted vs. altitude.

Caveats in working with IR spectrometer data...

There are at least two significant problems to be aware of when working with the IR spectrometer data. The first is that the spin rates and azimuthal direction were almost never what the in-flight software though it was during data-taking. Therefore, the data is not binned correctly and it is up to the user to create a model that re-apportions the data into the proper bins. This can be done by comparing the offset in azimuth between what the software predicted (i.e. pointing at the Sun at the beginning of observation for bin 1), and the actual azimuth at that epoch (from Appendix 5). And, by determining the error in spin rate from the Readings table in the data file vs. the actual spin rate calculated again from Appendix 5. Obviously not an exercise for the faint of heart. In at least one case (the data at 100.2 km) some of the bright (shutter open) data is in the dark (shutter closed) bin.

The second difficulty is that the IR system experienced difficulty with the Titan impact, and there is a significant offset introduced there. Perhaps movement of the optics or fibers. This is only a concern for analysis of the data taken on Titans surface of course.

The following plot is provided to give the reader a feeling for the scatter of the data. It is the average count rate (in DN/ms) for each bin collected during the Titan encounter. The calibration cycle, lamp-on data is removed. It shows the expected declining trend with time, but few bins with the Sun squarely in the FOV. Changes at the impact event (~8870 seconds) are apparent, but confusing. The probe is obviously not spinning during this period, but the data is not as stable as one might expect.

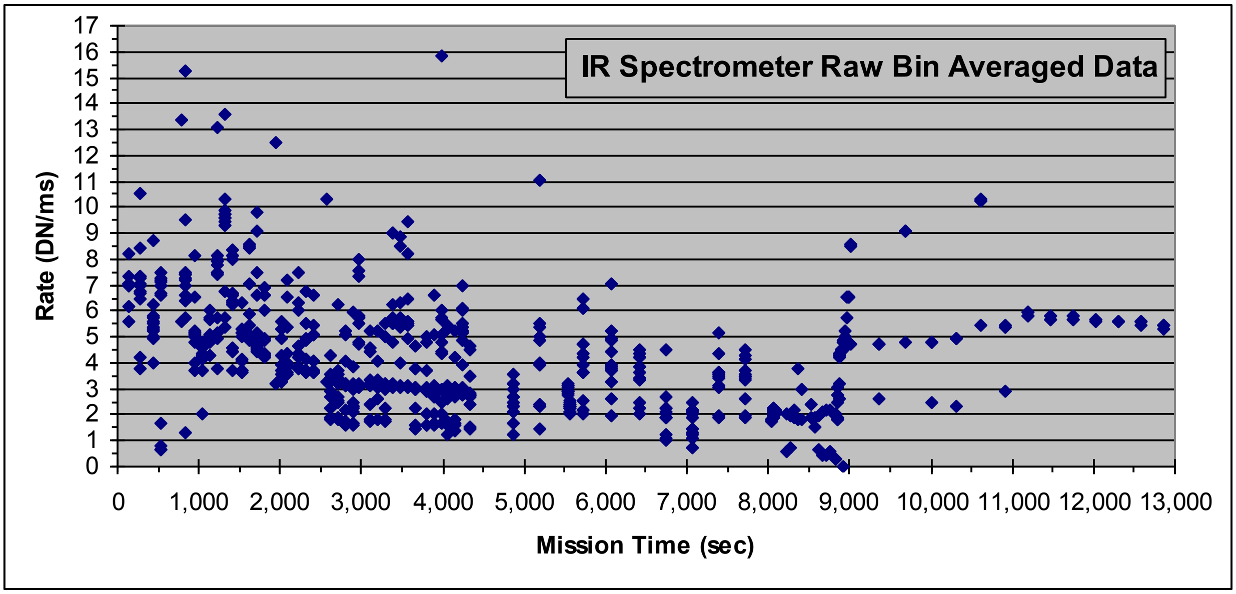
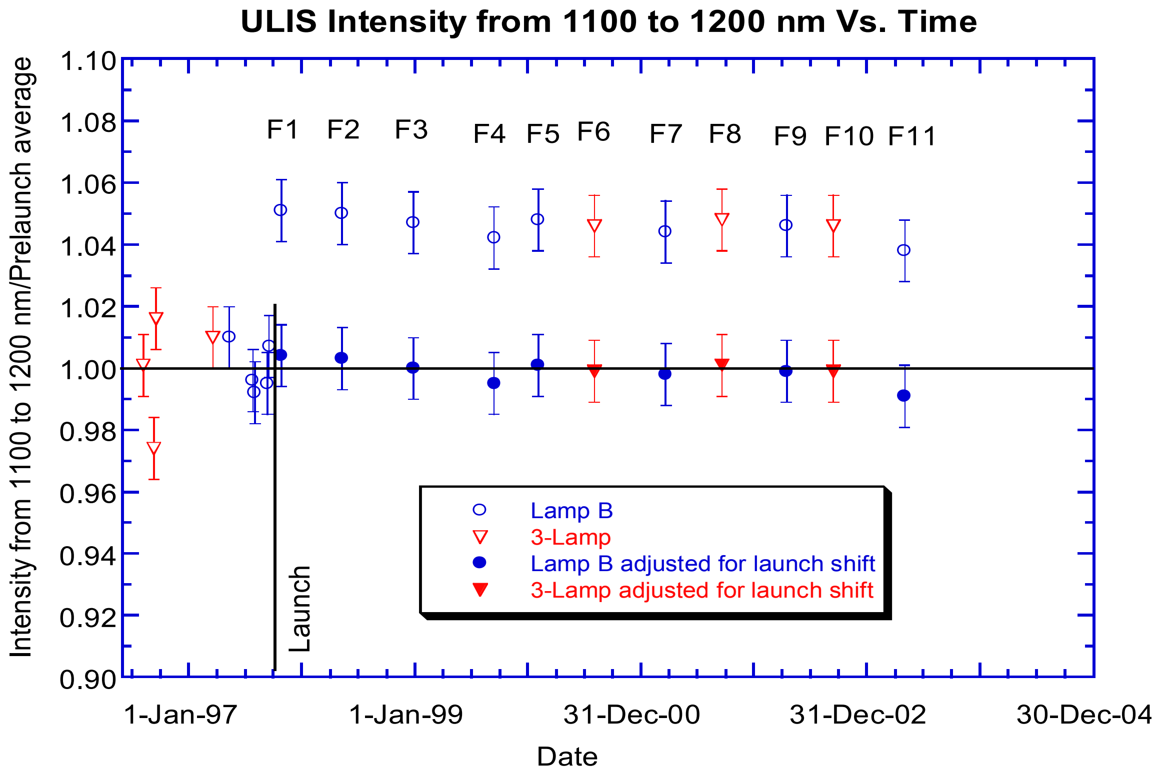


Figure 5.11-9: The average count rate for each IR spectra bin during the Titan encounter. Impact transients are apparent at ~8870 seconds. The calibration lamp-on data is well off this chart.

Cassini Cruise Phase Effects...

As discussed in section 5.6, many of the DISR detector systems exhibited changes in the absolute responsivity during the trip from Earth to Titan. The observed changes in the IR spectrometer system are small, and may be a combination of yellowing of the fiber optic bundles, and/or movement of the fibers during launch. The observations are presented below.

The changes in the IR system are small, generally less than 1%. There was some shift at launch, about 5% for the ULIS lamp B data, less for the rest. Overall the darkening of the fiber-optic bundles appears to be around 1% in the near IR from the lab calibration data.



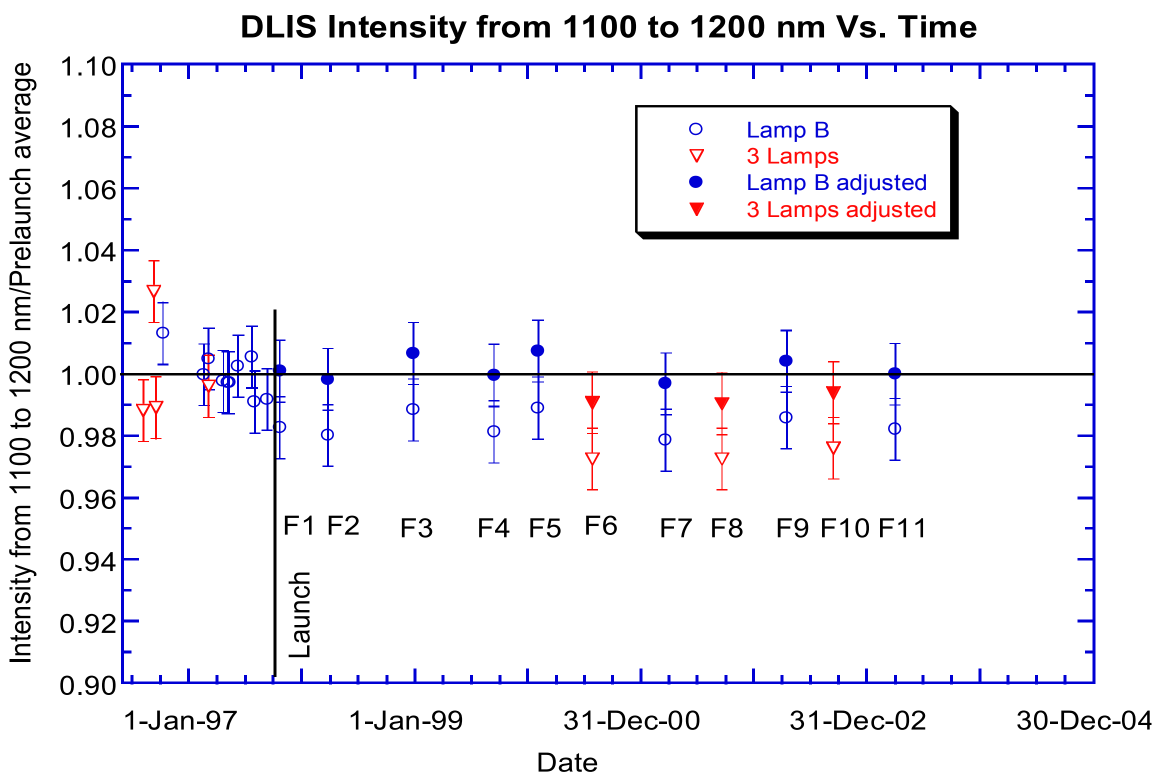


Figure 5.11-10: IR spectrometer calibration lamp response changes from lab calibration to Titan descent. ULIS on top, DLIS on bottom.

6.0 Derived Data Products (DDP)

The following Derived Data Products have been included in the archive. They represent a sample of the results of the DISR team's data analysis and reduction efforts, and provide a good reference for extended analysis. In general they show the measured spectral radiance, averaged over the instruments field of view.

DLIS/ULIS: A tabular presentation of the calculated light intensity at each wavelength of the IR spectrometers averaged over the field of view.

DLV/ULV: Two sets of tables, one presenting the Net counts measured during the descent after the detector offset is removed. The other presents the average violet light intensity over the photometer's pass band assuming a quadratic spectral shape (see Violet calibration documents for details).

DLVS/ULVS: Tables of the light intensity at each visible spectrometer wavelength, averaged over the field of view.

This figure presents the upward looking (downward streaming) spectral radiance near Titan's surface from the data in the DISR DDP archive. The IR is the average from 5.6 to 7.3 km altitude, the Visible is the ULVS average from 500 to 2300 m, and the Violet is the averaged ULV from 14 to 1400 m above the surface. The data is also presented in tabular form in Appendix 8.

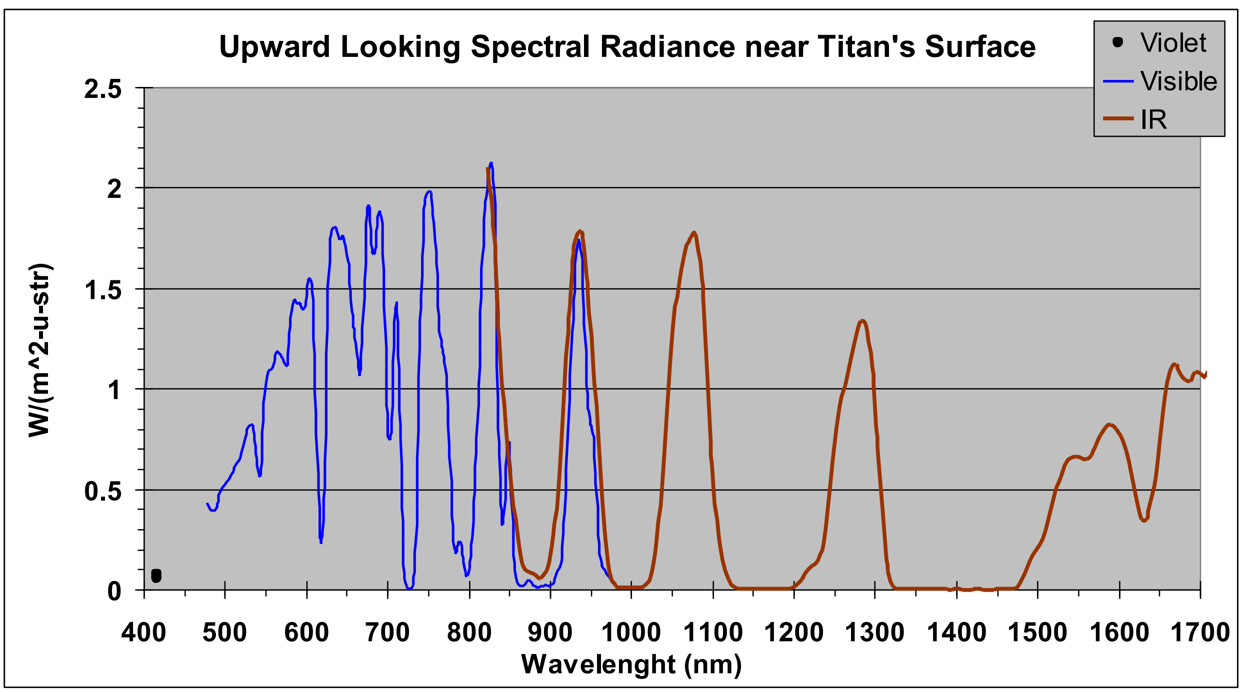


Figure 6-1: Plot of the spectral radiance near Titan's surface from all three DISR upward looking spectrometers.

7.0 Higher Level Data

In the Higher Level Data directory (DATA/HIGHER_LEVEL_DATA) are image posters in JPEG format generated as mosaics of the DISR images by Erich Karkoschka. There are 7 posters in the directory, along with the following description of each:

Description of Titan Posters
3 April 2006

Poster A - View's from the probe, in the 4 Cardinal Directions (N,S,E,W) at 5 different altitudes above Titan's surface.

Poster B - Mercator Projection of the view from the Huygens probe at 4 different altitudes.

Poster C - Nadir, Stereographic (fish-eye) view of Titan's surface from 6 different altitudes. Shows the haze layer at 20-21 Km.

Poster D - Mercator projection of Huygens probe view from 10 Km Altitude.

Poster E - Distorted fish-eye projection (in nadir direction) of the DISR images when the Huygens Probe was 5 Km above Titan's surface.

Poster F - Composite view of DISR's images taken while the Huygens Probe was setting on Titan's surface, juxtaposed with a similarly scaled picture taken on the Moon's surface. Objects near the center of the picture are roughly the size of a man's foot while objects at the horizon are a fraction of a man's height.

Poster G - When printed on letter sized paper this poster show's the size of the 'rocks' on Titan's surface in their true size.

The posters are made up of images that have been sharpened and photometrically adjusted to optimize structure visibility while minimizing the introduction of false features. The images have been colorized using the DLVS data. The variations in sharpness within the images are a result of the viewing and phase angle of the exposures and whether high resolution (HRI) coverage was available.

N.B. "Letter sized" paper is an American standard page of 8.5 inches by 11 inches.

The probe traveled Eastward during the descent, and the ultimate landing location is close to the center of the images in Poster C. The final DISR pointing direction is not well known, but is generally southward.

8.0 List of Appendices

The following table lists the Appendices that complete this document.

1 F0 - A table of values of the solar flux used in DISR data analysis.
2 IR data - A list of the IR datasets & associated attributes.
3 Image pointing - A list of the position and attitude of the probe at the image epochs.
4 E/W tilt - A table of probe east-west tilt as a function of mission time
5 Azimuth - A table of probe azimuth history.
6 Descent Cycles - A listing of the DISR descent cycles history.
7 Altitude - A comparison of DDB and DTWG 2010 altitude profiles.
8 DDP Example - Tabular data of the examples used in the Derived Data Products section.
9 DLIS Example - Tabular data of the DLIS near-surface example in section 5.11.2
10 DLIS Raw - Tabular data of the DLIS near-surface data below 200 m (sec. 5.11.2)
11 Violet Cruise Darks - Table of the violet photometer dark history during cruise.
12 IR DDP table headers - The header entries for the IR spectrometer Derived Data Prod's.
13 Lost IRs - Information on IR datasets lost due to chain B failure.
14 Sun Position - Table of Sun's azimuth, elevation & solar zenith angle during descent.
15 EA Temperature - History of the DISR Electronics temperature during Titan descent.
16 Violet Measurements - A list of the Violet measurements taken & associated attributes.
17 DLV Bias - A table of the DLV measurements with their deduced bias offset.
18 Image Thumbnails - A graphical display of the DISR images by descent cycle.
19 NASAView - Information on obtaining NASAView image viewer.
20 Image datasets - A summary of the Image datasets & associated attributes.
21 ULV Sun Location - Listing of whether the Sun was in the FOV for each ULV.
22 Violet Rel Spat - Tables of the relative spatial response for the Violet photometers.
23 Thermistors - Graphic showing the location of the DISR thermistors.
24 Dark Current Data - A summary of the CCD Dark Current datasets.
25 Square Rooter Table - 12 bit to 8 bit conversion table used for DISR images.
26 F16 Darks - Summary of the CCD dark data from the last in-flight checkout.
27 Imager RSR - Relative Spectral Response of each DISR imager at 239°K
28 Sun Sensor Data - A listing of the DISR Sun sensor data and attirbutes.
29 Visible Spectrometer Wavelength Scales - Tables of the ULVS & DLVS wavelengths.
30 Visible Spectrometer Resolutions - Tables of FWHM for ULVS & DLVS.
31 SA RSR tables - Relative Spectral Response tables for the SA channels.
32 SA AbsResp - Pixel map Absolute Responsivity 'M' coefficients for the SA camera.
33 SA RSR - Relative Spectral Response coefficients for the SA camera
34 SA Data - Listing of the Solar Aureole data & associated attributes.
35 CCD Dark Current - An Improved Method for Determining CCD Dark Current in DISR.
36 IR 'g' structure - An explanation of the IR spectrometer's g.structure tables.
37 Bibliography - The DISR publication bibliography.
38 Temperatures - A table of the DISR internal temperatures
39 Visible DDP table headers - The header entries for the Visible spectrometer DDP's.
40 Visible Spectrometer Data Summary - A summary list of the Vis. Spec. archive datasets.

9.0 References, Terms & Acronyms

1 - "The Descent Imager/Spectral Radiometer (DISR) Aboard Huygens", M. Tomasko etal., ESA_SP_1177, 1997, PDS DISR Archive DOCUMENT/DISR_SUPPORTING_DOCUMENTS/ESA_SP_1177/DISR_INSTRUMENT

2 - "A model of Titan's aerosols based on measurements made inside the atmosphere", M. Tomasko etal., Planetary and Space Science 56 (2008) 669–707

3 - "The unusual phase curve of Titan's surface observed by Huygens' Descent Imager/Spectral Radiometer", S.E. Schröder, H.U. Keller, Planetary and Space Science 57 (2009) 1963-1974

4 - "Calibration of Upward and Downward Looking Violet Photometers", M. Tomasko, M. Prout, and L. McFarlane, PDS DISR Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/VIOLET_PHOTOMETERS/VIOLET_PHOTOMETER_CAL_DOC

5 - "DISR imaging and the geometry of the descent of the Huygens probe within Titan's atmosphere", Erich Karkoschka, et al., Planetary and Space Science 55 (2007) 1896-1935

6 - "Calibration Report for the Imagers of the Descent Imager/Spectral Radiometer Instrument aboard the Huygens Probe of the Cassini Mission", L. R. Doose, B. Rizk, E. Karkoschka, and E. McFarlane, PDS DISR Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/IMAGERS

7 - "Dark Current Estimation for the CCD of the Descent Imager/Spectral Radiometer aboard the Huygens Probe of the Cassini Mission", L. Doose and A. Eibl, PDS DISR Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/CALIBRATION_STANDARD/DARK_CURRENT

8 - "Experiment User's Manual" Diane Whiteaker, CDRL#-OP001 & SW002, MCR-93-1349 Rev: C, PDS DISR Archive, DOCUMENT/DISR_SUPPORTING_DOCUMENTS/EXPERIMENT_USERS_MANUAL, 13 Sep. 1996

9 - "Calibration of the Sun Sensor", M.G. Tomasko, PDS DISR Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/SUN_SENSOR, 25 Feb. 2000.

10 - "Notes on the use of the Visible Spectrometer of the Descent Imager/Spectral Radiometer (DISR) Experiment on the Huygens Probe of Titan", PDS DISR Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/VISIBLE_SPECTROMETERS, 29 June 2006

11 - "Calibration Report for the Visible Spectrometer on the Descent/Imager Spectral Radiometer (DISR) Experiment on the Huygens Probe", Martin Tomasko and Steffi Engel, PDS DISR Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/VISIBLE_SPECTROMETERS

12 - "Limits on the size of aerosols from measurements of linear polarization in Titan's atmosphere", Tomasko etal., Icarus 204 (2009) 271–283, 2009

13 - "Calibration Report for the Solar Aureole Camera of the Descent Imager/Spectral Radiometer aboard the Huygens Probe of the Cassini Mission", M. G. Tomasko and L. E. Dafoe, PDS DISR Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/SOLAR_AUREOLE, 27 April 2006.

14 - "Calibration Information for the Upward-Looking Infrared Spectrometer (ULIS) and Downward-Looking Infrared Spectrometer (DLIS)", PDS Archive, hpdisr_0001/DOCUMENT/DISR_CALIBRATION_DOCUMENTS/INFRARED_SPECTROMETERS/IR_SPECTROMETER_CAL_DOC, 20 February 2006.

15 - "The reflectivity spectrum and opposition effect of Titan's surface observed by Huygens' DISR spectrometers", Erich Karkoschka, Stefan E. Schroeder, Martin G. Tomasko & Horst Uwe Keller, Planetary and Space Science 60 (2012) 342-355

16 - "Methane absorption coefficients for the jovian planets from laboratory, Huygens, and HST data", Erich Karkoschka & Martin G. Tomasko, Icarus 205 (2010) 674-694

17 - "A soft solid surface on Titan as revealed by the Huygens Surface Science Package", John C. Zarnecki, et al, Nature 04211 (2005)

18 - "Bouncing on titan: Motion of the huygens probe in the seconds after landing", S. Schroeder, E. Karkoschka, R. Lorenz, Planetary and Space Science (2012)

19 - "DISR Engineering Data Companion Document", C. See, PDS Archive, 28 September 2012

Contributors

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Acronyms

AGC Automatic Gain Control
AR Absolute Responsivity
ALT-AZ Two axis (altitude & azimuth) calibration mounting system
CCD Charge Coupled Device (detector chip)
CDMU Command & Data Management Unit (on probe)
CPU Central Processing Unit
DCT Discrete Cosine Transform
DCS Data Compression System
DDB Descent Data Broadcast
DDP Derived Data Products
DISR Descent Imager and Spectral Radiometer
DLI1 Downward Looking Imager 1 (HRI)
DLI2 Downward Looking Imager 2 (MRI)
DLIS Downward Looking IR Spectrometer (DISR sub-instrument)
DLV Downward Looking Violet photometer (DISR sub-instrument)
DLVS Downward Looking Visible Spectrometer (DISR sub-instrument)
DN Data Number (fundamental digital output from the detectors)
DOF Degree of Freedom -

DTWG Descent Trajectory Working Group
EA DISR Electronics Assembly
EAICD Experimenter to Archive Interface Control Document
ESA European Space Agency
FF Flat Field
FM Flight Model
FOV Field of View
FTU Flight Test Unit
GSE Ground Support Equipment
HC Health Check (pre-programmed test routine)
HNS High Near Surface (descent cycle)
HRI High Resolution Imager, aka DLI1 (DISR sub-instrument)
I/F Ratio of Intensity (spectral radiance) to solar flux unit per sr.
IC Integrated Circuit
ICD Interface Control Document
IFC In-Flight Calibration (pre-programmed test routine)
IR Infra-Red
JPEG Joint Photographic Experts Group compression algorithm for images (aka JPG)
JPL Jet Propulsion Laboratory, Pasadena, CA
LNS Low Near Surface (descent cycle)
MNS Medium Near Surface (descent cycles)
MNS Medium Near Surface (descent cycles)
MRI Medium Resolution Imager, aka DLI2 (DISR sub-instrument)
NASA National Aeronautics and Space Administration
O+SR Offset plus Serial Register (dark current component)
PDS Planetary Data System
PSA Planetary Science Archive
RSR Relative Spectral Response
SA Solar Aureole (DISR sub-instrument)
SH DISR Sensor Head
SLI Side Looking Imager (DISR sub-instrument)
SMM Single Measurement Mode (manual exposures)
SS Sun Sensor (DISR sub-instrument)
SSL Surface Science Lamp (DISR device)
SZA Solar Zenith Angle
T0 Time Zero (parachute deployment command epoch)
TAT Time-Altitude Table
UA University of Arizona, Tucson, AZ
ULIS Upward Looking IR Spectrometer (DISR sub-instrument)
ULV Upward Looking Violet photometer (DISR sub-instrument)
ULVS Upward Looking Visible Spectrometer (DISR sub-instrument)
VLNS Very Low Near Surface (descent cycle)
WL WaveLength

Conventions

COLUMN_NUMBER 1 = Column #1 = Column 0 = Column(0) = column index 0
Pixel(0,1) = Pixel in Row(0), Column(1) = Pixel in Row #1, Column #2

Numbering of the DISR images (and SLI strips) starts at the upper right corner of the images (i.e. SLI pixel (0,0) is in the upper, right most corner of the image).

For the Archive Label files, DISR's azimuths are defined as degrees west of north (counter-clockwise as viewed from above) relative to the Sun vector's projection on Titan's surface, in keeping with the original intended rotation sense of the probe. Thus for an observation at an azimuth of 6°, the Sun is 6 degrees to the right of the probe's +Z axis (i.e. DISR sensor head) at the start of the measurement (which would put the Sun behind the shadow bar). However, many analyses and tables use the opposite direction (CW from above) so it is always necessary to verify the sense of rotation.

10.0 DISR Huygens Fun Facts

The Descent...
Titan was at 9.053 AU from the Sun at Encounter.
T0 is the time of parachute deployment, and resetting of the DDB time.
The Stabilizer Chute deployed 15 minutes after the Main chute.
The probe rotated 367 times from Main chute deployment to impact.
The probe reversed spin direction at ~124.5 km altitude.

Impact...
Huygens impact was at 8869.7535 sec after TO as measured by SSP (1.8 sec later on the Cassini clock).
The vertical rate at impact was about 4.54 m/s.
The peak acceleration at impact was about 175 m/s^2 (18 Earth g's, 130 Titan g's)
The peak acceleration at atmospheric entry was ~12.5 Earth g's
The probe sank about 15.4 cm after penetrometer impact (~13 cm after probe impact).
The probe moved for about 10 seconds after impact.
The probe was tilted North about 3 degrees when resting on Titan.
Final Loss of Signal (LOS) from the probe occurred at 13,203 sec. after T0.
The window of the Side Looking Imager (SLI) rested 48cm above the surface, which is 3 cm higher than the windows of the DLVS, DLIS, and the lamp (Ref 5).

DISR Data Facts...
DISR began taking data at ~143 km altitude.
360 Images were transmitted before impact (of 722 taken)
A total of 608 images were transmitted (of 1211 taken)
Images are taken as 12 bits, square rooted, transmitted as 8 bits, and de-sqrt'ed to 12 bits.
99 of 268 IR datasets were lost on chain A.
The ULV dark bias was found to be 44.65 DN (@ Tv=295 & Te=302) at Titan.
ULV noise is around 0.5 DN, 1 sigma
164 (110+54) Descent cycles were executed before loss of signal (LOS)
DISR azimuths are defined as degrees west of north (counter-clockwise as viewed from above) relative to the Sun vector's projection on Titan's surface.
Huygens transmitted 59978 DISR packets (7.38 MB) which uncompressed to 113 MB of data in XDR format.

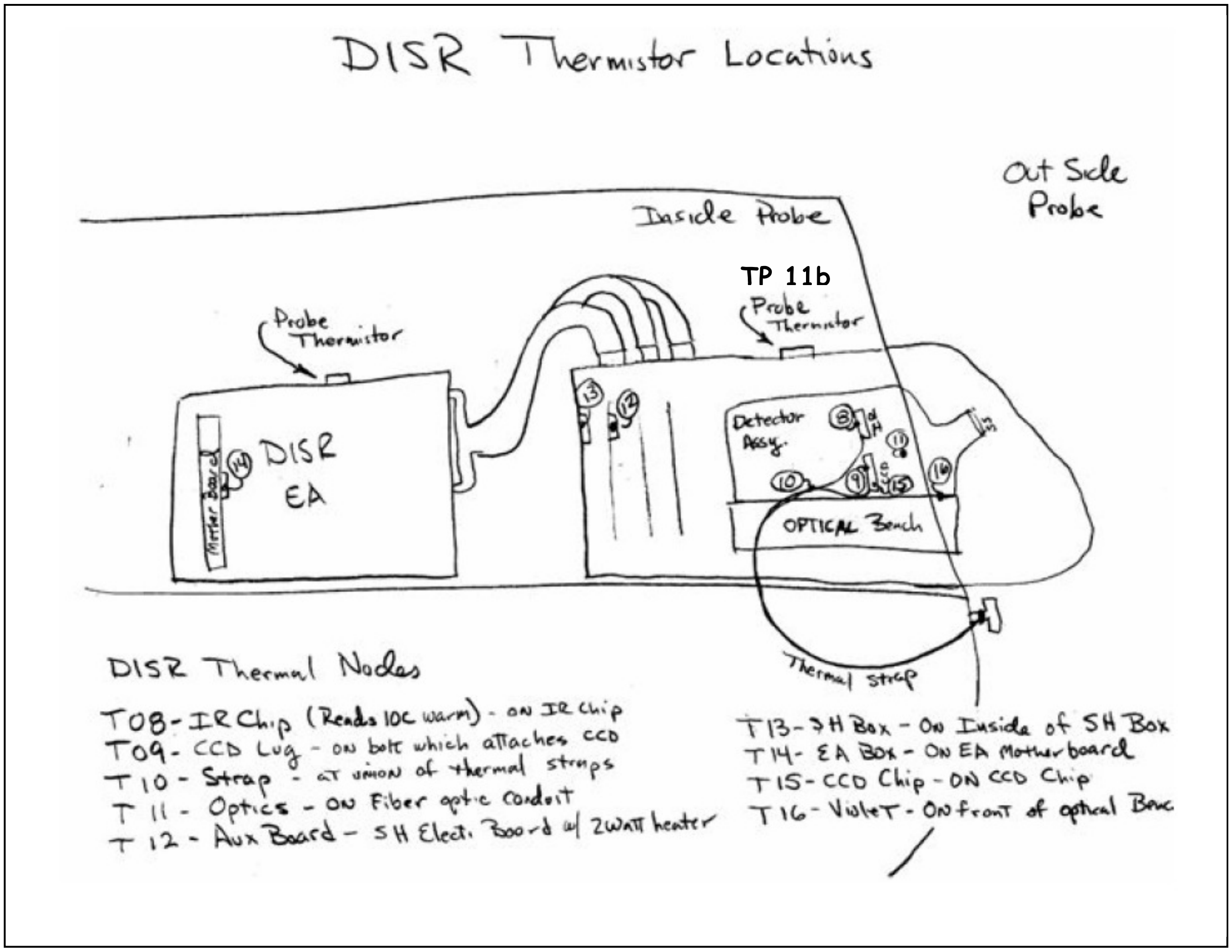
Temperatures & Insolation...
The coldest recorded DISR temperature was the Violet photometer (154°K) at impact.
All parts of the DISR Sensor Head began to warm significantly after Titan impact.
The DISR EA temperature varied by only 12.5° C (285.8°K to 297.3°K) during the mission.

The DISR Auxiliary (A/D) Board heater (1.3 W) was able to hold temperature at 263°K for ~1000 seconds before being overcome.

The DISR Strap heater (1.4 W) was able to limit cooling to 172°K from about T0+4500 sec to T0+10,900 s (when it began to warm again).

At 150 km altitude the Sun was 112.7° east of north, 115° at impact and ~115.5° at LOS.

The solar zenith angle (SZA) was 39° at 150 km, 33.8° at impact and ~32° at LOS.



11.0 Revision History

The following table summarizes the revision history of this document.

DISR Archive Users' Guide Revision History

Version	Date	Comments
0.0	2011.09.23	Preliminary draft, representing progress to the end of the first fiscal year of work on the Guide. It was delivered to JPL on 23rd September 2011, and was approximately 40% complete. AKA "DISR_Archive_Users_Guide2011.09.23.pdf" Included appendices 1 through 17.
0.1	2012.04.27	AKA "Draft 1.0" (i.e. "DISR Data Archive Users Guide 2012.04.27-Draft 1.0") The first comprehensive version of the Guide. Submitted to JPL on 27 April 2012. Includes appendices 1 thru 34. Submitted for team review.
0.2	2012.08.16	AKA "Draft 2.0" (i.e. "DISR Data Archive Users Guide Draft 2.0") Incorporates ITAR review and response to comments from the DISR team. Includes appendices 1 thru 39. Submitted for PDS review.
1.0	2012.09.28	First submittal of the 'completed' version of the DISR Guide; 28 September 2012. ("DISR Data Archive Users Guide 1.0 - 2012.09.27"), with appendices 1 through 40. Includes comments from Ralph Lorenz, Marty Tomasko, Lyn Doose & Erich Karkoschka.
2.0	2012.01.29	Current Version. Submitted to JPL on 29 January 2013. ("DISR Data Archive Users Guide 2.0 - 2013.01.28") Submitted to JPL on 29th January 2013, with appendices 1 thru 40. Includes comments from Bj"orn Grieger and Dave Heather of ESA. Significant changes to sections 3, 5.8, & 5.10, and appendices 1, 4, 5, 6, 20, 25 & 27.

Appendix 1 - F0 vs. Wavelength

This is the assumed values of the Solar Flux, F0 in Watts/(meter^2 - micron) used in the DISR data reduction. This is the spectral Flux at 1 Au. It must be divided by 9.053^2 and Pi to determine the spectral Radiance, F at Titan's orbit at the time of the Huygens encounter. λ is in nanometers.

Columns:

1) Solar Flux (W/m^2-u) as extended by Erich Karkoschka toward the blue (January 2007).
2) Solar Flux at 1 au, convolved to the wavelength and point spread function of the indicated ULIS or ULVS pixel.
3) Solar Flux at 1 au, convolved to the wavelength and point spread function of the indicated DLIS or DLVS pixel.
4) Solar Flux (W/m^2-u) as extended by Bruno Bezard toward the red (2007).

	1					2					3				4
λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
120.4	0.37			199	462.949	2043.760			199	477.403	2033.330				
120.8	1.89			198	465.681	2010.790			198	480.112	2038.820		0.8372	837.20	932.80
121.2	4.19			197	468.410	1985.800			197	482.819	1991.140		0.8445	844.46	1056.23
121.6	5.03			196	471.138	1990.900			196	485.524	1894.210		0.8517	851.71	1024.64
122.0	3.67			195	473.863	2015.350			195	488.227	1877.420		0.8590	858.95	1003.29
122.4	1.64			194	476.586	2028.860			194	490.928	1921.900		0.8662	866.18	997.16
122.8	0.43			193	479.308	2042.770			193	493.627	1951.550		0.8734	873.40	830.96
123.2	0.08			192	482.027	2020.540			192	496.323	1962.940		0.8806	880.61	948.29
123.6	0.04			191	484.744	1915.850			191	499.018	1933.240		0.8878	887.81	911.08
124.0	0.02			190	487.460	1860.810			190	501.711	1904.270		0.8950	895.01	925.12
124.4	0.03			189	490.173	1913.340			189	504.402	1915.830		0.9022	902.19	925.20
124.8	0.05			188	492.884	1944.160			188	507.091	1932.660		0.9094	909.36	899.80
125.2	0.04			187	495.593	1967.820			187	509.778	1929.950		0.9165	916.52	868.64
125.6	0.03			186	498.300	1945.640			186	512.462	1900.140		0.9237	923.68	870.83
126.0	0.03			185	501.005	1904.030			185	515.145	1833.110		0.9308	930.82	844.01
126.4	0.04			184	503.708	1908.500			184	517.826	1788.770		0.9380	937.95	852.19
126.8	0.04			183	506.409	1932.410			183	520.505	1827.650		0.9451	945.08	837.07
127.2	0.03			182	509.108	1933.730			182	523.181	1871.060		0.9522	952.19	831.02

λ	Karkoschka 2007.01.10	ULIS pixel	ULVS pixel	λ	F0-up	DLIS pixel	DLVS pixel	λ	F0-dn	Micron	nm	Bezard 2007.07.27
127.6	0.02		181	511.805	1915.070		181	525.856	1870.020	0.9593	959.29	803.90
128.0	0.02		180	514.500	1852.070		180	528.529	1880.170	0.9664	966.39	797.15
128.4	0.02		179	517.193	1782.390		179	531.199	1899.710	0.9735	973.47	776.55
128.8	0.02		178	519.884	1811.830		178	533.868	1897.180	0.9806	980.55	768.53
129.2	0.03		177	522.573	1870.740		177	536.534	1890.800	0.9876	987.61	759.85
129.6	0.05		176	525.260	1872.140		176	539.199	1868.900	0.9947	994.67	751.17
130.0	0.09		175	527.945	1871.520		175	541.862	1861.410	1.0017	1001.72	742.17
130.4	0.12		174	530.627	1901.760		174	544.522	1875.380	1.0088	1008.75	731.97
130.8	0.11		173	533.308	1897.080		173	547.181	1878.070	1.0158	1015.78	721.43
131.2	0.07		172	535.987	1895.540		172	549.837	1875.330	1.0228	1022.80	702.12
131.6	0.03		171	538.663	1873.070		171	552.492	1876.440	1.0298	1029.80	692.71
132.0	0.02		170	541.338	1856.890		170	555.144	1868.660	1.0368	1036.80	685.41
132.4	0.03		169	544.011	1874.320		169	557.794	1844.980	1.0438	1043.79	678.33
132.8	0.08		168	546.681	1879.500		168	560.443	1836.680	1.0508	1050.77	670.75
133.2	0.15		167	549.350	1874.800		167	563.089	1844.270	1.0577	1057.74	659.06
133.6	0.17		166	552.017	1876.600		166	565.734	1843.750	1.0647	1064.69	641.42
134.0	0.12		165	554.681	1873.950		165	568.376	1839.780	1.0716	1071.64	635.22
134.4	0.06		164	557.344	1847.710		164	571.016	1842.970	1.0786	1078.58	621.02
134.8	0.03		163	560.004	1833.570		163	573.655	1853.960	1.0855	1085.51	611.92
135.2	0.03		162	562.662	1844.680		162	576.291	1849.610	1.0924	1092.43	610.56
135.6	0.04		161	565.319	1844.610		161	578.925	1842.590	1.0993	1099.34	593.86
136.0	0.04		160	567.973	1840.040		160	581.557	1847.900	1.1062	1106.24	580.54
136.4	0.03		159	570.625	1839.740		159	584.188	1840.910	1.1131	1113.13	578.99
136.8	0.03		158	573.276	1855.020		158	586.816	1807.190	1.1200	1120.02	566.72
137.2	0.03		157	575.924	1851.880		157	589.442	1776.230	1.1269	1126.89	555.50
137.6	0.03		156	578.570	1840.650		156	592.066	1781.010	1.1338	1133.75	547.67
138.0	0.03		155	581.215	1848.080		155	594.688	1789.810	1.1406	1140.60	545.37
138.4	0.04		154	583.857	1846.620		154	597.308	1782.340	1.1474	1147.44	533.13
138.8	0.05		153	586.497	1813.020		153	599.927	1767.400	1.1543	1154.28	539.51
139.2	0.07		152	589.135	1772.970		152	602.543	1762.000	1.1611	1161.10	533.35

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
139.6	0.08			151	591.771	1779.010			151	605.157	1763.940		1.1679	1167.91	512.73
140.0	0.08			150	594.405	1791.660			150	607.769	1753.910		1.1747	1174.72	517.20
140.4	0.06			149	597.037	1784.770			149	610.379	1734.680		1.1815	1181.51	512.41
140.8	0.05			148	599.667	1767.700			148	612.987	1714.120		1.1883	1188.29	507.20
141.2	0.04			147	602.295	1760.410			147	615.593	1699.420		1.1951	1195.07	484.53
141.6	0.04			146	604.921	1765.790			146	618.197	1701.780		1.2018	1201.83	495.32
142.0	0.04			145	607.545	1756.350			145	620.799	1704.050		1.2086	1208.59	488.57
142.4	0.05			144	610.167	1736.410			144	623.398	1689.410		1.2153	1215.33	461.49
142.8	0.05			143	612.787	1715.420			143	625.996	1680.300		1.2221	1222.07	477.46
143.2	0.05			142	615.405	1697.630			142	628.592	1677.970		1.2288	1228.79	470.51
143.6	0.05			141	618.021	1700.820			141	631.186	1664.850		1.2355	1235.51	460.33
144.0	0.05			140	620.635	1707.340			140	633.778	1655.640		1.2422	1242.22	458.86
144.4	0.05			139	623.246	1689.510			139	636.368	1654.230		1.2489	1248.91	451.11
144.8	0.05			138	625.856	1678.870			138	638.956	1645.970		1.2556	1255.60	449.14
145.2	0.06			137	628.464	1680.550			137	641.541	1631.540		1.2623	1262.28	442.11
145.6	0.06			136	631.069	1664.750			136	644.125	1621.250		1.2690	1268.95	435.82
146.0	0.06			135	633.673	1654.530			135	646.707	1608.420		1.2756	1275.61	427.52
146.4	0.07			134	636.275	1655.300			134	649.287	1594.940		1.2823	1282.25	425.32
146.8	0.08			133	638.874	1647.500			133	651.864	1579.940		1.2889	1288.89	377.64
147.2	0.09			132	641.472	1630.800			132	654.440	1536.390		1.2955	1295.52	414.98
147.6	0.09			131	644.067	1622.060			131	657.014	1504.470		1.3021	1302.14	412.87
148.0	0.09			130	646.661	1608.950			130	659.585	1531.300		1.3088	1308.75	406.27
148.4	0.08			129	649.252	1594.120			129	662.155	1557.410		1.3154	1315.35	403.41
148.8	0.08			128	651.842	1585.020			128	664.723	1557.230		1.3219	1321.94	393.24
149.2	0.08			127	654.429	1536.170			127	667.288	1547.760		1.3285	1328.52	393.73
149.6	0.08			126	657.015	1494.240			126	669.852	1536.010		1.3351	1335.09	388.65
150.0	0.08			125	659.598	1533.330			125	672.413	1524.480		1.3417	1341.65	387.43
150.4	0.09			124	662.179	1561.180			124	674.973	1516.100		1.3482	1348.20	379.39
150.8	0.09			123	664.759	1557.810			123	677.530	1508.300		1.3548	1354.75	378.53
151.2	0.1			122	667.336	1547.790			122	680.086	1498.650		1.3613	1361.28	372.00

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
151.6	0.1			121	669.911	1535.770			121	682.639	1487.010		1.3678	1367.80	366.31
152.0	0.11			120	672.484	1523.650			120	685.191	1477.700		1.3743	1374.31	362.27
152.4	0.12			119	675.055	1515.860			119	687.740	1470.250		1.3808	1380.82	359.54
152.8	0.12			118	677.625	1508.230			118	690.288	1459.880		1.3873	1387.31	356.43
153.2	0.12			117	680.192	1498.560			117	692.833	1449.880		1.3938	1393.79	352.12
153.6	0.14			116	682.757	1486.060			116	695.376	1438.320		1.4003	1400.27	349.55
154.0	0.17			115	685.320	1476.980			115	697.918	1422.850		1.4067	1406.73	341.30
154.4	0.2			114	687.881	1470.470			114	700.457	1409.350		1.4132	1413.18	339.48
154.8	0.22			113	690.440	1458.880			113	702.994	1403.830		1.4196	1419.63	331.03
155.2	0.22			112	692.997	1449.540			112	705.530	1403.040		1.4261	1426.06	333.17
155.6	0.22			111	695.552	1438.020			111	708.063	1397.660		1.4325	1432.49	323.05
156.0	0.21			110	698.105	1421.370			110	710.594	1387.950		1.4389	1438.90	324.21
156.4	0.19			109	700.656	1407.300			109	713.123	1375.830		1.4453	1445.31	321.26
156.8	0.19			108	703.205	1403.050			108	715.650	1362.540		1.4517	1451.71	315.52
157.2	0.18			107	705.752	1403.830			107	718.176	1350.120		1.4581	1458.09	311.13
157.6	0.18			106	708.296	1397.320			106	720.699	1343.570		1.4645	1464.47	312.82
158.0	0.17			105	710.839	1387.210			105	723.220	1345.840		1.4708	1470.84	307.12
158.4	0.17			104	713.380	1374.620			104	725.739	1346.010		1.4772	1477.19	303.46
158.8	0.17			103	715.919	1361.080			103	728.256	1336.860		1.4835	1483.54	296.86
159.2	0.18			102	718.455	1348.080			102	730.771	1326.840		1.4899	1489.88	295.53
159.6	0.18			101	720.990	1341.870			101	733.284	1319.720		1.4962	1496.21	291.88
160.0	0.19			100	723.523	1347.000			100	735.795	1309.310		1.5025	1502.53	289.01
160.4	0.2			99	726.053	1347.000			99	738.304	1293.120		1.5088	1508.84	280.37
160.8	0.21			98	728.582	1335.020			98	740.811	1280.600		1.5151	1515.14	284.89
161.2	0.22			97	731.108	1325.270			97	743.316	1279.790		1.5214	1521.42	282.90
161.6	0.23			96	733.633	1319.330			96	745.819	1282.380		1.5277	1527.70	280.13
162.0	0.24			95	736.155	1308.340			95	748.320	1278.190		1.5340	1533.97	283.71
162.4	0.26			94	738.676	1289.830			94	750.819	1269.060		1.5402	1540.23	275.10
162.8	0.27			93	741.194	1277.590			93	753.316	1262.220		1.5465	1546.49	269.93
163.2	0.28			92	743.711	1280.250			92	755.811	1256.520		1.5527	1552.73	274.77

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
163.6	0.29			91	746.225	1283.690			91	758.304	1250.090		1.5590	1558.96	269.59
164.0	0.29			90	748.737	1277.410			90	760.795	1243.770		1.5652	1565.18	264.75
164.4	0.3			89	751.248	1266.840			89	763.283	1233.200		1.5714	1571.39	261.21
164.8	0.35			88	753.756	1261.340			88	765.770	1216.570		1.5776	1577.59	259.28
165.2	0.41			87	756.262	1255.520			87	768.255	1206.530		1.5838	1583.79	242.34
165.6	0.44			86	758.767	1248.730			86	770.738	1204.330		1.5900	1589.97	248.71
166.0	0.44			85	761.269	1243.200			85	773.219	1201.660		1.5961	1596.14	230.96
166.4	0.42			84	763.769	1231.530			84	775.697	1197.500		1.6023	1602.31	243.23
166.8	0.4			83	766.267	1211.530			83	778.174	1192.580		1.6085	1608.46	245.01
167.2	0.4			82	768.763	1204.900			82	780.649	1187.820		1.6146	1614.60	241.50
167.6	0.4			81	771.257	1204.400			81	783.121	1184.020		1.6207	1620.74	239.37
168.0	0.42			80	773.749	1200.970			80	785.592	1180.580		1.6252	1625.20	237.67
168.4	0.46			79	776.239	1196.670			79	788.060	1175.250		1.6416	1641.60	238.82
168.8	0.51			78	778.727	1191.290			78	790.527	1164.550		1.6557	1655.70	223.00
169.2	0.57			77	781.214	1186.760			77	792.992	1152.000		1.6724	1672.40	225.33
169.6	0.62			76	783.697	1183.100			76	795.454	1146.340		1.6890	1689.00	211.97
170.0	0.65			75	786.179	1180.060			75	797.915	1144.790		1.7054	1705.40	208.63
170.4	0.68			74	788.659	1174.350			74	800.373	1139.870		1.7218	1721.80	203.50
170.8	0.69			73	791.137	1161.380			73	802.830	1132.440		1.7380	1738.00	195.72
171.2	0.7			72	793.613	1147.840			72	805.284	1124.100		1.7544	1754.40	180.13
171.6	0.71			71	796.087	1145.840			71	807.737	1116.430		1.7710	1771.00	184.41
172.0	0.73			70	798.558	1144.800			70	810.187	1112.920		1.7877	1787.70	177.95
172.4	0.75			69	801.028	1138.250			69	812.635	1113.140		1.8040	1804.00	173.44
172.8	0.76			68	803.496	1130.330			68	815.082	1108.600		1.8200	1820.00	166.45
173.2	0.77			67	805.962	1121.720			67	817.526	1096.100		1.8362	1836.20	154.41
173.6	0.8			66	808.425	1113.760			66	819.969	1083.440		1.8529	1852.90	156.88
174.0	0.85			65	810.887	1112.370			65	822.409	1077.940		1.8693	1869.30	152.03
174.4	0.92			64	813.347	1114.180			64	824.847	1076.950		1.8868	1886.80	145.51
174.8	1			63	815.804	1107.050			63	827.284	1075.460		1.9026	1902.60	156.81
175.2	1.07			62	818.260	1091.110			62	829.718	1068.940		1.9192	1919.20	122.14

λ	Karkoschka 2007.01.10	ULIS pixel	ULVS pixel	λ	F0-up	DLIS pixel	DLVS pixel	λ	F0-dn	Micron	nm	Bezard 2007.07.27
175.6	1.13		61	820.713	1079.320		61	832.150	1058.090	1.9354	1935.40	133.13
176.0	1.19		60	823.165	1077.040		60	834.580	1050.950	1.9519	1951.90	129.08
176.4	1.24		59	825.614	1077.010		59	837.009	1049.130	1.9687	1968.70	120.98
176.8	1.31		58	828.062	1075.410		58	839.435	1045.960	1.9853	1985.30	123.34
177.2	1.39		57	830.507	1066.220		57	841.859	1039.560	2.0017	2001.70	131.28
177.6	1.47		56	832.950	1053.390		56	844.281	1030.940	2.0178	2017.80	209.15
178.0	1.54		55	835.392	1049.410		55	846.701	1017.830	2.0342	2034.20	108.70
178.4	1.58		54	837.831	1049.220		54	849.119	997.420	2.0509	2050.90	106.18
178.8	1.6		53	840.268	1044.620		53	851.535	973.263	2.0676	2067.60	103.93
179.2	1.61		52	842.704	1036.980		52	853.950	956.465	2.0840	2084.00	98.97
179.6	1.64		51	845.137	1028.350		51	856.362	967.193	2.1003	2100.30	97.30
180.0	1.73		50	847.568	1012.730		50	858.772	988.520	2.1167	2116.70	16.25
180.4	1.86		49	849.997	989.282		49	861.180	991.975	2.1334	2133.40	81.89
180.8	2.04		48	852.424	962.814		48	863.586	974.604	2.1502	2150.20	92.55
181.2	2.22		47	854.849	948.828		47	865.990	950.577	2.1665	2166.50	89.18
181.6	2.33		46	857.273	978.213		46	868.391	946.245	2.1829	2182.90	76.64
182.0	2.34		45	859.694	996.932		45	870.791	953.655	2.1992	2199.20	83.38
182.4	2.32		44	862.113	991.709		44	873.189	951.901	2.2159	2215.90	82.75
182.8	2.33		43	864.530	963.838		43	875.585	944.169	2.2328	2232.80	79.92
183.2	2.34		42	866.945	938.875		42	877.979	936.757	2.2495	2249.50	78.15
183.6	2.3		41	869.358	950.382		41	880.371	930.788	2.2662	2266.20	75.26
184.0	2.21		40	871.768	957.181		40	882.761	928.171	2.2824	2282.40	73.28
184.4	2.14		39	874.177	948.825		39	885.149	926.064	2.2992	2299.20	69.26
184.8	2.17		38	876.584	940.865		38	887.534	923.770	2.3161	2316.10	68.78
185.2	2.28		37	878.989	933.494		37	889.918	923.197	2.3333	2333.30	67.62
185.6	2.43		36	881.392	928.310		36	892.300	922.433	2.3504	2350.40	65.32
186.0	2.6		35	883.793	928.125		35	894.680	920.088	2.3677	2367.70	64.56
186.4	2.76		34	886.191	924.386		34	897.057	913.895	2.3847	2384.70	62.21
186.8	2.91		33	888.588	923.105		33	899.433	905.420	2.4016	2401.60	57.55
187.2	3.03		32	890.983	923.253		32	901.807	898.742	2.4182	2418.20	58.71

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
187.6	3.15			31	893.375	922.038			31	904.178	892.296		2.4347	2434.70	56.50
188.0	3.26			30	895.766	919.142			30	906.548	884.213		2.4510	2451.00	55.69
188.4	3.38			29	898.155	909.731			29	908.916	878.454		2.4672	2467.20	53.48
188.8	3.5			28	900.541	901.365			28	911.281	877.661		2.4836	2483.60	53.39
189.2	3.63			27	902.926	896.394			27	913.645	876.788		2.5000	2500.00	51.23
189.6	3.72			26	905.308	888.963			26	916.006	871.952		2.5166	2516.60	50.78
190.0	3.78			25	907.689	879.347			25	918.366	862.841		2.5329	2532.90	49.57
190.4	3.87			24	910.067	876.697			24	920.723	852.369		2.5492	2549.20	48.38
190.8	4.02			23	912.444	878.588			23	923.079	847.188		2.5644	2564.40	47.20
191.2	4.2			22	914.818	875.825			22	925.432	848.632		2.5818	2581.80	46.09
191.6	4.34			21	917.190	868.989			21	927.784	851.809		2.5981	2598.10	44.82
192.0	4.38			20	919.561	856.883			20	930.133	852.820		2.6151	2615.10	43.64
192.4	4.3			19	921.929	846.590			19	932.481	849.814		2.6300	2630.00	42.59
192.8	4.08			18	924.295	846.320			18	934.826	843.038		2.6465	2646.50	41.68
193.2	3.88			17	926.660	850.754			17	937.169	836.213		2.6615	2661.50	40.68
193.6	4.03			16	929.022	853.464			16	939.511	830.795		2.6809	2680.90	39.75
194.0	4.63			15	931.382	853.041			15	941.850	826.572		2.6962	2696.20	38.58
194.4	5.27			14	933.740	847.032			14	944.187	823.936		2.7120	2712.00	37.65
194.8	5.57			13	936.096	838.410			13	946.523	819.773		2.7327	2732.70	36.80
195.2	5.59			12	938.450	833.170			12	948.856	813.140		2.7477	2747.70	35.76
195.6	5.65			11	940.802	827.631			11	951.187	806.648		2.7631	2763.10	39.22
196.0	5.89			10	943.153	824.799			10	953.516	802.261		2.7812	2781.20	61.63
196.4	6.17			9	945.501	823.157			9	955.844	800.724		2.7989	2798.90	1.64
196.8	6.34			8	947.847	816.258			8	958.169	799.047		2.8161	2816.10	32.40
197.2	6.4			7	950.191	808.984			7	960.492	794.759		2.8325	2832.50	31.66
197.6	6.41			6	952.532	802.879			6	962.813	789.245		2.8495	2849.50	30.97
198.0	6.38			5	954.872	800.487			5	965.132	784.177		2.8661	2866.10	30.25
198.4	6.39			4	957.210	800.940			4	967.449	780.598		2.8824	2882.40	29.54
198.8	6.51			3	959.546	797.334			3	969.764	778.053		2.8988	2898.80	28.85
199.2	6.71			2	961.880	791.438			2	972.078	774.516		2.9154	2915.40	28.06

λ	Karkoschka 2007.01.10	ULIS pixel	ULVS pixel	λ	F0-up	DLIS pixel	DLVS pixel	λ	F0-dn	Micron	nm	Bezard 2007.07.27
199.6	6.96		1	964.212	785.786		1	974.389	769.933	2.9314	2931.40	25.57
200.0	7.22		0	966.542	781.217		0	976.698	766.170	2.9473	2947.30	23.03
200.4	7.5	7		822.654	1082.940	7		832.160	1058.530	2.9633	2963.30	20.51
200.8	7.83	8		829.932	1064.520	8		839.414	1036.850	2.9772	2977.20	17.99
201.2	8.14	9		837.202	1043.940	9		846.658	1012.070	3.0007	3000.70	15.72
201.6	8.34	10		844.461	1019.690	10		853.892	989.135	3.0138	3013.80	12.41
202.0	8.41	11		851.711	995.443	11		861.117	971.620	3.0297	3029.70	13.63
202.4	8.5	12		858.951	976.335	12		868.333	957.170	3.0481	3048.10	17.17
202.8	8.77	13		866.181	961.336	13		875.539	943.812	3.0645	3064.50	16.99
203.2	9.18	14		873.402	947.634	14		882.735	931.891	3.0804	3080.40	18.50
203.6	9.66	15		880.613	935.244	15		889.923	920.689	3.0969	3096.90	17.36
204.0	10.14	16		887.814	924.037	16		897.100	908.023	3.1121	3112.10	21.23
204.4	10.53	17		895.006	911.990	17		904.269	893.238	3.1296	3129.60	21.19
204.8	10.75	18		902.188	897.678	18		911.428	878.087	3.1467	3146.70	20.75
205.2	10.84	19		909.360	882.368	19		918.577	864.431	3.1630	3163.00	20.31
205.6	10.93	20		916.523	868.121	20		925.717	852.932	3.1797	3179.70	19.90
206.0	11.09	21		923.675	856.031	21		932.848	842.268	3.1971	3197.10	19.47
206.4	11.39	22		930.818	845.364	22		939.969	830.422	3.2136	3213.60	19.03
206.8	11.9	23		937.952	833.952	23		947.081	817.373	3.2315	3231.50	18.66
207.2	12.58	24		945.076	821.101	24		954.183	804.400	3.2481	3248.10	20.47
207.6	13.27	25		952.189	807.978	25		961.276	792.109	3.2656	3265.60	17.84
208.0	13.99	26		959.294	795.478	26		968.359	780.395	3.2830	3283.00	17.46
208.4	15.18	27		966.388	783.606	27		975.433	769.132	3.2995	3299.50	15.01
208.8	17.22	28		973.473	772.214	28		982.497	758.144	3.3162	3316.20	16.76
209.2	19.94	29		980.548	761.170	29		989.552	746.994	3.3334	3333.40	16.44
209.6	22.8	30		987.614	750.107	30		996.598	735.231	3.3498	3349.80	18.07
210.0	25.47	31		994.670	738.516	31		1003.630	723.193	3.3656	3365.60	15.77
210.4	28.18	32		1001.720	726.441	32		1010.660	712.044	3.3818	3381.80	15.47
210.8	31.15	33		1008.750	714.940	33		1017.680	702.170	3.3987	3398.70	13.33
211.2	33.73	34		1015.780	704.757	34		1024.690	692.723	3.4155	3415.50	14.89

λ	Karkoschka 2007.01.10	ULIS pixel	ULVS pixel	λ	F0-up	DLIS pixel	DLVS pixel	λ	F0-dn	Micron	nm	Bezard 2007.07.27
211.6	34.75	35		1022.800	695.290	35		1031.680	682.893	3.4318	3431.80	14.61
212.0	33.95	36		1029.800	685.581	36		1038.670	672.823	3.4487	3448.70	14.34
212.4	32.64	37		1036.800	675.514	37		1045.650	662.924	3.4648	3464.80	14.06
212.8	32.11	38		1043.790	665.559	38		1052.620	652.828	3.4814	3481.40	13.79
213.2	32.81	39		1050.770	655.575	39		1059.580	641.930	3.4980	3498.00	13.51
213.6	35.01	40		1057.740	644.906	40		1066.530	630.358	3.5128	3512.80	13.24
214.0	38.38	41		1064.690	633.451	41		1073.480	618.739	3.5301	3530.10	13.03
214.4	41.08	42		1071.640	621.792	42		1080.410	607.313	3.5466	3546.60	12.80
214.8	41.25	43		1078.580	610.312	43		1087.330	596.197	3.5627	3562.70	12.58
215.2	39.31	44		1085.510	599.058	44		1094.250	586.482	3.5803	3580.30	12.36
215.6	36.8	45		1092.430	588.838	45		1101.150	579.244	3.5961	3596.10	12.12
216.0	34.77	46		1099.340	580.941	46		1108.040	573.482	3.6139	3613.90	11.90
216.4	33.55	47		1106.240	574.966	47		1114.930	567.199	3.6309	3630.90	11.67
216.8	33.41	48		1113.130	568.937	48		1121.800	559.789	3.6485	3648.50	11.46
217.2	34.6	49		1120.020	561.785	49		1128.670	552.031	3.6652	3665.20	11.24
217.6	37.34	50		1126.890	554.028	50		1135.530	544.912	3.6828	3682.80	11.03
218.0	41.34	51		1133.750	546.678	51		1142.370	538.823	3.6995	3699.50	10.81
218.4	45.16	52		1140.600	540.334	52		1149.210	533.058	3.7174	3717.40	10.60
218.8	47.35	53		1147.440	534.580	53		1156.040	526.540	3.7344	3734.40	10.40
219.2	48.15	54		1154.280	528.302	54		1162.860	519.369	3.7510	3751.00	10.22
219.6	48.83	55		1161.100	521.235	55		1169.670	512.327	3.7676	3767.60	10.04
220.0	49.81	56		1167.910	514.121	56		1176.470	505.484	3.7844	3784.40	9.86
220.4	49.5	57		1174.720	507.247	57		1183.260	498.655	3.8008	3800.80	9.68
220.8	46.41	58		1181.510	500.414	58		1190.040	491.925	3.8174	3817.40	9.51
221.2	42.42	59		1188.290	493.650	59		1196.810	485.458	3.8347	3834.70	9.36
221.6	41.1	60		1195.070	487.093	60		1203.580	479.831	3.8514	3851.40	9.20
222.0	44.06	61		1201.830	481.191	61		1210.330	475.574	3.8618	3861.80	9.05
222.4	49.76	62		1208.590	476.582	62		1217.070	471.991	3.8817	3881.70	8.95
222.8	56.5	63		1215.330	472.920	63		1223.810	467.804	3.8986	3898.60	8.78
223.2	62.52	64		1222.070	468.955	64		1230.530	462.692	3.9148	3914.80	8.63

λ	Karkoschka 2007.01.10	ULIS pixel	ULVS pixel	λ	F0-up	DLIS pixel	DLVS pixel	λ	F0-dn	Micron	nm	Bezard 2007.07.27
223.6	65.55	65		1228.790	464.061	65		1237.250	457.154	3.9307	3930.70	8.48
224.0	64.57	66		1235.510	458.595	66		1243.950	451.591	3.9476	3947.60	8.34
224.4	61.71	67		1242.220	453.026	67		1250.650	446.088	3.9637	3963.70	8.19
224.8	59.24	68		1248.910	447.511	68		1257.330	440.528	3.9801	3980.10	8.05
225.2	56.85	69		1255.600	441.979	69		1264.010	434.643	3.9967	3996.70	7.91
225.6	54.12	70		1262.280	436.204	70		1270.680	428.078	4.0128	4012.80	7.76
226.0	52.61	71		1268.950	429.833	71		1277.340	421.173	4.0294	4029.40	7.65
226.4	43.14	72		1275.610	422.955	72		1283.990	415.447	4.0473	4047.30	7.53
226.8	36.2	73		1282.250	416.818	73		1290.630	411.717	4.0630	4063.00	7.41
227.2	37.07	74		1288.890	412.589	74		1297.260	408.680	4.0809	4080.90	7.31
227.6	43.35	75		1295.520	409.492	75		1303.880	404.851	4.0974	4097.40	7.18
228.0	52.42	76		1302.140	405.920	76		1310.490	400.255	4.1145	4114.50	7.07
228.4	54.47	77		1308.750	401.488	77		1317.090	395.640	4.1318	4131.80	6.96
228.8	50.74	78		1315.350	396.843	78		1323.680	391.312	4.1488	4148.80	6.84
229.2	48.58	79		1321.940	392.442	79		1330.270	387.170	4.1664	4166.40	6.72
229.6	48.73	80		1328.520	388.261	80		1336.840	383.151	4.1830	4183.00	6.60
230.0	43.01	81		1335.090	384.215	81		1343.400	379.110	4.1984	4198.40	6.49
230.4	52.27	82		1341.650	380.196	82		1349.960	374.812	4.2112	4211.20	6.39
230.8	54.92	83		1348.200	375.980	83		1356.500	370.308	4.2240	4224.00	6.32
231.2	50.12	84		1354.750	371.523	84		1363.040	365.921	4.2422	4242.20	6.25
231.6	53.72	85		1361.280	367.090	85		1369.570	361.907	4.2603	4260.30	6.15
232.0	53.12	86		1367.800	362.971	86		1376.080	358.294	4.2784	4278.40	6.05
232.4	55.32	87		1374.310	359.257	87		1382.590	354.879	4.2965	4296.50	5.95
232.8	52.02	88		1380.820	355.808	88		1389.090	351.319	4.3147	4314.70	5.85
233.2	46.55	89		1387.310	352.310	89		1395.580	347.357	4.3328	4332.80	5.76
233.6	46.89	90		1393.790	348.470	90		1402.060	343.017	4.3509	4350.90	5.66
234.0	47.99	91		1400.270	344.231	91		1408.530	338.485	4.3665	4366.50	5.56
234.4	41	92		1406.730	339.749	92		1414.990	333.894	4.3829	4382.90	5.48
234.8	43.07	93		1413.180	335.176	93		1421.440	329.431	4.3979	4397.90	5.39
235.2	51.49	94		1419.630	330.670	94		1427.880	325.388	4.4154	4415.40	5.31

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
235.6	52.71		95		1426.060	326.502		95		1434.310	321.814		4.4317	4431.70	5.23
236.0	46.79		96		1432.490	322.808		96		1440.730	318.465		4.4477	4447.70	5.16
236.4	48.33		97		1438.910	319.413		97		1447.150	315.231		4.4657	4465.70	5.09
236.8	56.95		98		1445.310	316.151		98		1453.550	312.131		4.4824	4482.40	5.01
237.2	58.4		99		1451.710	313.017		99		1459.940	309.007		4.4995	4499.50	4.94
237.6	46.97		100		1458.090	309.916		100		1466.330	305.612		4.5159	4515.90	4.87
238.0	38.24		101		1464.470	306.614		101		1472.700	301.973		4.5338	4533.80	4.80
238.4	41.54		102		1470.840	303.044		102		1479.070	298.400		4.5519	4551.90	4.72
238.8	48.5		103		1477.190	299.443		103		1485.420	295.108		4.5680	4568.00	4.64
239.2	49.34		104		1483.540	296.070		104		1491.770	291.952		4.5856	4585.60	4.57
239.6	45.27		105		1489.880	292.893		105		1498.110	288.726		4.6029	4602.90	5.04
240.0	48.59		106		1496.210	289.698		106		1504.440	285.795		4.6201	4620.10	3.88
240.4	42.44		107		1502.530	286.658		107		1510.760	283.679		4.6361	4636.10	4.37
240.8	39.85		108		1508.840	284.286		108		1517.060	282.048		4.6542	4654.20	4.31
241.2	46.16		109		1515.140	282.539		109		1523.360	280.185		4.6703	4670.30	4.25
241.6	56.35		110		1521.420	280.775		110		1529.650	277.901		4.6872	4687.20	4.19
242.0	69.57		111		1527.700	278.623		111		1535.940	275.365		4.7029	4702.90	4.64
242.4	72.78		112		1533.970	276.163		112		1542.210	272.627		4.7196	4719.60	4.07
242.8	74.13		113		1540.240	273.496		113		1548.470	269.647		4.7371	4737.10	5.30
243.2	73.34		114		1546.490	270.599		114		1554.720	266.463		4.7535	4753.50	5.88
243.6	68.39		115		1552.730	267.484		115		1560.960	263.060		4.7703	4770.30	3.84
244.0	72.38		116		1558.960	264.162		116		1567.200	259.286		4.7867	4786.70	3.79
244.4	65.73		117		1565.180	260.523		117		1573.420	255.217		4.8035	4803.50	3.70
244.8	55.72		118		1571.390	256.553		118		1579.640	251.351		4.8195	4819.50	3.54
245.2	50.69		119		1577.590	252.611		119		1585.840	248.279		4.8358	4835.80	3.36
245.6	51.35		120		1583.790	249.267		120		1592.040	246.232		4.8529	4852.90	3.18
246.0	50.87		121		1589.970	246.883		121		1598.220	244.747		4.8694	4869.40	3.01
246.4	51.53		122		1596.140	245.237		122		1604.400	243.012		4.8855	4885.50	2.84
246.8	54.92		123		1602.310	243.617		123		1610.570	240.854		4.9026	4902.60	2.66
247.2	57.76		124		1608.460	241.603		124		1616.730	238.788		4.9198	4919.80	2.48

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
247.6	57.19		125		1614.600	239.490		125		1622.880	236.901		4.9369	4936.90	2.30
248.0	55.17		126		1620.740	237.552		126		1629.010	234.512		4.9539	4953.90	2.12
248.4	49.7		127		1626.860	235.372		127		1635.140	231.325		4.9718	4971.80	1.94
248.8	40.66		128		1632.980	232.475		128		1641.270	228.179		4.9890	4989.00	1.76
249.2	43.98		129		1639.080	229.291		129		1647.380	225.940		5.0058	5005.80	1.58
249.6	62.12		130		1645.180	226.716		130		1653.480	224.317		5.0224	5022.40	1.40
250.0	63.07		131		1651.260	224.895		131		1659.570	222.307				
250.4	61.98		132		1657.340	223.059		132		1665.650	219.308				
250.8	62.76		133		1663.410	220.441		133		1671.720	215.590				
251.2	57.66		134		1669.460	216.990		134		1677.790	212.074				
251.6	45.27		135		1675.510	213.387		135		1683.840	209.587				
252.0	45.69		136		1681.550	210.503		136		1689.890	208.029				
252.4	43.28		137		1687.570	208.607		137		1695.920	206.499				
252.8	44.48		138		1693.590	207.095		138		1701.950	204.369				
253.2	50.43		139		1699.600	205.213		139		1707.960	201.746				
253.6	54.1		140		1705.600	202.783		140		1713.970	198.894				
254.0	57.03		141		1711.590	200.026		141		1719.970	195.757				
254.4	60.83		142		1717.570	197.019		142		1725.960	192.261				
254.8	65.44														
255.2	73.25														
255.6	84.88														
256.0	93.05														
256.4	101.21														
256.8	121.55														
257.2	135.21														
257.6	132.58														
258.0	167.31														
258.4	136.22														
258.8	123.67														
259.2	128.45														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
259.6	99.4														
260.0	79.62														
260.4	86.19														
260.8	91.38														
261.2	89.11														
261.6	94.74														
262.0	100.74														
262.4	108.44														
262.8	100.13														
263.2	113.16														
263.6	193.92														
264.0	255.88														
264.4	264.67														
264.8	233.59														
265.2	224.17														
265.6	274.76														
266.0	291.47														
266.4	265.41														
266.8	245.09														
267.2	251.48														
267.6	258.78														
268.0	238.86														
268.4	248.87														
268.8	257.27														
269.2	248.38														
269.6	249.8														
270.0	270.52														
270.4	279.77														
270.8	259.18														
271.2	234.6														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
271.6	228.14														
272.0	186.72														
272.4	194.95														
272.8	234.27														
273.2	238.87														
273.6	190.43														
274.0	156.17														
274.4	137.35														
274.8	147.5														
275.2	170.27														
275.6	189.75														
276.0	247.28														
276.4	254.69														
276.8	241.59														
277.2	240.92														
277.6	235.96														
278.0	181.9														
278.4	166.46														
278.8	154.18														
279.2	115.45														
279.6	82.81														
280.0	78.13														
280.4	90.58														
280.8	129.47														
281.2	180.83														
281.6	226.55														
282.0	266.36														
282.4	297.77														
282.8	321.53														
283.2	332.2														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
283.6	321.27														
284.0	306.26														
284.4	259.82														
284.8	189.76														
285.2	135.41														
285.6	195.77														
286.0	316.53														
286.4	336.11														
286.8	334.59														
287.2	350.33														
287.6	336.66														
288.0	267.64														
288.4	315.04														
288.8	383.96														
289.2	429.93														
289.6	512.83														
290.0	598.36														
290.4	626.35														
290.8	597.34														
291.2	577.3														
291.6	609.64														
292.0	603.46														
292.4	547.01														
292.8	550.91														
293.2	588.28														
293.6	536.56														
294.0	491.56														
294.4	520.26														
294.8	533.1														
295.2	526.65														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
295.6	596.3														
296.0	663														
296.4	556.87														
296.8	475.64														
297.2	497.98														
297.6	537.56														
298.0	575.67														
298.4	492.73														
298.8	502.57														
299.2	565.01														
299.6	474.58														
300.0	419.11														
300.4	431.93														
300.8	432.93														
301.2	435.55														
301.6	471.23														
302.0	383.71														
302.4	468.79														
302.8	600.44														
303.2	638.36														
303.6	634.69														
304.0	566.66														
304.4	607.47														
304.8	653.39														
305.2	633.79														
305.6	612.76														
306.0	601.05														
306.4	569.27														
306.8	626.63														
307.2	684.74														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
307.6	616.93														
308.0	580.43														
308.4	624.73														
308.8	629.4														
309.2	561.5														
309.6	497.4														
310.0	461.37														
310.4	604.17														
310.8	735.15														
311.2	763.32														
311.6	742.44														
312.0	661.17														
312.4	668.68														
312.8	707.32														
313.2	717.32														
313.6	734.39														
314.0	784.1														
314.4	702.64														
314.8	675.8														
315.2	703.22														
315.6	630.95														
316.0	561.52														
316.4	627.38														
316.8	740.59														
317.2	809.3														
317.6	786.21														
318.0	699.64														
318.4	679.42														
318.8	722.32														
319.2	726.92														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
319.6	744.98														
320.0	810.66														
320.4	839.06														
320.8	789.96														
321.2	717.51														
321.6	735.21														
322.0	772														
322.4	729.68														
322.8	671.13														
323.2	666.77														
323.6	694.3														
324.0	745.55														
324.4	784.71														
324.8	790.59														
325.2	832.31														
325.6	932.62														
326.0	1002.29														
326.4	1013.85														
326.8	1012.14														
327.2	999.37														
327.6	981.66														
328.0	961.69														
328.4	948.79														
328.8	972.2														
329.2	1048.71														
329.6	1110.46														
330.0	1125.77														
330.4	1067.87														
330.8	1017.17														
331.2	1007.6														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
331.6	998.27														
332.0	997.76														
332.4	988.18														
332.8	992.78														
333.2	979.78														
333.6	948.35														
334.0	959.08														
334.4	992.66														
334.8	981.87														
335.2	985.16														
335.6	960.3														
336.0	845.11														
336.4	835.42														
336.8	833.91														
337.2	819.07														
337.6	888.92														
338.0	911.61														
338.4	941.87														
338.8	980.01														
339.2	962.33														
339.6	1011.62														
340.0	1090.61														
340.4	1058.66														
340.8	993.19														
341.2	956.42														
341.6	964.44														
342.0	1019.31														
342.4	1025.95														
342.8	1039.62														
343.2	1035.46														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
343.6	956.31														
344.0	827.62														
344.4	801.42														
344.8	921.3														
345.2	988.45														
345.6	958.97														
346.0	910.74														
346.4	941.4														
346.8	1005.09														
347.2	984.3														
347.6	922.85														
348.0	934.59														
348.4	933.73														
348.8	909.56														
349.2	894.4														
349.6	939.78														
350.0	1042.28														
350.4	1091.06														
350.8	1048.29														
351.2	998.3														
351.6	1024.42														
352.0	1034.69														
352.4	947.11														
352.8	967.67														
353.2	1043.34														
353.6	1075.53														
354.0	1110.88														
354.4	1143.08														
354.8	1156.99														
355.2	1118.86														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
355.6	1075.17														
356.0	1066.56														
356.4	981.81														
356.8	835.84														
357.2	802.98														
357.6	824.57														
358.0	758.16														
358.4	708.36														
358.8	796.06														
359.2	941.8														
359.6	1049.49														
360.0	1099.52														
360.4	1033.16														
360.8	930.67														
361.2	914.27														
361.6	903.1														
362.0	885.84														
362.4	1001.8														
362.8	1081.35														
363.2	1016.09														
363.6	1052.92														
364.0	1138.13														
364.4	1073.98														
364.8	1008.09														
365.2	1095.61														
365.6	1221.5														
366.0	1286.53														
366.4	1283.82														
366.8	1251.74														
367.2	1245.09														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
367.6	1208.78														
368.0	1145.23														
368.4	1137.78														
368.8	1158.51														
369.2	1228.87														
369.6	1281.94														
370.0	1310.93														
370.4	1213.61														
370.8	1115.98														
371.2	1200.23														
371.6	1195.76														
372.0	1032.1														
372.4	1056.64														
372.8	1175.14														
373.2	1068.93														
373.6	938.94														
374.0	1014.21														
374.4	969.18														
374.8	851.74														
375.2	985.09														
375.6	1117.29														
376.0	1088.43														
376.4	1111.92														
376.8	1163.2														
377.2	1252.04														
377.6	1350.96														
378.0	1418.69														
378.4	1402.36														
378.8	1261.85														
379.2	1158.8														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
379.6	1093.09														
380.0	1111.61														
380.4	1223.34														
380.8	1272.04														
381.2	1225.85														
381.6	1081.65														
382.0	957.91														
382.4	845.87														
382.8	752.7														
383.2	714.65														
383.6	712.4														
384.0	784.99														
384.4	955.17														
384.8	1075.03														
385.2	1087.5														
385.6	1022.9														
386.0	962.93														
386.4	1031.12														
386.8	1038.8														
387.2	999.63														
387.6	1052.62														
388.0	1049.81														
388.4	1022.5														
388.8	1034.68														
389.2	1134.16														
389.6	1236.54														
390.0	1276.6														
390.4	1280.85														
390.8	1338.96														
391.2	1415.07														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
391.6	1365.84														
392.0	1229.5														
392.4	1091.85														
392.8	871.63														
393.2	608.45														
393.6	620.99														
394.0	855.51														
394.4	1028.09														
394.8	1176.96														
395.2	1307.75														
395.6	1346.44														
396.0	1231.73														
396.4	923.25														
396.8	662.23														
397.2	742.15														
397.6	1057.68														
398.0	1355.17														
398.4	1516.82														
398.8	1608.17														
399.2	1678.67														
399.6	1681.19														
400.0	1706.46														
400.4	1710.17														
400.8	1705.83														
401.2	1775.81														
401.6	1795.61														
402.0	1799.03														
402.4	1802.81														
402.8	1767.52														
403.2	1677.82														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
403.6	1713.61														
404.0	1791.74														
404.4	1674.93														
404.8	1644.39														
405.2	1728.99														
405.6	1678.31														
406.0	1626.57														
406.4	1586.14														
406.8	1617.66														
407.2	1649.79														
407.6	1624.39														
408.0	1676.87														
408.4	1760.55														
408.8	1814.69														
409.2	1803.1														
409.6	1667.1														
410.0	1499.83														
410.4	1501.34														
410.8	1657.34														
411.2	1754.81														
411.6	1808.17														
412.0	1799.92														
412.4	1782.27														
412.8	1756.69														
413.2	1710.47														
413.6	1762.06														
414.0	1816.78														
414.4	1745.75														
414.8	1749.6														
415.2	1756.81														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
415.6	1738.09														
416.0	1805.84														
416.4	1859.94														
416.8	1802.56														
417.2	1702.88														
417.6	1670.3														
418.0	1703.54														
418.4	1703.6														
418.8	1694.87														
419.2	1735.07														
419.6	1702.15														
420.0	1628.32														
420.4	1704														
420.8	1818.41														
421.2	1842.5														
421.6	1797.43														
422.0	1778.01														
422.4	1658.77														
422.8	1575.82														
423.2	1710.94														
423.6	1720.75														
424.0	1725.07														
424.4	1779.64														
424.8	1721.42														
425.2	1672.87														
425.6	1695.74														
426.0	1665.54														
426.4	1707.8														
426.8	1687.43														
427.2	1527.09														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
427.6	1567.65														
428.0	1669.9														
428.4	1642.08														
428.8	1567.32														
429.2	1528.63														
429.6	1461.73														
430.0	1266.29														
430.4	1169.56														
430.8	1166.45														
431.2	1322														
431.6	1692.95														
432.0	1846.57														
432.4	1657.12														
432.8	1661.59														
433.2	1831.95														
433.6	1733.9														
434.0	1514.22														
434.4	1577.68														
434.8	1753.38														
435.2	1738.39														
435.6	1757.33														
436.0	1853.62														
436.4	1917.82														
436.8	1900.68														
437.2	1823.42														
437.6	1781.67														
438.0	1737.2														
438.4	1588.42														
438.8	1625.64														
439.2	1758.98														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
439.6	1819.18														
440.0	1812.66														
440.4	1732.36														
440.8	1776.36														
441.2	1907.69														
441.6	1921.93														
442.0	1957.26														
442.4	1976.63														
442.8	1964.46														
443.2	1937.44														
443.6	1919.67														
444.0	1959.33														
444.4	1967.5														
444.8	1993.05														
445.2	1946.83														
445.6	1821.24														
446.0	1789.87														
446.4	1870.99														
446.8	1937.21														
447.2	1995.37														
447.6	2059														
448.0	2001.03														
448.4	1981.09														
448.8	2019.22														
449.2	1993.41														
449.6	2009.6														
450.0	2063.66														
450.4	2139.54														
450.8	2178.45														
451.2	2143.14														

λ	Karkoschka 2007.01.10		ULIS pixel	ULVS pixel	λ	F0-up		DLIS pixel	DLVS pixel	λ	F0-dn		Micron	nm	Bezard 2007.07.27
451.6	2096.97														
452.0	2086.74														
452.4	2026.86														
452.8	1899.6														
453.2	1871.63														
453.6	1953.7														
454.0	2042.94														
454.4	2042.72														
454.8	1986.59														
455.2	1967.8														
455.6	2017.58														
456.0	2087.25														
456.4	2092.54														
456.8	2081.16														
457.2	2098.1														
457.6	2095.84														
458.0	2035.2														
458.4	1981.85														
458.8	2010.91														
459.2	2023.62														
459.6	2000.79														
460.0	2000														
460.4	2027.15														
460.8	2069.59														
461.2	2077.69														
461.6	2066.4														
462.0	2076.02														

Appendix 2 - IR datasets summary.

This appendix summarizes the IR data taken during the Titan encounter. Two tables are presented. The first contains the average and maximum data numbers (DN) observed per azimuthal bin. The second presents the downward looking spectrometer geometry and resolution. The minus sign is some data is to remind the reader that the probe changed direction during the descent.

N = Dataset index number (from 0 to number of datasets-1)
IR # = The Sequence number of the IR dataset (as in archive file name).
Time = Mission time in seconds after parachute deploy (T0).
Alt. = Altitude above Titan's surface at the beginning of the measurement.
Cycle # = The Descent Cycle number in which the observation was taken (see appendix 6).
# Cols = The number of columns in the dataset (each corresponding to one spectra).
Type = The IR dataset type. D (or dwn) is for downward looking, U (or up) is for upward looking & the number indicates the azimuth region bin.
Ave. DN = The average measured signal in digital data number.
Max. DN = The maximum measured IR signal for all pixels.
Lamp = The state of the calibration and surface lamps during the measurement. 0000 is all off, 1110 are all cal. lamps on, 0001 is the SSL on.
Exp. = Exposure time (Sample time) in milliseconds.
Collect = The total collection time in seconds over which the measurements are averaged (similar to integration time).
Rots = The number of intended probe rotations over which the data was to be collected.
Rots Act. = The actual number of probe rotations over which the data was collected, adjusted for actual spin rate. (-) indicates reverse rotation.
Regns = The number of azimuth regions the data is divided into.
Min(p) = The minimum value of all the active IR pixels, indication how near the measurement is to the non-linear region.
Sat?, * = indicates that some pixels may be in the non-linear or saturated region.
Temp = The temperature of the IR detector at the start of the measurement.
To Nadir = The distance from probe nadir to the center of the spectrometer footprint on Titan's surface (assuming no tilt) in kilometers.
Resol. = The radial resolution of the measurement on Titan's surface in kilometers.
1 Rot. = The annular length of the spectrometer footprint per revolution using the altitude at the start of observation, and no tilt (in kilometers).
Annul. Ext. = The total azimuthal, annular extent of the measurement's footprint on Titan's surface for all rotations observed in kilometers.

Summary Table of DISR IR Spectrometer Data

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
0	1	143.2	142.145	1	24	Comb D- 0	58.0	266	0000	8.1	70.36	7	5.89	8	41,448		270.3
0	1	143.2	142.145	1	24	Comb D- 1	57.9	260	0000	8.1	70.36	7	5.89	8	41,391		270.3
0	1	143.2	142.145	1	24	Comb D- 2	56.3	255	0000	8.1	70.36	7	5.89	8	41,393		270.3
0	1	143.2	142.145	1	24	Comb D- 3	56.3	254	0000	8.1	70.36	7	5.89	8	41,451		270.3
0	1	143.2	142.145	1	24	Comb D- 4	56.9	255	0000	8.1	70.36	7	5.89	8	41,480		270.3
0	1	143.2	142.145	1	24	Comb D- 5	57.1	257	0000	8.1	70.36	7	5.89	8	41,463		270.3

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
0	1	143.2	142.145	1	24	Comb D- 6	57.6	262	0000	8.1	70.36	7	5.89	8	41,446		270.3
0	1	143.2	142.145	1	24	Comb D- 7	57.7	262	0000	8.1	70.36	7	5.89	8	41,465		270.3
0	1	143.2	142.145	1	24	Comb U- 0	50.7	92	0000	8.1	70.36	7	5.89	4	3,272		270.3
0	1	143.2	142.145	1	24	Comb U- 1	45.5	83	0000	8.1	70.36	7	5.89	4	3,276		270.3
0	1	143.2	142.145	1	24	Comb U- 2	66.3	120	0000	8.1	70.36	7	5.89	4	3,273		270.3
0	1	143.2	142.145	1	24	Comb U- 3	59.1	109	0000	8.1	70.36	7	5.89	4	3,286		270.3
1	2	283.8	135.520	2	24	Comb D- 0	947.9	4,586	0000	129.0	61.11	3	3.45	8	3,107		271.3
1	2	283.8	135.520	2	24	Comb D- 1	872.8	4,135	0000	129.0	61.11	3	3.45	8	3,114		271.3
1	2	283.8	135.520	2	24	Comb D- 2	912.3	4,384	0000	129.0	61.11	3	3.45	8	3,108		271.3
1	2	283.8	135.520	2	24	Comb D- 3	899.4	4,302	0000	129.0	61.11	3	3.45	8	3,113		271.3
1	2	283.8	135.520	2	24	Comb D- 4	836.7	4,005	0000	129.0	61.11	3	3.45	8	5,328		271.3
1	2	283.8	135.520	2	24	Comb D- 5	940.3	4,555	0000	129.0	61.11	3	3.45	8	3,109		271.3
1	2	283.8	135.520	2	24	Comb D- 6	865.3	4,070	0000	129.0	61.11	3	3.45	8	3,108		271.3
1	2	283.8	135.520	2	24	Comb D- 7	947.6	4,585	0000	129.0	61.11	3	3.45	8	3,107		271.3
1	2	283.8	135.520	2	24	Comb U- 0	1,090.1	1,966	0000	129.0	61.11	3	3.45	4	2,936	*	271.3
1	2	283.8	135.520	2	24	Comb U- 1	1,358.3	2,372	0000	129.0	61.11	3	3.45	4	2,934	*	271.3
1	2	283.8	135.520	2	24	Comb U- 2	489.6	883	0000	129.0	61.11	3	3.45	4	2,939	*	271.3
1	2	283.8	135.520	2	24	Comb U- 3	540.2	974	0000	129.0	61.11	3	3.45	4	2,936	*	271.3
2	3	436.4	128.856	3	24	Comb D- 0	1,000.0	5,008	0000	185.5	85.59	2	1.82	8	3,112		272.1
2	3	436.4	128.856	3	24	Comb D- 1	918.4	4,461	0000	185.5	85.59	2	1.82	8	3,110		272.1
2	3	436.4	128.856	3	24	Comb D- 2	1,073.0	5,312	0000	185.5	85.59	2	1.82	8	3,110		272.1
2	3	436.4	128.856	3	24	Comb D- 3	1,027.1	5,145	0000	185.5	85.59	2	1.82	8	3,112		272.1
2	3	436.4	128.856	3	24	Comb D- 4	975.0	4,847	0000	185.5	85.59	2	1.82	8	3,115		272.1
2	3	436.4	128.856	3	24	Comb D- 5	1,059.9	5,282	0000	185.5	85.59	2	1.82	8	3,113		272.1
2	3	436.4	128.856	3	24	Comb D- 6	928.3	4,539	0000	185.5	85.59	2	1.82	8	3,119		272.1
2	3	436.4	128.856	3	24	Comb D- 7	1,042.2	5,234	0000	185.5	85.59	2	1.82	8	3,114		272.1
2	3	436.4	128.856	3	24	Comb U- 0	977.1	1,769	0000	185.5	85.59	2	1.82	4	2,943	*	272.1
2	3	436.4	128.856	3	24	Comb U- 1	741.8	1,312	0000	185.5	85.59	2	1.82	4	2,925	*	272.1
2	3	436.4	128.856	3	24	Comb U- 2	1,161.6	2,082	0000	185.5	85.59	2	1.82	4	2,939	*	272.1
2	3	436.4	128.856	3	24	Comb U- 3	1,620.4	2,851	0000	185.5	85.59	2	1.82	4	2,940	*	272.1
3	4	528.1	125.159	4	24	Comb D- 0	1,040.6	5,227	0000	145.2	83.58	2	0.24	8	3,110		272.4
3	4	528.1	125.159	4	24	Comb D- 1	957.0	4,767	0000	145.2	83.58	2	0.24	8	3,117		272.4
3	4	528.1	125.159	4	24	Comb D- 2	1,084.6	5,438	0000	145.2	83.58	2	0.24	8	3,116		272.4

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
3	4	528.1	125.159	4	24	Comb D- 3	1,037.7	5,253	0000	145.2	83.58	2	0.24	8	3,113		272.4
3	4	528.1	125.159	4	24	Comb D- 4	1,010.2	5,096	0000	145.2	83.58	2	0.24	8	3,116		272.4
3	4	528.1	125.159	4	24	Comb D- 5	1,017.8	5,110	0000	145.2	83.58	2	0.24	8	3,114		272.4
3	4	528.1	125.159	4	24	Comb D- 6	972.1	4,756	0000	145.2	83.58	2	0.24	8	3,120		272.4
3	4	528.1	125.159	4	24	Comb D- 7	1,051.6	5,272	0000	145.2	83.58	2	0.24	8	3,117		272.4
3	4	528.1	125.159	4	24	Comb U- 0	244.3	513	0000	145.2	83.58	2	0.24	4	2,932	*	272.4
3	4	528.1	125.159	4	24	Comb U- 1	116.5	256	0000	145.2	83.58	2	0.24	4	2,936	*	272.4
3	4	528.1	125.159	4	24	Comb U- 2	99.7	228	0000	145.2	83.58	2	0.24	4	2,929	*	272.4
3	4	528.1	125.159	4	24	Comb U- 3	90.4	211	0000	145.2	83.58	2	0.24	4	2,934	*	272.4
4	5	715.3	118.082	5	4	Comb dwn	18,727.4	23,811	1110	8.1	10	1	-0.25	1	20,543		272.7
4	5	715.3	118.082	5	4	Comb up	37,740.4	46,284	1110	8.1	10	1	-0.25	1	2,896	*	272.7
5	6	781.6	115.736	6	4	Comb dwn	45.2	227	0000	8.1	7.89	1	-0.27	1	40,428		272.7
5	6	781.6	115.736	6	4	Comb up	108.1	197	0000	8.1	7.89	1	-0.27	1	3,073		272.7
6	7	789.9	115.431	6	2	Long down	39,765.7	46,276	0000	508.0	0.52	1	-0.02	1	3,064		272.7
6	7	789.9	115.431	6	2	Long up	32,828.1	50,560	0000	508.0	0.52	1	-0.02	1	2,784	*	272.7
7	8	822.2	114.336	7	4	Comb dwn	18,743.9	23,847	1110	8.1	5.95	1	-0.24	1	20,255		272.7
7	8	822.2	114.336	7	4	Comb up	37,650.3	46,159	1110	8.1	5.95	1	-0.24	1	2,897	*	272.7
8	9	832.4	113.987	8	24	Comb D- 0	881.9	4,539	0000	121.0	68.19	3	-2.82	8	3,120		272.7
8	9	832.4	113.987	8	24	Comb D- 1	797.5	3,943	0000	121.0	68.19	3	-2.82	8	3,114		272.7
8	9	832.4	113.987	8	24	Comb D- 2	895.4	4,627	0000	121.0	68.19	3	-2.82	8	3,121		272.7
8	9	832.4	113.987	8	24	Comb D- 3	901.8	4,608	0000	121.0	68.19	3	-2.82	8	3,118		272.7
8	9	832.4	113.987	8	24	Comb D- 4	870.9	4,453	0000	121.0	68.19	3	-2.82	8	3,120		272.7
8	9	832.4	113.987	8	24	Comb D- 5	848.9	4,379	0000	121.0	68.19	3	-2.82	8	3,120		272.7
8	9	832.4	113.987	8	24	Comb D- 6	696.8	3,403	0000	121.0	68.19	3	-2.82	8	3,114		272.7
8	9	832.4	113.987	8	24	Comb D- 7	896.5	4,607	0000	121.0	68.19	3	-2.82	8	3,117		272.7
8	9	832.4	113.987	8	24	Comb U- 0	1,849.6	3,320	0000	121.0	68.19	3	-2.82	4	2,953	*	272.7
8	9	832.4	113.987	8	24	Comb U- 1	1,151.4	2,049	0000	121.0	68.19	3	-2.82	4	2,932	*	272.7
8	9	832.4	113.987	8	24	Comb U- 2	769.9	1,385	0000	121.0	68.19	3	-2.82	4	2,934	*	272.7
8	9	832.4	113.987	8	24	Comb U- 3	159.9	335	0000	121.0	68.19	3	-2.82	4	2,941	*	272.7
9	10	958.8	107.005	9	24	Comb D- 0	811.8	4,166	0000	161.3	69.35	5	-4.49	8	3,114		272.6
9	10	958.8	107.005	9	24	Comb D- 1	643.0	3,214	0000	161.3	69.35	5	-4.49	8	3,108		272.6
9	10	958.8	107.005	9	24	Comb D- 2	837.7	4,272	0000	161.3	69.35	5	-4.49	8	3,115		272.6
9	10	958.8	107.005	9	24	Comb D- 3	840.9	4,321	0000	161.3	69.35	5	-4.49	8	3,114		272.6

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
9	10	958.8	107.005	9	24	Comb D- 4	826.5	4,208	0000	161.3	69.35	5	-4.49	8	3,117		272.6
9	10	958.8	107.005	9	24	Comb D- 5	775.1	3,955	0000	161.3	69.35	5	-4.49	8	3,116		272.6
9	10	958.8	107.005	9	24	Comb D- 6	596.8	2,955	0000	161.3	69.35	5	-4.49	8	3,107		272.6
9	10	958.8	107.005	9	24	Comb D- 7	813.4	4,159	0000	161.3	69.35	5	-4.49	8	3,111		272.6
9	10	958.8	107.005	9	24	Comb U- 0	1,314.9	2,319	0000	161.3	69.35	5	-4.49	4	2,924	*	272.6
9	10	958.8	107.005	9	24	Comb U- 1	1,060.2	1,880	0000	161.3	69.35	5	-4.49	4	2,927	*	272.6
9	10	958.8	107.005	9	24	Comb U- 2	803.2	1,452	0000	161.3	69.35	5	-4.49	4	2,935	*	272.6
9	10	958.8	107.005	9	24	Comb U- 3	834.2	1,500	0000	161.3	69.35	5	-4.49	4	2,938	*	272.6
10	11	1,049.5	100.231	10	24	Comb D- 0	-281.8	2,536	0000	169.3	67.15	7	-6.82	8	3,120		272.4
10	11	1,049.5	100.231	10	24	Comb D- 1	626.3	3,104	0000	169.3	67.15	7	-6.82	8	3,111		272.4
10	11	1,049.5	100.231	10	24	Comb D- 2	720.6	3,706	0000	169.3	67.15	7	-6.82	8	3,114		272.4
10	11	1,049.5	100.231	10	24	Comb D- 3	713.5	3,720	0000	169.3	67.15	7	-6.82	8	3,116		272.4
10	11	1,049.5	100.231	10	24	Comb D- 4	702.8	3,617	0000	169.3	67.15	7	-6.82	8	3,114		272.4
10	11	1,049.5	100.231	10	24	Comb D- 5	708.1	3,683	0000	169.3	67.15	7	-6.82	8	3,114		272.4
10	11	1,049.5	100.231	10	24	Comb D- 6	744.2	3,744	0000	169.3	67.15	7	-6.82	8	7,792		272.4
10	11	1,049.5	100.231	10	24	Comb D- 7	729.5	3,750	0000	169.3	67.15	7	-6.82	8	3,116		272.4
10	11	1,049.5	100.231	10	24	Comb U- 0	347.5	1,179	0000	169.3	67.15	7	-6.82	4	2,928	*	272.4
10	11	1,049.5	100.231	10	24	Comb U- 1	631.9	1,135	0000	169.3	67.15	7	-6.82	4	2,946	*	272.4
10	11	1,049.5	100.231	10	24	Comb U- 2	774.9	1,413	0000	169.3	67.15	7	-6.82	4	2,934	*	272.4
10	11	1,049.5	100.231	10	24	Comb U- 3	816.2	1,450	0000	169.3	67.15	7	-6.82	4	2,931	*	272.4
11	12	1,139.4	94.414	11	24	Comb D- 0	568.7	2,973	0000	112.9	61.71	8	-8.18	8	3,100		272.2
11	12	1,139.4	94.414	11	24	Comb D- 1	481.0	2,414	0000	112.9	61.71	8	-8.18	8	5,209		272.2
11	12	1,139.4	94.414	11	24	Comb D- 2	566.9	2,903	0000	112.9	61.71	8	-8.18	8	3,100		272.2
11	12	1,139.4	94.414	11	24	Comb D- 3	539.3	2,753	0000	112.9	61.71	8	-8.18	8	3,099		272.2
11	12	1,139.4	94.414	11	24	Comb D- 4	547.9	2,796	0000	112.9	61.71	8	-8.18	8	3,101		272.2
11	12	1,139.4	94.414	11	24	Comb D- 5	548.3	2,852	0000	112.9	61.71	8	-8.18	8	3,102		272.2
11	12	1,139.4	94.414	11	24	Comb D- 6	646.0	3,233	0000	112.9	61.71	8	-8.18	8	3,106		272.2
11	12	1,139.4	94.414	11	24	Comb D- 7	567.4	2,976	0000	112.9	61.71	8	-8.18	8	3,102		272.2
11	12	1,139.4	94.414	11	24	Comb U- 0	574.1	1,053	0000	112.9	61.71	8	-8.18	4	2,929	*	272.2
11	12	1,139.4	94.414	11	24	Comb U- 1	575.0	1,046	0000	112.9	61.71	8	-8.18	4	2,924	*	272.2
11	12	1,139.4	94.414	11	24	Comb U- 2	639.2	1,188	0000	112.9	61.71	8	-8.18	4	2,923	*	272.2
11	12	1,139.4	94.414	11	24	Comb U- 3	680.3	1,275	0000	112.9	61.71	8	-8.18	4	2,920	*	272.2
12	13	1,229.1	89.113	12	24	Comb D- 0	642.0	3,327	0000	80.6	62.13	10	-10.06	8	3,125		271.8

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
12	13	1,229.1	89.113	12	24	Comb D- 1	414.3	2,040	0000	80.6	62.13	10	-10.06	8	3,482		271.8
12	13	1,229.1	89.113	12	24	Comb D- 2	605.2	3,193	0000	80.6	62.13	10	-10.06	8	3,124		271.8
12	13	1,229.1	89.113	12	24	Comb D- 3	606.3	3,313	0000	80.6	62.13	10	-10.06	8	3,128		271.8
12	13	1,229.1	89.113	12	24	Comb D- 4	659.6	3,596	0000	80.6	62.13	10	-10.06	8	3,128		271.8
12	13	1,229.1	89.113	12	24	Comb D- 5	599.8	3,210	0000	80.6	62.13	10	-10.06	8	3,128		271.8
12	13	1,229.1	89.113	12	24	Comb D- 6	463.1	2,268	0000	80.6	62.13	10	-10.06	8	4,724		271.8
12	13	1,229.1	89.113	12	24	Comb D- 7	640.1	3,306	0000	80.6	62.13	10	-10.06	8	3,128		271.8
12	13	1,229.1	89.113	12	24	Comb U- 0	1,054.9	1,911	0000	80.6	62.13	10	-10.06	4	2,928	*	271.8
12	13	1,229.1	89.113	12	24	Comb U- 1	629.7	1,155	0000	80.6	62.13	10	-10.06	4	2,923	*	271.8
12	13	1,229.1	89.113	12	24	Comb U- 2	401.8	749	0000	80.6	62.13	10	-10.06	4	2,923	*	271.8
12	13	1,229.1	89.113	12	24	Comb U- 3	307.8	611	0000	80.6	62.13	10	-10.06	4	2,923	*	271.8
13	14	1,318.5	84.362	13	24	Comb D- 0	762.9	4,242	0000	80.6	62.08	10	-9.73	8	3,107		271.4
13	14	1,318.5	84.362	13	24	Comb D- 1	431.8	2,250	0000	80.6	62.08	10	-9.73	8	3,127		271.4
13	14	1,318.5	84.362	13	24	Comb D- 2	799.1	4,286	0000	80.6	62.08	10	-9.73	8	3,107		271.4
13	14	1,318.5	84.362	13	24	Comb D- 3	786.1	4,353	0000	80.6	62.08	10	-9.73	8	3,108		271.4
13	14	1,318.5	84.362	13	24	Comb D- 4	750.9	4,153	0000	80.6	62.08	10	-9.73	8	3,414		271.4
13	14	1,318.5	84.362	13	24	Comb D- 5	782.2	4,302	0000	80.6	62.08	10	-9.73	8	3,109		271.4
13	14	1,318.5	84.362	13	24	Comb D- 6	461.4	2,365	0000	80.6	62.08	10	-9.73	8	3,112		271.4
13	14	1,318.5	84.362	13	24	Comb D- 7	771.6	4,220	0000	80.6	62.08	10	-9.73	8	3,107		271.4
13	14	1,318.5	84.362	13	24	Comb U- 0	1,094.3	1,993	0000	80.6	62.08	10	-9.73	4	2,911	*	271.4
13	14	1,318.5	84.362	13	24	Comb U- 1	548.0	1,012	0000	80.6	62.08	10	-9.73	4	2,907	*	271.4
13	14	1,318.5	84.362	13	24	Comb U- 2	773.3	1,445	0000	80.6	62.08	10	-9.73	4	2,912	*	271.4
13	14	1,318.5	84.362	13	24	Comb U- 3	835.4	1,525	0000	80.6	62.08	10	-9.73	4	2,916	*	271.4
14	15	1,408.9	79.950	14	24	Comb D- 0	709.8	3,978	0000	112.9	62.9	9	-8.42	8	3,114		270.9
14	15	1,408.9	79.950	14	24	Comb D- 1	423.0	2,303	0000	112.9	62.9	9	-8.42	8	4,383		270.9
14	15	1,408.9	79.950	14	24	Comb D- 2	725.7	3,992	0000	112.9	62.9	9	-8.42	8	3,116		270.9
14	15	1,408.9	79.950	14	24	Comb D- 3	754.2	4,276	0000	112.9	62.9	9	-8.42	8	3,118		270.9
14	15	1,408.9	79.950	14	24	Comb D- 4	743.2	4,194	0000	112.9	62.9	9	-8.42	8	3,119		270.9
14	15	1,408.9	79.950	14	24	Comb D- 5	743.5	4,202	0000	112.9	62.9	9	-8.42	8	3,118		270.9
14	15	1,408.9	79.950	14	24	Comb D- 6	502.3	2,648	0000	112.9	62.9	9	-8.42	8	3,096		270.9
14	15	1,408.9	79.950	14	24	Comb D- 7	710.2	3,980	0000	112.9	62.9	9	-8.42	8	3,114		270.9
14	15	1,408.9	79.950	14	24	Comb U- 0	905.3	1,680	0000	112.9	62.9	9	-8.42	4	2,924	*	270.9
14	15	1,408.9	79.950	14	24	Comb U- 1	518.2	977	0000	112.9	62.9	9	-8.42	4	2,919	*	270.9

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
14	15	1,408.9	79.950	14	24	Comb U- 2	943.3	1,740	0000	112.9	62.9	9	-8.42	4	2,924	*	270.9
14	15	1,408.9	79.950	14	24	Comb U- 3	918.5	1,725	0000	112.9	62.9	9	-8.42	4	2,924	*	270.9
15	16	1,532.8	74.559	15	24	Comb D- 0	500.3	2,953	0000	137.1	60.53	7	-6.85	8	3,088		269.9
15	16	1,532.8	74.559	15	24	Comb D- 1	555.0	3,133	0000	137.1	60.53	7	-6.85	8	3,088		269.9
15	16	1,532.8	74.559	15	24	Comb D- 2	502.8	2,894	0000	137.1	60.53	7	-6.85	8	3,097		269.9
15	16	1,532.8	74.559	15	24	Comb D- 3	511.2	2,957	0000	137.1	60.53	7	-6.85	8	3,088		269.9
15	16	1,532.8	74.559	15	24	Comb D- 4	506.0	2,974	0000	137.1	60.53	7	-6.85	8	3,087		269.9
15	16	1,532.8	74.559	15	24	Comb D- 5	509.2	2,960	0000	137.1	60.53	7	-6.85	8	3,087		269.9
15	16	1,532.8	74.559	15	24	Comb D- 6	571.3	3,192	0000	137.1	60.53	7	-6.85	8	3,088		269.9
15	16	1,532.8	74.559	15	24	Comb D- 7	505.6	2,953	0000	137.1	60.53	7	-6.85	8	3,088		269.9
15	16	1,532.8	74.559	15	24	Comb U- 0	688.6	1,328	0000	137.1	60.53	7	-6.85	4	2,912	*	269.9
15	16	1,532.8	74.559	15	24	Comb U- 1	870.8	1,621	0000	137.1	60.53	7	-6.85	4	2,905	*	269.9
15	16	1,532.8	74.559	15	24	Comb U- 2	710.6	1,356	0000	137.1	60.53	7	-6.85	4	2,907	*	269.9
15	16	1,532.8	74.559	15	24	Comb U- 3	731.0	1,384	0000	137.1	60.53	7	-6.85	4	2,910	*	269.9
16	17	1,622.1	71.060	16	24	Comb D- 0	551.0	3,319	0000	112.9	60.68	7	-5.99	8	3,085		269.1
16	17	1,622.1	71.060	16	24	Comb D- 1	619.4	3,640	0000	112.9	60.68	7	-5.99	8	3,088		269.1
16	17	1,622.1	71.060	16	24	Comb D- 2	562.4	3,345	0000	112.9	60.68	7	-5.99	8	3,085		269.1
16	17	1,622.1	71.060	16	24	Comb D- 3	559.6	3,353	0000	112.9	60.68	7	-5.99	8	3,088		269.1
16	17	1,622.1	71.060	16	24	Comb D- 4	560.3	3,370	0000	112.9	60.68	7	-5.99	8	3,090		269.1
16	17	1,622.1	71.060	16	24	Comb D- 5	577.4	3,468	0000	112.9	60.68	7	-5.99	8	3,086		269.1
16	17	1,622.1	71.060	16	24	Comb D- 6	662.0	3,837	0000	112.9	60.68	7	-5.99	8	3,090		269.1
16	17	1,622.1	71.060	16	24	Comb D- 7	560.0	3,367	0000	112.9	60.68	7	-5.99	8	3,085		269.1
16	17	1,622.1	71.060	16	24	Comb U- 0	792.9	1,535	0000	112.9	60.68	7	-5.99	4	2,915	*	269.1
16	17	1,622.1	71.060	16	24	Comb U- 1	964.1	1,830	0000	112.9	60.68	7	-5.99	4	2,911	*	269.1
16	17	1,622.1	71.060	16	24	Comb U- 2	961.1	1,860	0000	112.9	60.68	7	-5.99	4	2,914	*	269.1
16	17	1,622.1	71.060	16	24	Comb U- 3	948.2	1,797	0000	112.9	60.68	7	-5.99	4	2,911	*	269.1
17	18	1,711.7	67.959	17	24	Comb D- 0	579.9	3,590	0000	129.0	67.38	7	-6.16	8	3,082		268.1
17	18	1,711.7	67.959	17	24	Comb D- 1	647.6	3,951	0000	129.0	67.38	7	-6.16	8	3,084		268.1
17	18	1,711.7	67.959	17	24	Comb D- 2	602.6	3,707	0000	129.0	67.38	7	-6.16	8	3,082		268.1
17	18	1,711.7	67.959	17	24	Comb D- 3	597.3	3,723	0000	129.0	67.38	7	-6.16	8	3,086		268.1
17	18	1,711.7	67.959	17	24	Comb D- 4	594.3	3,647	0000	129.0	67.38	7	-6.16	8	3,082		268.1
17	18	1,711.7	67.959	17	24	Comb D- 5	590.8	3,643	0000	129.0	67.38	7	-6.16	8	3,083		268.1
17	18	1,711.7	67.959	17	24	Comb D- 6	664.1	3,948	0000	129.0	67.38	7	-6.16	8	3,087		268.1

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
17	18	1,711.7	67.959	17	24	Comb D- 7	576.8	3,580	0000	129.0	67.38	7	-6.16	8	3,084		268.1
17	18	1,711.7	67.959	17	24	Comb U- 0	1,174.6	2,280	0000	129.0	67.38	7	-6.16	4	2,904	*	268.1
17	18	1,711.7	67.959	17	24	Comb U- 1	1,266.4	2,412	0000	129.0	67.38	7	-6.16	4	2,909	*	268.1
17	18	1,711.7	67.959	17	24	Comb U- 2	969.6	1,888	0000	129.0	67.38	7	-6.16	4	2,907	*	268.1
17	18	1,711.7	67.959	17	24	Comb U- 3	849.6	1,671	0000	129.0	67.38	7	-6.16	4	2,903	*	268.1
18	19	1,802.5	65.151	18	24	Comb D- 0	616.4	3,908	0000	145.2	64.22	6	-5.12	8	3,080		267
18	19	1,802.5	65.151	18	24	Comb D- 1	703.9	4,343	0000	145.2	64.22	6	-5.12	8	3,086		267
18	19	1,802.5	65.151	18	24	Comb D- 2	632.4	3,973	0000	145.2	64.22	6	-5.12	8	3,079		267
18	19	1,802.5	65.151	18	24	Comb D- 3	620.6	3,941	0000	145.2	64.22	6	-5.12	8	3,080		267
18	19	1,802.5	65.151	18	24	Comb D- 4	619.8	3,940	0000	145.2	64.22	6	-5.12	8	3,078		267
18	19	1,802.5	65.151	18	24	Comb D- 5	619.6	3,909	0000	145.2	64.22	6	-5.12	8	3,080		267
18	19	1,802.5	65.151	18	24	Comb D- 6	721.1	4,392	0000	145.2	64.22	6	-5.12	8	3,085		267
18	19	1,802.5	65.151	18	24	Comb D- 7	620.0	3,928	0000	145.2	64.22	6	-5.12	8	3,080		267
18	19	1,802.5	65.151	18	24	Comb U- 0	875.0	1,746	0000	145.2	64.22	6	-5.12	4	2,903	*	267
18	19	1,802.5	65.151	18	24	Comb U- 1	1,000.5	1,999	0000	145.2	64.22	6	-5.12	4	2,899	*	267
18	19	1,802.5	65.151	18	24	Comb U- 2	1,007.0	1,982	0000	145.2	64.22	6	-5.12	4	2,891	*	267
18	19	1,802.5	65.151	18	24	Comb U- 3	962.0	1,936	0000	145.2	64.22	6	-5.12	4	2,885	*	267
19	20	1,897.7	62.529	19	4	Comb dwn	18,692.7	23,849	1110	8.1	2.83	1	-0.22	1	23,012		266.2
19	20	1,897.7	62.529	19	4	Comb up	36,950.4	45,418	1110	8.1	2.83	1	-0.22	1	2,870	*	266.2
20	21	1,955.9	61.062	20	4	Comb dwn	25.6	196	0000	8.1	3	1	-0.22	1	43,687		265.3
20	21	1,955.9	61.062	20	4	Comb up	100.8	204	0000	8.1	3	1	-0.22	1	5,087		265.3
21	22	1,959.4	60.975	20	2	Long down	28,597.1	46,592	0000	508.0	0.52	1	-0.04	1	3,028		265.3
21	22	1,959.4	60.975	20	2	Long up	22,213.2	50,696	0000	508.0	0.52	1	-0.04	1	2,948	*	265.3
22	23	1,989.7	60.237	21	4	Comb dwn	18,677.5	23,861	1110	8.1	3	1	-0.21	1	23,320		264.8
22	23	1,989.7	60.237	21	4	Comb up	37,026.4	45,599	1110	8.1	3	1	-0.21	1	2,846	*	264.8
23	24	2,006.4	59.841	22	24	Comb D- 0	692.0	4,585	0000	209.7	63.53	5	-4.65	8	3,073		264
23	24	2,006.4	59.841	22	24	Comb D- 1	709.7	4,536	0000	209.7	63.53	5	-4.65	8	3,074		264
23	24	2,006.4	59.841	22	24	Comb D- 2	688.0	4,496	0000	209.7	63.53	5	-4.65	8	3,067		264
23	24	2,006.4	59.841	22	24	Comb D- 3	688.9	4,574	0000	209.7	63.53	5	-4.65	8	3,067		264
23	24	2,006.4	59.841	22	24	Comb D- 4	769.5	5,116	0000	209.7	63.53	5	-4.65	8	3,071		264
23	24	2,006.4	59.841	22	24	Comb D- 5	749.6	5,032	0000	209.7	63.53	5	-4.65	8	3,068		264
23	24	2,006.4	59.841	22	24	Comb D- 6	817.1	5,270	0000	209.7	63.53	5	-4.65	8	3,070		264
23	24	2,006.4	59.841	22	24	Comb D- 7	697.5	4,601	0000	209.7	63.53	5	-4.65	8	3,069		264

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
23	24	2,006.4	59.841	22	24	Comb U- 0	1,111.7	2,311	0000	209.7	63.53	5	-4.65	4	2,887	*	264
23	24	2,006.4	59.841	22	24	Comb U- 1	1,167.6	2,380	0000	209.7	63.53	5	-4.65	4	2,885	*	264
23	24	2,006.4	59.841	22	24	Comb U- 2	897.2	1,917	0000	209.7	63.53	5	-4.65	4	2,890	*	264
23	24	2,006.4	59.841	22	24	Comb U- 3	1,037.2	2,149	0000	209.7	63.53	5	-4.65	4	2,890	*	264
24	25	2,095.5	57.809	23	24	Comb D- 0	663.0	4,396	0000	185.5	68.05	5	-4.61	8	3,059		262.5
24	25	2,095.5	57.809	23	24	Comb D- 1	742.0	4,850	0000	185.5	68.05	5	-4.61	8	3,062		262.5
24	25	2,095.5	57.809	23	24	Comb D- 2	715.0	4,738	0000	185.5	68.05	5	-4.61	8	3,058		262.5
24	25	2,095.5	57.809	23	24	Comb D- 3	731.3	4,919	0000	185.5	68.05	5	-4.61	8	3,056		262.5
24	25	2,095.5	57.809	23	24	Comb D- 4	735.0	4,914	0000	185.5	68.05	5	-4.61	8	3,059		262.5
24	25	2,095.5	57.809	23	24	Comb D- 5	722.3	4,847	0000	185.5	68.05	5	-4.61	8	3,057		262.5
24	25	2,095.5	57.809	23	24	Comb D- 6	806.5	5,189	0000	185.5	68.05	5	-4.61	8	3,061		262.5
24	25	2,095.5	57.809	23	24	Comb D- 7	677.5	4,484	0000	185.5	68.05	5	-4.61	8	3,056		262.5
24	25	2,095.5	57.809	23	24	Comb U- 0	1,208.5	2,538	0000	185.5	68.05	5	-4.61	4	2,875	*	262.5
24	25	2,095.5	57.809	23	24	Comb U- 1	1,333.4	2,793	0000	185.5	68.05	5	-4.61	4	2,877	*	262.5
24	25	2,095.5	57.809	23	24	Comb U- 2	996.4	2,124	0000	185.5	68.05	5	-4.61	4	2,883	*	262.5
24	25	2,095.5	57.809	23	24	Comb U- 3	806.0	1,730	0000	185.5	68.05	5	-4.61	4	2,892	*	262.5
25	26	2,229.0	55.012	24	24	Comb D- 0	774.4	5,292	0000	201.6	82.71	5	-4.25	8	3,045		259.8
25	26	2,229.0	55.012	24	24	Comb D- 1	858.0	5,758	0000	201.6	82.71	5	-4.25	8	3,051		259.8
25	26	2,229.0	55.012	24	24	Comb D- 2	780.2	5,269	0000	201.6	82.71	5	-4.25	8	3,047		259.8
25	26	2,229.0	55.012	24	24	Comb D- 3	766.3	5,201	0000	201.6	82.71	5	-4.25	8	3,047		259.8
25	26	2,229.0	55.012	24	24	Comb D- 4	782.4	5,336	0000	201.6	82.71	5	-4.25	8	3,047		259.8
25	26	2,229.0	55.012	24	24	Comb D- 5	783.9	5,357	0000	201.6	82.71	5	-4.25	8	3,046		259.8
25	26	2,229.0	55.012	24	24	Comb D- 6	884.1	5,861	0000	201.6	82.71	5	-4.25	8	3,053		259.8
25	26	2,229.0	55.012	24	24	Comb D- 7	765.8	5,218	0000	201.6	82.71	5	-4.25	8	3,046		259.8
25	26	2,229.0	55.012	24	24	Comb U- 0	942.4	2,111	0000	201.6	82.71	5	-4.25	4	2,864	*	259.8
25	26	2,229.0	55.012	24	24	Comb U- 1	1,503.7	3,196	0000	201.6	82.71	5	-4.25	4	2,859	*	259.8
25	26	2,229.0	55.012	24	24	Comb U- 2	1,216.4	2,681	0000	201.6	82.71	5	-4.25	4	2,859	*	259.8
25	26	2,229.0	55.012	24	24	Comb U- 3	1,275.0	2,748	0000	201.6	82.71	5	-4.25	4	2,856	*	259.8
26	27	2,320.6	53.229	25	24	Comb D- 0	861.9	5,944	0000	233.9	65.77	4	-3.10	8	3,039		258.1
26	27	2,320.6	53.229	25	24	Comb D- 1	969.5	6,619	0000	233.9	65.77	4	-3.10	8	3,044		258.1
26	27	2,320.6	53.229	25	24	Comb D- 2	875.5	5,989	0000	233.9	65.77	4	-3.10	8	3,042		258.1
26	27	2,320.6	53.229	25	24	Comb D- 3	862.8	5,965	0000	233.9	65.77	4	-3.10	8	3,041		258.1
26	27	2,320.6	53.229	25	24	Comb D- 4	861.2	5,952	0000	233.9	65.77	4	-3.10	8	3,041		258.1

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
26	27	2,320.6	53.229	25	24	Comb D- 5	855.1	5,901	0000	233.9	65.77	4	-3.10	8	3,043		258.1
26	27	2,320.6	53.229	25	24	Comb D- 6	960.8	6,502	0000	233.9	65.77	4	-3.10	8	3,047		258.1
26	27	2,320.6	53.229	25	24	Comb D- 7	855.2	5,892	0000	233.9	65.77	4	-3.10	8	3,040		258.1
26	27	2,320.6	53.229	25	24	Comb U- 0	1,145.5	2,574	0000	233.9	65.77	4	-3.10	4	2,856	*	258.1
26	27	2,320.6	53.229	25	24	Comb U- 1	1,586.5	3,404	0000	233.9	65.77	4	-3.10	4	2,854	*	258.1
26	27	2,320.6	53.229	25	24	Comb U- 2	1,149.5	2,583	0000	233.9	65.77	4	-3.10	4	2,862	*	258.1
26	27	2,320.6	53.229	25	24	Comb U- 3	1,285.1	2,841	0000	233.9	65.77	4	-3.10	4	2,861	*	258.1
27	28	2,410.0	51.592	26	24	Comb D- 0	918.9	6,431	0000	250.0	70.41	4	-3.11	8	3,033		256
27	28	2,410.0	51.592	26	24	Comb D- 1	1,013.6	7,032	0000	250.0	70.41	4	-3.11	8	3,035		256
27	28	2,410.0	51.592	26	24	Comb D- 2	920.4	6,387	0000	250.0	70.41	4	-3.11	8	3,032		256
27	28	2,410.0	51.592	26	24	Comb D- 3	914.0	6,366	0000	250.0	70.41	4	-3.11	8	3,032		256
27	28	2,410.0	51.592	26	24	Comb D- 4	912.2	6,369	0000	250.0	70.41	4	-3.11	8	3,031		256
27	28	2,410.0	51.592	26	24	Comb D- 5	912.0	6,383	0000	250.0	70.41	4	-3.11	8	3,031		256
27	28	2,410.0	51.592	26	24	Comb D- 6	1,018.7	6,996	0000	250.0	70.41	4	-3.11	8	3,037		256
27	28	2,410.0	51.592	26	24	Comb D- 7	914.4	6,393	0000	250.0	70.41	4	-3.11	8	3,029		256
27	28	2,410.0	51.592	26	24	Comb U- 0	1,356.0	3,069	0000	250.0	70.41	4	-3.11	4	2,849	*	256
27	28	2,410.0	51.592	26	24	Comb U- 1	1,659.5	3,649	0000	250.0	70.41	4	-3.11	4	2,850	*	256
27	28	2,410.0	51.592	26	24	Comb U- 2	1,273.5	2,882	0000	250.0	70.41	4	-3.11	4	2,856	*	256
27	28	2,410.0	51.592	26	24	Comb U- 3	1,281.6	2,881	0000	250.0	70.41	4	-3.11	4	2,851	*	256
28	29	2,509.2	49.865	27	4	Comb dwn	18,597.9	23,874	1110	8.1	4.54	1	-0.19	1	25,594		254.5
28	29	2,509.2	49.865	27	4	Comb up	36,937.8	45,776	1110	8.1	4.54	1	-0.19	1	2,839	*	254.5
29	30	2,561.9	48.979	28	4	Comb dwn	26.4	197	0000	8.1	4.41	1	-0.20	1	47,051		253.3
29	30	2,561.9	48.979	28	4	Comb up	83.2	172	0000	8.1	4.41	1	-0.20	1	20,379		253.3
30	31	2,566.7	48.897	28	2	Long down	14,489.3	47,192	0000	508.0	0.52	1	-0.02	1	3,024		253.2
30	31	2,566.7	48.897	28	2	Long up	10,352.7	51,468	0000	508.0	0.52	1	-0.02	1	2,852	*	253.2
31	32	2,588.3	48.545	29	4	Comb dwn	18,580.2	23,900	1110	8.1	4.29	1	-0.19	1	25,728		252.7
31	32	2,588.3	48.545	29	4	Comb up	36,517.0	45,288	1110	8.1	4.29	1	-0.19	1	2,833	*	252.7
32	33	2,615.4	48.105	30	24	Comb D- 0	990.6	7,103	0000	516.1	69.45	4	-2.99	8	3,066		251.2
32	33	2,615.4	48.105	30	24	Comb D- 1	930.0	6,581	0000	516.1	69.45	4	-2.99	8	3,076		251.2
32	33	2,615.4	48.105	30	24	Comb D- 2	1,148.5	8,218	0000	516.1	69.45	4	-2.99	8	3,087		251.2
32	33	2,615.4	48.105	30	24	Comb D- 3	1,164.3	8,401	0000	516.1	69.45	4	-2.99	8	3,066		251.2
32	33	2,615.4	48.105	30	24	Comb D- 4	1,714.9	12,512	0000	516.1	69.45	4	-2.99	8	3,008		251.2
32	33	2,615.4	48.105	30	24	Comb D- 5	1,376.3	9,954	0000	516.1	69.45	4	-2.99	8	3,055		251.2

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
32	33	2,615.4	48.105	30	24	Comb D- 6	985.1	6,940	0000	516.1	69.45	4	-2.99	8	3,022		251.2
32	33	2,615.4	48.105	30	24	Comb D- 7	1,696.7	12,333	0000	516.1	69.45	4	-2.99	8	3,009		251.2
32	33	2,615.4	48.105	30	24	Comb U- 0	1,850.5	4,280	0000	516.1	69.45	4	-2.99	4	2,833	*	251.2
32	33	2,615.4	48.105	30	24	Comb U- 1	1,492.1	3,413	0000	516.1	69.45	4	-2.99	4	2,816	*	251.2
32	33	2,615.4	48.105	30	24	Comb U- 2	1,760.2	4,123	0000	516.1	69.45	4	-2.99	4	2,821	*	251.2
32	33	2,615.4	48.105	30	24	Comb U- 3	2,229.3	5,089	0000	516.1	69.45	4	-2.99	4	2,829	*	251.2
33	34	2,705.7	46.687	31	24	Comb D- 0	1,760.1	12,947	0000	548.4	60.62	3	-2.73	8	3,003		249.1
33	34	2,705.7	46.687	31	24	Comb D- 1	978.6	6,921	0000	548.4	60.62	3	-2.73	8	3,130		249.1
33	34	2,705.7	46.687	31	24	Comb D- 2	1,348.3	9,829	0000	548.4	60.62	3	-2.73	8	12,801		249.1
33	34	2,705.7	46.687	31	24	Comb D- 3	1,965.8	14,525	0000	548.4	60.62	3	-2.73	8	3,004		249.1
33	34	2,705.7	46.687	31	24	Comb D- 4	2,025.0	14,956	0000	548.4	60.62	3	-2.73	8	3,002		249.1
33	34	2,705.7	46.687	31	24	Comb D- 5	1,953.4	14,503	0000	548.4	60.62	3	-2.73	8	3,004		249.1
33	34	2,705.7	46.687	31	24	Comb D- 6	1,021.4	7,277	0000	548.4	60.62	3	-2.73	8	3,029		249.1
33	34	2,705.7	46.687	31	24	Comb D- 7	1,802.2	13,285	0000	548.4	60.62	3	-2.73	8	3,003		249.1
33	34	2,705.7	46.687	31	24	Comb U- 0	3,429.5	8,017	0000	548.4	60.62	3	-2.73	4	2,825	*	249.1
33	34	2,705.7	46.687	31	24	Comb U- 1	1,397.3	3,307	0000	548.4	60.62	3	-2.73	4	2,816	*	249.1
33	34	2,705.7	46.687	31	24	Comb U- 2	1,875.7	4,470	0000	548.4	60.62	3	-2.73	4	2,824	*	249.1
33	34	2,705.7	46.687	31	24	Comb U- 3	1,483.1	3,588	0000	548.4	60.62	3	-2.73	4	2,830	*	249.1
34	35	2,794.3	45.364	32	24	Comb D- 0	1,644.8	12,091	0000	516.1	66.38	4	-3.22	8	3,015		246.8
34	35	2,794.3	45.364	32	24	Comb D- 1	833.6	5,958	0000	516.1	66.38	4	-3.22	8	7,386		246.8
34	35	2,794.3	45.364	32	24	Comb D- 2	1,643.7	12,072	0000	516.1	66.38	4	-3.22	8	3,016		246.8
34	35	2,794.3	45.364	32	24	Comb D- 3	1,624.4	11,953	0000	516.1	66.38	4	-3.22	8	3,013		246.8
34	35	2,794.3	45.364	32	24	Comb D- 4	1,607.6	11,823	0000	516.1	66.38	4	-3.22	8	3,014		246.8
34	35	2,794.3	45.364	32	24	Comb D- 5	1,616.9	11,844	0000	516.1	66.38	4	-3.22	8	3,015		246.8
34	35	2,794.3	45.364	32	24	Comb D- 6	912.0	6,509	0000	516.1	66.38	4	-3.22	8	4,760		246.8
34	35	2,794.3	45.364	32	24	Comb D- 7	1,624.5	11,929	0000	516.1	66.38	4	-3.22	8	3,012		246.8
34	35	2,794.3	45.364	32	24	Comb U- 0	2,690.3	6,310	0000	516.1	66.38	4	-3.22	4	2,812	*	246.8
34	35	2,794.3	45.364	32	24	Comb U- 1	1,137.5	2,723	0000	516.1	66.38	4	-3.22	4	2,808	*	246.8
34	35	2,794.3	45.364	32	24	Comb U- 2	2,640.6	6,171	0000	516.1	66.38	4	-3.22	4	2,818	*	246.8
34	35	2,794.3	45.364	32	24	Comb U- 3	2,098.7	5,133	0000	516.1	66.38	4	-3.22	4	2,812	*	246.8
35	36	2,885.4	44.052	33	24	Comb D- 0	1,553.6	11,481	0000	677.4	61.44	2	-2.66	8	3,034		244.6
35	36	2,885.4	44.052	33	24	Comb D- 1	1,079.7	7,809	0000	677.4	61.44	2	-2.66	8	6,420		244.6
35	36	2,885.4	44.052	33	24	Comb D- 2	1,584.2	11,737	0000	677.4	61.44	2	-2.66	8	7,259		244.6

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
35	36	2,885.4	44.052	33	24	Comb D- 3	2,053.9	15,323	0000	677.4	61.44	2	-2.66	8	3,010		244.6
35	36	2,885.4	44.052	33	24	Comb D- 4	2,189.6	16,283	0000	677.4	61.44	2	-2.66	8	3,016		244.6
35	36	2,885.4	44.052	33	24	Comb D- 5	2,038.3	15,275	0000	677.4	61.44	2	-2.66	8	3,019		244.6
35	36	2,885.4	44.052	33	24	Comb D- 6	1,119.4	8,161	0000	677.4	61.44	2	-2.66	8	4,316		244.6
35	36	2,885.4	44.052	33	24	Comb D- 7	1,502.3	11,076	0000	677.4	61.44	2	-2.66	8	3,039		244.6
35	36	2,885.4	44.052	33	24	Comb U- 0	4,021.2	9,472	0000	677.4	61.44	2	-2.66	4	2,809	*	244.6
35	36	2,885.4	44.052	33	24	Comb U- 1	2,613.2	6,107	0000	677.4	61.44	2	-2.66	4	2,803	*	244.6
35	36	2,885.4	44.052	33	24	Comb U- 2	1,661.8	4,241	0000	677.4	61.44	2	-2.66	4	2,803	*	244.6
35	36	2,885.4	44.052	33	24	Comb U- 3	1,428.5	3,537	0000	677.4	61.44	2	-2.66	4	2,806	*	244.6
36	37	2,975.5	42.807	34	24	Comb D- 0	1,594.7	11,814	0000	290.3	70.83	4	-2.87	8	3,012		242.2
36	37	2,975.5	42.807	34	24	Comb D- 1	888.4	6,400	0000	290.3	70.83	4	-2.87	8	11,307		242.2
36	37	2,975.5	42.807	34	24	Comb D- 2	1,666.7	12,319	0000	290.3	70.83	4	-2.87	8	3,004		242.2
36	37	2,975.5	42.807	34	24	Comb D- 3	1,679.2	12,447	0000	290.3	70.83	4	-2.87	8	3,004		242.2
36	37	2,975.5	42.807	34	24	Comb D- 4	1,677.0	12,432	0000	290.3	70.83	4	-2.87	8	3,008		242.2
36	37	2,975.5	42.807	34	24	Comb D- 5	1,659.5	12,327	0000	290.3	70.83	4	-2.87	8	3,004		242.2
36	37	2,975.5	42.807	34	24	Comb D- 6	919.6	6,662	0000	290.3	70.83	4	-2.87	8	10,999		242.2
36	37	2,975.5	42.807	34	24	Comb D- 7	1,368.5	10,143	0000	290.3	70.83	4	-2.87	8	10,026		242.2
36	37	2,975.5	42.807	34	24	Comb U- 0	2,327.7	5,659	0000	290.3	70.83	4	-2.87	4	2,803	*	242.2
36	37	2,975.5	42.807	34	24	Comb U- 1	1,392.0	3,309	0000	290.3	70.83	4	-2.87	4	2,795	*	242.2
36	37	2,975.5	42.807	34	24	Comb U- 2	2,184.9	5,360	0000	290.3	70.83	4	-2.87	4	2,797	*	242.2
36	37	2,975.5	42.807	34	24	Comb U- 3	2,127.5	5,193	0000	290.3	70.83	4	-2.87	4	2,808	*	242.2
37	38	3,115.4	40.959	35	24	Comb D- 0	1,642.5	12,187	0000	491.9	66.27	4	-2.69	8	3,378		238.7
37	38	3,115.4	40.959	35	24	Comb D- 1	891.4	6,514	0000	491.9	66.27	4	-2.69	8	18,030		238.7
37	38	3,115.4	40.959	35	24	Comb D- 2	1,536.2	11,413	0000	491.9	66.27	4	-2.69	8	3,373		238.7
37	38	3,115.4	40.959	35	24	Comb D- 3	1,563.7	11,641	0000	491.9	66.27	4	-2.69	8	3,372		238.7
37	38	3,115.4	40.959	35	24	Comb D- 4	1,569.3	11,667	0000	491.9	66.27	4	-2.69	8	3,377		238.7
37	38	3,115.4	40.959	35	24	Comb D- 5	1,553.1	11,540	0000	491.9	66.27	4	-2.69	8	3,349		238.7
37	38	3,115.4	40.959	35	24	Comb D- 6	847.9	6,197	0000	491.9	66.27	4	-2.69	8	18,296		238.7
37	38	3,115.4	40.959	35	24	Comb D- 7	1,531.0	11,356	0000	491.9	66.27	4	-2.69	8	3,454		238.7
37	38	3,115.4	40.959	35	24	Comb U- 0	2,579.5	6,294	0000	491.9	66.27	4	-2.69	4	2,809	*	238.7
37	38	3,115.4	40.959	35	24	Comb U- 1	1,171.9	2,931	0000	491.9	66.27	4	-2.69	4	2,800	*	238.7
37	38	3,115.4	40.959	35	24	Comb U- 2	2,268.0	5,630	0000	491.9	66.27	4	-2.69	4	2,798	*	238.7
37	38	3,115.4	40.959	35	24	Comb U- 3	2,190.1	5,490	0000	491.9	66.27	4	-2.69	4	2,805	*	238.7

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
38	39	3,205.0	39.836	36	24	Comb D- 0	1,611.1	12,036	0000	508.0	68.57	4	-2.64	8	4,892		236.5
38	39	3,205.0	39.836	36	24	Comb D- 1	913.3	6,717	0000	508.0	68.57	4	-2.64	8	20,996		236.5
38	39	3,205.0	39.836	36	24	Comb D- 2	1,695.7	12,663	0000	508.0	68.57	4	-2.64	8	4,824		236.5
38	39	3,205.0	39.836	36	24	Comb D- 3	1,556.1	11,585	0000	508.0	68.57	4	-2.64	8	4,543		236.5
38	39	3,205.0	39.836	36	24	Comb D- 4	1,551.1	11,593	0000	508.0	68.57	4	-2.64	8	4,529		236.5
38	39	3,205.0	39.836	36	24	Comb D- 5	1,605.7	11,968	0000	508.0	68.57	4	-2.64	8	4,647		236.5
38	39	3,205.0	39.836	36	24	Comb D- 6	905.5	6,632	0000	508.0	68.57	4	-2.64	8	20,779		236.5
38	39	3,205.0	39.836	36	24	Comb D- 7	1,574.5	11,743	0000	508.0	68.57	4	-2.64	8	4,808		236.5
38	39	3,205.0	39.836	36	24	Comb U- 0	2,066.6	5,282	0000	508.0	68.57	4	-2.64	4	2,789	*	236.5
38	39	3,205.0	39.836	36	24	Comb U- 1	1,332.1	3,303	0000	508.0	68.57	4	-2.64	4	2,786	*	236.5
38	39	3,205.0	39.836	36	24	Comb U- 2	2,652.8	6,557	0000	508.0	68.57	4	-2.64	4	2,795	*	236.5
38	39	3,205.0	39.836	36	24	Comb U- 3	2,641.5	6,686	0000	508.0	68.57	4	-2.64	4	2,798	*	236.5
39	40	3,295.3	38.729	37	24	Comb D- 0	1,604.6	12,059	0000	524.2	70.79	4	-3.01	8	7,232		234.2
39	40	3,295.3	38.729	37	24	Comb D- 1	895.1	6,634	0000	524.2	70.79	4	-3.01	8	23,582		234.2
39	40	3,295.3	38.729	37	24	Comb D- 2	1,666.9	12,468	0000	524.2	70.79	4	-3.01	8	7,273		234.2
39	40	3,295.3	38.729	37	24	Comb D- 3	1,589.1	11,923	0000	524.2	70.79	4	-3.01	8	7,610		234.2
39	40	3,295.3	38.729	37	24	Comb D- 4	1,586.6	11,897	0000	524.2	70.79	4	-3.01	8	7,607		234.2
39	40	3,295.3	38.729	37	24	Comb D- 5	1,696.0	12,725	0000	524.2	70.79	4	-3.01	8	7,104		234.2
39	40	3,295.3	38.729	37	24	Comb D- 6	941.5	6,965	0000	524.2	70.79	4	-3.01	8	23,254		234.2
39	40	3,295.3	38.729	37	24	Comb D- 7	1,656.9	12,477	0000	524.2	70.79	4	-3.01	8	7,207		234.2
39	40	3,295.3	38.729	37	24	Comb U- 0	1,569.0	4,214	0000	524.2	70.79	4	-3.01	4	2,796	*	234.2
39	40	3,295.3	38.729	37	24	Comb U- 1	1,166.5	2,934	0000	524.2	70.79	4	-3.01	4	2,785	*	234.2
39	40	3,295.3	38.729	37	24	Comb U- 2	2,612.4	6,562	0000	524.2	70.79	4	-3.01	4	2,800	*	234.2
39	40	3,295.3	38.729	37	24	Comb U- 3	2,878.5	7,366	0000	524.2	70.79	4	-3.01	4	2,796	*	234.2
40	41	3,383.8	37.685	38	24	Comb D- 0	1,656.4	12,536	0000	298.4	72.96	4	-3.14	8	10,844		232.1
40	41	3,383.8	37.685	38	24	Comb D- 1	910.7	6,744	0000	298.4	72.96	4	-3.14	8	25,837		232.1
40	41	3,383.8	37.685	38	24	Comb D- 2	1,654.8	12,433	0000	298.4	72.96	4	-3.14	8	9,953		232.1
40	41	3,383.8	37.685	38	24	Comb D- 3	1,681.1	12,632	0000	298.4	72.96	4	-3.14	8	10,343		232.1
40	41	3,383.8	37.685	38	24	Comb D- 4	1,645.6	12,409	0000	298.4	72.96	4	-3.14	8	10,458		232.1
40	41	3,383.8	37.685	38	24	Comb D- 5	1,679.4	12,673	0000	298.4	72.96	4	-3.14	8	10,509		232.1
40	41	3,383.8	37.685	38	24	Comb D- 6	953.5	7,062	0000	298.4	72.96	4	-3.14	8	26,162		232.1
40	41	3,383.8	37.685	38	24	Comb D- 7	1,711.0	12,916	0000	298.4	72.96	4	-3.14	8	10,832		232.1
40	41	3,383.8	37.685	38	24	Comb U- 0	1,859.9	4,937	0000	298.4	72.96	4	-3.14	4	2,791	*	232.1

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
40	41	3,383.8	37.685	38	24	Comb U- 1	1,422.9	3,578	0000	298.4	72.96	4	-3.14	4	2,777	*	232.1
40	41	3,383.8	37.685	38	24	Comb U- 2	2,678.3	6,843	0000	298.4	72.96	4	-3.14	4	2,787	*	232.1
40	41	3,383.8	37.685	38	24	Comb U- 3	2,689.0	6,911	0000	298.4	72.96	4	-3.14	4	2,790	*	232.1
41	42	3,475.4	36.636	39	24	Comb D- 0	1,752.0	13,271	0000	306.4	77.7	4	-3.05	8	13,932		229.9
41	42	3,475.4	36.636	39	24	Comb D- 1	935.8	6,991	0000	306.4	77.7	4	-3.05	8	28,029		229.9
41	42	3,475.4	36.636	39	24	Comb D- 2	1,690.9	12,773	0000	306.4	77.7	4	-3.05	8	13,359		229.9
41	42	3,475.4	36.636	39	24	Comb D- 3	1,682.1	12,712	0000	306.4	77.7	4	-3.05	8	13,060		229.9
41	42	3,475.4	36.636	39	24	Comb D- 4	1,716.5	13,008	0000	306.4	77.7	4	-3.05	8	13,406		229.9
41	42	3,475.4	36.636	39	24	Comb D- 5	1,741.8	13,145	0000	306.4	77.7	4	-3.05	8	13,364		229.9
41	42	3,475.4	36.636	39	24	Comb D- 6	951.8	7,131	0000	306.4	77.7	4	-3.05	8	28,112		229.9
41	42	3,475.4	36.636	39	24	Comb D- 7	1,653.0	12,523	0000	306.4	77.7	4	-3.05	8	15,332		229.9
41	42	3,475.4	36.636	39	24	Comb U- 0	1,947.1	5,205	0000	306.4	77.7	4	-3.05	4	2,797	*	229.9
41	42	3,475.4	36.636	39	24	Comb U- 1	1,224.4	3,222	0000	306.4	77.7	4	-3.05	4	2,788	*	229.9
41	42	3,475.4	36.636	39	24	Comb U- 2	2,713.3	7,091	0000	306.4	77.7	4	-3.05	4	2,804	*	229.9
41	42	3,475.4	36.636	39	24	Comb U- 3	2,607.8	6,822	0000	306.4	77.7	4	-3.05	4	2,789	*	229.9
42	43	3,566.2	35.631	40	24	Comb D- 0	1,756.8	13,326	0000	314.5	76.52	4	-2.78	8	16,423		227.9
42	43	3,566.2	35.631	40	24	Comb D- 1	990.5	7,440	0000	314.5	76.52	4	-2.78	8	30,142		227.9
42	43	3,566.2	35.631	40	24	Comb D- 2	1,722.8	13,068	0000	314.5	76.52	4	-2.78	8	16,510		227.9
42	43	3,566.2	35.631	40	24	Comb D- 3	1,730.0	13,117	0000	314.5	76.52	4	-2.78	8	16,708		227.9
42	43	3,566.2	35.631	40	24	Comb D- 4	1,720.5	13,119	0000	314.5	76.52	4	-2.78	8	16,643		227.9
42	43	3,566.2	35.631	40	24	Comb D- 5	1,735.2	13,183	0000	314.5	76.52	4	-2.78	8	16,658		227.9
42	43	3,566.2	35.631	40	24	Comb D- 6	968.1	7,258	0000	314.5	76.52	4	-2.78	8	29,884		227.9
42	43	3,566.2	35.631	40	24	Comb D- 7	1,756.7	13,341	0000	314.5	76.52	4	-2.78	8	16,268		227.9
42	43	3,566.2	35.631	40	24	Comb U- 0	2,036.6	5,531	0000	314.5	76.52	4	-2.78	4	2,779	*	227.9
42	43	3,566.2	35.631	40	24	Comb U- 1	1,553.9	3,975	0000	314.5	76.52	4	-2.78	4	2,774	*	227.9
42	43	3,566.2	35.631	40	24	Comb U- 2	2,583.9	6,939	0000	314.5	76.52	4	-2.78	4	2,773	*	227.9
42	43	3,566.2	35.631	40	24	Comb U- 3	2,965.4	7,768	0000	314.5	76.52	4	-2.78	4	2,776	*	227.9
43	44	3,656.0	34.675	41	24	Comb D- 0	1,814.2	13,848	0000	596.7	79.08	4	-3.10	8	19,152		225.9
43	44	3,656.0	34.675	41	24	Comb D- 1	876.9	6,589	0000	596.7	79.08	4	-3.10	8	34,439		225.9
43	44	3,656.0	34.675	41	24	Comb D- 2	1,812.4	13,854	0000	596.7	79.08	4	-3.10	8	19,128		225.9
43	44	3,656.0	34.675	41	24	Comb D- 3	1,796.7	13,735	0000	596.7	79.08	4	-3.10	8	19,333		225.9
43	44	3,656.0	34.675	41	24	Comb D- 4	1,777.8	13,573	0000	596.7	79.08	4	-3.10	8	19,356		225.9
43	44	3,656.0	34.675	41	24	Comb D- 5	1,781.1	13,550	0000	596.7	79.08	4	-3.10	8	18,876		225.9

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
43	44	3,656.0	34.675	41	24	Comb D- 6	975.0	7,360	0000	596.7	79.08	4	-3.10	8	31,695		225.9
43	44	3,656.0	34.675	41	24	Comb D- 7	1,800.5	13,724	0000	596.7	79.08	4	-3.10	8	18,988		225.9
43	44	3,656.0	34.675	41	24	Comb U- 0	2,254.8	6,139	0000	596.7	79.08	4	-3.10	4	2,790	*	225.9
43	44	3,656.0	34.675	41	24	Comb U- 1	1,337.9	3,491	0000	596.7	79.08	4	-3.10	4	2,787	*	225.9
43	44	3,656.0	34.675	41	24	Comb U- 2	2,251.2	6,195	0000	596.7	79.08	4	-3.10	4	2,788	*	225.9
43	44	3,656.0	34.675	41	24	Comb U- 3	2,789.2	7,371	0000	596.7	79.08	4	-3.10	4	2,794	*	225.9
44	45	3,796.3	33.222	42	24	Comb D- 0	1,870.3	14,354	0000	620.9	62.38	3	-2.22	8	22,798		223.1
44	45	3,796.3	33.222	42	24	Comb D- 1	1,012.9	7,683	0000	620.9	62.38	3	-2.22	8	34,384		223.1
44	45	3,796.3	33.222	42	24	Comb D- 2	1,794.4	13,760	0000	620.9	62.38	3	-2.22	8	22,856		223.1
44	45	3,796.3	33.222	42	24	Comb D- 3	1,821.9	13,996	0000	620.9	62.38	3	-2.22	8	23,091		223.1
44	45	3,796.3	33.222	42	24	Comb D- 4	1,836.8	14,087	0000	620.9	62.38	3	-2.22	8	22,932		223.1
44	45	3,796.3	33.222	42	24	Comb D- 5	1,881.5	14,450	0000	620.9	62.38	3	-2.22	8	22,655		223.1
44	45	3,796.3	33.222	42	24	Comb D- 6	1,011.1	7,677	0000	620.9	62.38	3	-2.22	8	34,411		223.1
44	45	3,796.3	33.222	42	24	Comb D- 7	1,838.3	14,124	0000	620.9	62.38	3	-2.22	8	22,701		223.1
44	45	3,796.3	33.222	42	24	Comb U- 0	2,966.0	7,915	0000	620.9	62.38	3	-2.22	4	2,791	*	223.1
44	45	3,796.3	33.222	42	24	Comb U- 1	1,263.8	3,507	0000	620.9	62.38	3	-2.22	4	2,787	*	223.1
44	45	3,796.3	33.222	42	24	Comb U- 2	2,297.2	6,426	0000	620.9	62.38	3	-2.22	4	2,781	*	223.1
44	45	3,796.3	33.222	42	24	Comb U- 3	3,116.5	8,456	0000	620.9	62.38	3	-2.22	4	2,802	*	223.1
45	46	3,885.1	32.330	43	24	Comb D- 0	2,002.9	15,395	0000	645.1	64	3	-1.75	8	25,116		221.2
45	46	3,885.1	32.330	43	24	Comb D- 1	1,087.3	8,285	0000	645.1	64	3	-1.75	8	35,926		221.2
45	46	3,885.1	32.330	43	24	Comb D- 2	1,807.7	14,003	0000	645.1	64	3	-1.75	8	25,101		221.2
45	46	3,885.1	32.330	43	24	Comb D- 3	1,799.6	13,833	0000	645.1	64	3	-1.75	8	25,364		221.2
45	46	3,885.1	32.330	43	24	Comb D- 4	1,781.4	13,682	0000	645.1	64	3	-1.75	8	25,325		221.2
45	46	3,885.1	32.330	43	24	Comb D- 5	1,744.4	13,405	0000	645.1	64	3	-1.75	8	25,515		221.2
45	46	3,885.1	32.330	43	24	Comb D- 6	1,026.9	7,802	0000	645.1	64	3	-1.75	8	36,048		221.2
45	46	3,885.1	32.330	43	24	Comb D- 7	1,976.5	15,228	0000	645.1	64	3	-1.75	8	24,926		221.2
45	46	3,885.1	32.330	43	24	Comb U- 0	1,741.2	4,956	0000	645.1	64	3	-1.75	4	2,797	*	221.2
45	46	3,885.1	32.330	43	24	Comb U- 1	1,301.7	3,633	0000	645.1	64	3	-1.75	4	2,784	*	221.2
45	46	3,885.1	32.330	43	24	Comb U- 2	3,261.8	9,003	0000	645.1	64	3	-1.75	4	2,785	*	221.2
45	46	3,885.1	32.330	43	24	Comb U- 3	4,260.3	11,467	0000	645.1	64	3	-1.75	4	2,801	*	221.2
46	47	3,976.2	31.445	44	24	Comb D- 0	1,732.0	13,314	0000	362.9	64.13	3	-2.72	8	27,503		219.4
46	47	3,976.2	31.445	44	24	Comb D- 1	733.6	5,571	0000	362.9	64.13	3	-2.72	8	41,811		219.4
46	47	3,976.2	31.445	44	24	Comb D- 2	2,051.2	15,898	0000	362.9	64.13	3	-2.72	8	27,125		219.4

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
46	47	3,976.2	31.445	44	24	Comb D- 3	2,176.7	16,807	0000	362.9	64.13	3	-2.72	8	27,082		219.4
46	47	3,976.2	31.445	44	24	Comb D- 4	2,084.1	16,233	0000	362.9	64.13	3	-2.72	8	26,957		219.4
46	47	3,976.2	31.445	44	24	Comb D- 5	1,858.0	14,478	0000	362.9	64.13	3	-2.72	8	27,272		219.4
46	47	3,976.2	31.445	44	24	Comb D- 6	897.0	6,853	0000	362.9	64.13	3	-2.72	8	37,187		219.4
46	47	3,976.2	31.445	44	24	Comb D- 7	1,616.2	12,436	0000	362.9	64.13	3	-2.72	8	27,357		219.4
46	47	3,976.2	31.445	44	24	Comb U- 0	5,751.3	15,506	0000	362.9	64.13	3	-2.72	4	2,800	*	219.4
46	47	3,976.2	31.445	44	24	Comb U- 1	1,572.6	4,373	0000	362.9	64.13	3	-2.72	4	10,687	*	219.4
46	47	3,976.2	31.445	44	24	Comb U- 2	1,073.3	3,734	0000	362.9	64.13	3	-2.72	4	2,797	*	219.4
46	47	3,976.2	31.445	44	24	Comb U- 3	606.2	2,444	0000	362.9	64.13	3	-2.72	4	2,798	*	219.4
47	48	4,065.4	30.595	45	24	Comb D- 0	2,070.2	16,109	0000	677.4	66.2	3	-2.51	8	29,544		217.7
47	48	4,065.4	30.595	45	24	Comb D- 1	1,074.0	8,269	0000	677.4	66.2	3	-2.51	8	38,469		217.7
47	48	4,065.4	30.595	45	24	Comb D- 2	1,750.2	13,585	0000	677.4	66.2	3	-2.51	8	29,019		217.7
47	48	4,065.4	30.595	45	24	Comb D- 3	1,820.0	14,089	0000	677.4	66.2	3	-2.51	8	29,010		217.7
47	48	4,065.4	30.595	45	24	Comb D- 4	1,917.5	14,875	0000	677.4	66.2	3	-2.51	8	29,060		217.7
47	48	4,065.4	30.595	45	24	Comb D- 5	2,067.1	16,066	0000	677.4	66.2	3	-2.51	8	29,018		217.7
47	48	4,065.4	30.595	45	24	Comb D- 6	1,191.7	9,170	0000	677.4	66.2	3	-2.51	8	38,357		217.7
47	48	4,065.4	30.595	45	24	Comb D- 7	2,101.0	16,402	0000	677.4	66.2	3	-2.51	8	29,458		217.7
47	48	4,065.4	30.595	45	24	Comb U- 0	1,132.5	3,694	0000	677.4	66.2	3	-2.51	4	2,806	*	217.7
47	48	4,065.4	30.595	45	24	Comb U- 1	831.9	2,513	0000	677.4	66.2	3	-2.51	4	2,804	*	217.7
47	48	4,065.4	30.595	45	24	Comb U- 2	3,680.7	10,080	0000	677.4	66.2	3	-2.51	4	2,804	*	217.7
47	48	4,065.4	30.595	45	24	Comb U- 3	3,578.4	10,028	0000	677.4	66.2	3	-2.51	4	2,810	*	217.7
48	49	4,155.7	29.757	46	24	Comb D- 0	2,113.7	16,521	0000	693.5	67.89	3	-1.87	8	31,144		216.1
48	49	4,155.7	29.757	46	24	Comb D- 1	1,120.8	8,686	0000	693.5	67.89	3	-1.87	8	39,399		216.1
48	49	4,155.7	29.757	46	24	Comb D- 2	1,925.6	14,998	0000	693.5	67.89	3	-1.87	8	30,636		216.1
48	49	4,155.7	29.757	46	24	Comb D- 3	1,847.8	14,406	0000	693.5	67.89	3	-1.87	8	30,781		216.1
48	49	4,155.7	29.757	46	24	Comb D- 4	1,920.1	15,022	0000	693.5	67.89	3	-1.87	8	30,915		216.1
48	49	4,155.7	29.757	46	24	Comb D- 5	2,019.3	15,716	0000	693.5	67.89	3	-1.87	8	30,922		216.1
48	49	4,155.7	29.757	46	24	Comb D- 6	1,137.6	8,836	0000	693.5	67.89	3	-1.87	8	39,296		216.1
48	49	4,155.7	29.757	46	24	Comb D- 7	2,094.6	16,375	0000	693.5	67.89	3	-1.87	8	31,088		216.1
48	49	4,155.7	29.757	46	24	Comb U- 0	1,277.4	4,108	0000	693.5	67.89	3	-1.87	4	2,809	*	216.1
48	49	4,155.7	29.757	46	24	Comb U- 1	981.6	2,903	0000	693.5	67.89	3	-1.87	4	2,797	*	216.1
48	49	4,155.7	29.757	46	24	Comb U- 2	2,935.1	8,453	0000	693.5	67.89	3	-1.87	4	2,810	*	216.1
48	49	4,155.7	29.757	46	24	Comb U- 3	3,631.6	10,256	0000	693.5	67.89	3	-1.87	4	2,817	*	216.1

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
49	50	4,245.3	28.946	47	24	Comb D- 0	1,999.7	15,673	0000	387.1	70.73	3	-2.41	8	32,753		214.4
49	50	4,245.3	28.946	47	24	Comb D- 1	1,065.8	8,224	0000	387.1	70.73	3	-2.41	8	40,242		214.4
49	50	4,245.3	28.946	47	24	Comb D- 2	1,895.1	14,880	0000	387.1	70.73	3	-2.41	8	32,321		214.4
49	50	4,245.3	28.946	47	24	Comb D- 3	2,037.0	15,930	0000	387.1	70.73	3	-2.41	8	32,477		214.4
49	50	4,245.3	28.946	47	24	Comb D- 4	2,089.8	16,441	0000	387.1	70.73	3	-2.41	8	32,436		214.4
49	50	4,245.3	28.946	47	24	Comb D- 5	2,144.2	16,848	0000	387.1	70.73	3	-2.41	8	32,486		214.4
49	50	4,245.3	28.946	47	24	Comb D- 6	1,185.5	9,192	0000	387.1	70.73	3	-2.41	8	40,410		214.4
49	50	4,245.3	28.946	47	24	Comb D- 7	2,013.9	15,858	0000	387.1	70.73	3	-2.41	8	32,746		214.4
49	50	4,245.3	28.946	47	24	Comb U- 0	2,342.2	6,998	0000	387.1	70.73	3	-2.41	4	2,796	*	214.4
49	50	4,245.3	28.946	47	24	Comb U- 1	1,514.6	4,386	0000	387.1	70.73	3	-2.41	4	2,809	*	214.4
49	50	4,245.3	28.946	47	24	Comb U- 2	2,374.6	7,054	0000	387.1	70.73	3	-2.41	4	2,806	*	214.4
49	50	4,245.3	28.946	47	24	Comb U- 3	2,692.8	7,771	0000	387.1	70.73	3	-2.41	4	2,816	*	214.4
50	51	4,337.1	28.133	48	24	Comb D- 0	2,006.9	15,760	0000	725.8	72.49	3	-2.07	8	33,846		212.8
50	51	4,337.1	28.133	48	24	Comb D- 1	1,069.5	8,327	0000	725.8	72.49	3	-2.07	8	41,182		212.8
50	51	4,337.1	28.133	48	24	Comb D- 2	1,957.2	15,442	0000	725.8	72.49	3	-2.07	8	33,841		212.8
50	51	4,337.1	28.133	48	24	Comb D- 3	1,996.5	15,738	0000	725.8	72.49	3	-2.07	8	33,873		212.8
50	51	4,337.1	28.133	48	24	Comb D- 4	2,007.0	15,863	0000	725.8	72.49	3	-2.07	8	33,924		212.8
50	51	4,337.1	28.133	48	24	Comb D- 5	2,022.9	15,953	0000	725.8	72.49	3	-2.07	8	33,964		212.8
50	51	4,337.1	28.133	48	24	Comb D- 6	1,120.6	8,750	0000	725.8	72.49	3	-2.07	8	41,256		212.8
50	51	4,337.1	28.133	48	24	Comb D- 7	2,052.4	16,178	0000	725.8	72.49	3	-2.07	8	34,020		212.8
50	51	4,337.1	28.133	48	24	Comb U- 0	3,248.3	9,397	0000	725.8	72.49	3	-2.07	4	2,834	*	212.8
50	51	4,337.1	28.133	48	24	Comb U- 1	1,743.6	5,022	0000	725.8	72.49	3	-2.07	4	2,824	*	212.8
50	51	4,337.1	28.133	48	24	Comb U- 2	2,556.9	7,765	0000	725.8	72.49	3	-2.07	4	2,821	*	212.8
50	51	4,337.1	28.133	48	24	Comb U- 3	3,391.7	9,790	0000	725.8	72.49	3	-2.07	4	2,821	*	212.8
51	52	4,861.1	23.830	50	24	Comb D- 0	2,791.1	22,715	0000	1032.2	65.72	2	-1.95	8	29,562		206.5
51	52	4,861.1	23.830	50	24	Comb D- 1	1,692.3	13,635	0000	1032.2	65.72	2	-1.95	8	38,694		206.5
51	52	4,861.1	23.830	50	24	Comb D- 2	3,067.3	24,811	0000	1032.2	65.72	2	-1.95	8	27,451		206.5
51	52	4,861.1	23.830	50	24	Comb D- 3	2,805.1	22,672	0000	1032.2	65.72	2	-1.95	8	29,583		206.5
51	52	4,861.1	23.830	50	24	Comb D- 4	2,426.4	19,791	0000	1032.2	65.72	2	-1.95	8	32,450		206.5
51	52	4,861.1	23.830	50	24	Comb D- 5	2,193.5	17,821	0000	1032.2	65.72	2	-1.95	8	34,444		206.5
51	52	4,861.1	23.830	50	24	Comb D- 6	1,298.3	10,306	0000	1032.2	65.72	2	-1.95	8	42,015		206.5
51	52	4,861.1	23.830	50	24	Comb D- 7	2,432.7	19,810	0000	1032.2	65.72	2	-1.95	8	32,464		206.5
51	52	4,861.1	23.830	50	24	Comb U- 0	3,279.9	10,582	0000	1032.2	65.72	2	-1.95	4	2,866	*	206.5

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
51	52	4,861.1	23.830	50	24	Comb U- 1	2,560.3	7,865	0000	1032.2	65.72	2	-1.95	4	2,861	*	206.5
51	52	4,861.1	23.830	50	24	Comb U- 2	3,646.6	11,815	0000	1032.2	65.72	2	-1.95	4	2,866	*	206.5
51	52	4,861.1	23.830	50	24	Comb U- 3	3,267.1	10,719	0000	1032.2	65.72	2	-1.95	4	2,860	*	206.5
52	53	5,199.2	21.260	51	24	Comb D- 0	2,274.4	18,604	0000	580.6	69.54	2	-2.01	8	33,854		203.7
52	53	5,199.2	21.260	51	24	Comb D- 1	1,331.5	10,805	0000	580.6	69.54	2	-2.01	8	41,684		203.7
52	53	5,199.2	21.260	51	24	Comb D- 2	2,843.3	23,439	0000	580.6	69.54	2	-2.01	8	29,025		203.7
52	53	5,199.2	21.260	51	24	Comb D- 3	3,216.8	26,209	0000	580.6	69.54	2	-2.01	8	26,240		203.7
52	53	5,199.2	21.260	51	24	Comb D- 4	3,107.3	25,274	0000	580.6	69.54	2	-2.01	8	27,172		203.7
52	53	5,199.2	21.260	51	24	Comb D- 5	2,918.5	23,791	0000	580.6	69.54	2	-2.01	8	28,647		203.7
52	53	5,199.2	21.260	51	24	Comb D- 6	1,399.2	11,346	0000	580.6	69.54	2	-2.01	8	41,149		203.7
52	53	5,199.2	21.260	51	24	Comb D- 7	2,276.0	18,761	0000	580.6	69.54	2	-2.01	8	33,697		203.7
52	53	5,199.2	21.260	51	24	Comb U- 0	6,426.7	21,136	0000	580.6	69.54	2	-2.01	4	2,893	*	203.7
52	53	5,199.2	21.260	51	24	Comb U- 1	2,327.3	7,779	0000	580.6	69.54	2	-2.01	4	2,891	*	203.7
52	53	5,199.2	21.260	51	24	Comb U- 2	1,327.2	5,565	0000	580.6	69.54	2	-2.01	4	2,884	*	203.7
52	53	5,199.2	21.260	51	24	Comb U- 3	840.9	3,982	0000	580.6	69.54	2	-2.01	4	2,883	*	203.7
53	58	5,538.2	18.841	52	2	DLIS	401.5	3,190	0000	129.0	0.6	1	-0.02	1	49,470		201.5
54	59	5,538.9	18.836	52	2	DLIS	409.2	3,210	0000	129.0	0.6	1	-0.02	1	49,446		201.5
55	60	5,539.6	18.831	52	2	DLIS	401.9	3,194	0000	129.0	0.6	1	-0.02	1	49,464		201.5
56	65	5,543.0	18.806	52	2	DLIS	392.6	3,054	0000	129.0	0.6	1	-0.02	1	49,596		201.5
57	68	5,545.0	18.792	52	2	DLIS	374.7	2,930	0000	129.0	0.6	1	-0.02	1	49,738		201.5
58	69	5,545.7	18.787	52	2	DLIS	370.7	2,928	0000	129.0	0.6	1	-0.02	1	49,734		201.5
59	71	5,547.1	18.778	52	2	DLIS	371.9	2,918	0000	129.0	0.6	1	-0.02	1	49,738		201.5
60	72	5,547.8	18.773	52	2	DLIS	365.4	2,874	0000	129.0	0.6	1	-0.02	1	49,788		201.5
61	75	5,549.8	18.760	52	2	DLIS	355.1	2,796	0000	129.0	0.6	1	-0.02	1	49,866		201.5
62	78	5,551.9	18.746	52	2	DLIS	286.2	2,342	0000	129.0	0.6	1	-0.02	1	50,322		201.4
63	79	5,552.6	18.741	52	2	DLIS	293.9	2,344	0000	129.0	0.6	1	-0.02	1	50,314		201.4
64	82	5,554.6	18.726	52	2	DLIS	295.4	2,368	0000	129.0	0.6	1	-0.02	1	50,296		201.4
65	85	5,556.7	18.710	52	2	DLIS	275.3	2,176	0000	129.0	0.6	1	-0.02	1	50,484		201.4
66	86	5,557.4	18.706	52	2	DLIS	264.2	2,168	0000	129.0	0.6	1	-0.02	1	50,496		201.4
67	88	5,558.7	18.696	52	2	DLIS	270.7	2,128	0000	129.0	0.6	1	-0.02	1	50,546		201.4
68	89	5,559.4	18.692	52	2	DLIS	275.4	2,160	0000	129.0	0.6	1	-0.02	1	50,502		201.4
69	91	5,560.8	18.682	52	2	DLIS	287.0	2,260	0000	129.0	0.6	1	-0.02	1	50,408		201.4
70	92	5,561.5	18.677	52	2	DLIS	304.8	2,396	0000	129.0	0.6	1	-0.02	1	50,268		201.4

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
71	95	5,563.5	18.663	52	2	DLIS	325.8	2,460	0000	129.0	0.6	1	-0.02	1	50,216		201.4
72	96	5,564.2	18.658	52	2	DLIS	306.6	2,394	0000	129.0	0.6	1	-0.02	1	50,272		201.4
73	99	5,566.3	18.643	52	2	DLIS	299.2	2,350	0000	129.0	0.6	1	-0.02	1	50,314		201.4
74	102	5,568.3	18.628	52	2	DLIS	302.0	2,380	0000	129.0	0.6	1	-0.02	1	50,292		201.4
75	103	5,569.0	18.623	52	2	DLIS	306.2	2,446	0000	129.0	0.6	1	-0.02	1	50,212		201.4
76	105	5,570.4	18.613	52	2	DLIS	318.5	2,548	0000	129.0	0.6	1	-0.02	1	50,114		201.4
77	106	5,727.2	17.540	54	24	Comb D- 0	2,542.6	21,127	0000	580.6	66.03	2	-1.69	8	31,548		200.1
77	106	5,727.2	17.540	54	24	Comb D- 1	1,264.2	10,228	0000	580.6	66.03	2	-1.69	8	42,477		200.1
77	106	5,727.2	17.540	54	24	Comb D- 2	2,729.8	22,541	0000	580.6	66.03	2	-1.69	8	30,129		200.1
77	106	5,727.2	17.540	54	24	Comb D- 3	2,460.5	20,374	0000	580.6	66.03	2	-1.69	8	32,302		200.1
77	106	5,727.2	17.540	54	24	Comb D- 4	2,113.8	17,747	0000	580.6	66.03	2	-1.69	8	34,933		200.1
77	106	5,727.2	17.540	54	24	Comb D- 5	2,117.6	17,569	0000	580.6	66.03	2	-1.69	8	35,101		200.1
77	106	5,727.2	17.540	54	24	Comb D- 6	1,184.7	9,775	0000	580.6	66.03	2	-1.69	8	42,937		200.1
77	106	5,727.2	17.540	54	24	Comb D- 7	2,269.7	18,857	0000	580.6	66.03	2	-1.69	8	33,823		200.1
77	106	5,727.2	17.540	54	24	Comb U- 0	2,735.9	10,194	0000	580.6	66.03	2	-1.69	4	2,909	*	200.1
77	106	5,727.2	17.540	54	24	Comb U- 1	1,493.4	5,492	0000	580.6	66.03	2	-1.69	4	6,932	*	200.1
77	106	5,727.2	17.540	54	24	Comb U- 2	3,522.8	12,865	0000	580.6	66.03	2	-1.69	4	2,923	*	200.1
77	106	5,727.2	17.540	54	24	Comb U- 3	3,755.4	13,661	0000	580.6	66.03	2	-1.69	4	2,941	*	200.1
78	107	6,069.5	15.278	55	24	Comb D- 0	2,042.0	17,088	0000	516.1	61.87	2	-1.50	8	35,721		198.3
78	107	6,069.5	15.278	55	24	Comb D- 1	1,355.9	11,133	0000	516.1	61.87	2	-1.50	8	41,688		198.3
78	107	6,069.5	15.278	55	24	Comb D- 2	2,533.3	20,933	0000	516.1	61.87	2	-1.50	8	31,869		198.3
78	107	6,069.5	15.278	55	24	Comb D- 3	2,284.9	19,013	0000	516.1	61.87	2	-1.50	8	33,786		198.3
78	107	6,069.5	15.278	55	24	Comb D- 4	1,982.5	16,677	0000	516.1	61.87	2	-1.50	8	36,124		198.3
78	107	6,069.5	15.278	55	24	Comb D- 5	1,897.8	15,928	0000	516.1	61.87	2	-1.50	8	36,878		198.3
78	107	6,069.5	15.278	55	24	Comb D- 6	1,024.7	8,488	0000	516.1	61.87	2	-1.50	8	44,340		198.3
78	107	6,069.5	15.278	55	24	Comb D- 7	1,937.2	16,246	0000	516.1	61.87	2	-1.50	8	36,554		198.3
78	107	6,069.5	15.278	55	24	Comb U- 0	3,622.6	13,559	0000	516.1	61.87	2	-1.50	4	2,951	*	198.3
78	107	6,069.5	15.278	55	24	Comb U- 1	1,702.2	6,273	0000	516.1	61.87	2	-1.50	4	6,922	*	198.3
78	107	6,069.5	15.278	55	24	Comb U- 2	2,696.5	10,440	0000	516.1	61.87	2	-1.50	4	2,947	*	198.3
78	107	6,069.5	15.278	55	24	Comb U- 3	2,521.1	9,816	0000	516.1	61.87	2	-1.50	4	2,946	*	198.3
79	108	6,408.9	13.149	56	24	Comb D- 0	2,313.5	19,380	0000	548.4	63.69	2	-1.61	8	33,523		196.7
79	108	6,408.9	13.149	56	24	Comb D- 1	1,370.8	11,292	0000	548.4	63.69	2	-1.61	8	41,624		196.7
79	108	6,408.9	13.149	56	24	Comb D- 2	2,484.7	20,783	0000	548.4	63.69	2	-1.61	8	32,113		196.7

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
79	108	6,408.9	13.149	56	24	Comb D- 3	2,403.7	20,176	0000	548.4	63.69	2	-1.61	8	32,723		196.7
79	108	6,408.9	13.149	56	24	Comb D- 4	2,310.7	19,267	0000	548.4	63.69	2	-1.61	8	33,634		196.7
79	108	6,408.9	13.149	56	24	Comb D- 5	1,993.5	16,917	0000	548.4	63.69	2	-1.61	8	35,982		196.7
79	108	6,408.9	13.149	56	24	Comb D- 6	1,107.6	9,245	0000	548.4	63.69	2	-1.61	8	43,670		196.7
79	108	6,408.9	13.149	56	24	Comb D- 7	2,094.1	17,700	0000	548.4	63.69	2	-1.61	8	35,194		196.7
79	108	6,408.9	13.149	56	24	Comb U- 0	2,112.0	8,586	0000	548.4	63.69	2	-1.61	4	2,970	*	196.7
79	108	6,408.9	13.149	56	24	Comb U- 1	1,230.7	4,991	0000	548.4	63.69	2	-1.61	4	8,408	*	196.7
79	108	6,408.9	13.149	56	24	Comb U- 2	1,864.6	7,966	0000	548.4	63.69	2	-1.61	4	2,958	*	196.7
79	108	6,408.9	13.149	56	24	Comb U- 3	1,842.8	7,821	0000	548.4	63.69	2	-1.61	4	2,967	*	196.7
80	109	6,737.6	11.173	57	24	Comb D- 0	2,003.6	16,889	0000	1048.3	68.65	2	-1.53	8	36,092		195.3
80	109	6,737.6	11.173	57	24	Comb D- 1	1,077.2	9,072	0000	1048.3	68.65	2	-1.53	8	43,930		195.3
80	109	6,737.6	11.173	57	24	Comb D- 2	2,094.6	17,754	0000	1048.3	68.65	2	-1.53	8	35,229		195.3
80	109	6,737.6	11.173	57	24	Comb D- 3	2,185.6	18,596	0000	1048.3	68.65	2	-1.53	8	34,382		195.3
80	109	6,737.6	11.173	57	24	Comb D- 4	2,390.3	20,185	0000	1048.3	68.65	2	-1.53	8	32,792		195.3
80	109	6,737.6	11.173	57	24	Comb D- 5	2,348.3	19,702	0000	1048.3	68.65	2	-1.53	8	33,271		195.3
80	109	6,737.6	11.173	57	24	Comb D- 6	1,168.6	9,813	0000	1048.3	68.65	2	-1.53	8	43,188		195.3
80	109	6,737.6	11.173	57	24	Comb D- 7	2,013.4	17,054	0000	1048.3	68.65	2	-1.53	8	35,924		195.3
80	109	6,737.6	11.173	57	24	Comb U- 0	4,732.9	19,417	0000	1048.3	68.65	2	-1.53	4	2,987	*	195.3
80	109	6,737.6	11.173	57	24	Comb U- 1	1,964.9	8,335	0000	1048.3	68.65	2	-1.53	4	10,700	*	195.3
80	109	6,737.6	11.173	57	24	Comb U- 2	2,799.8	11,857	0000	1048.3	68.65	2	-1.53	4	3,008	*	195.3
80	109	6,737.6	11.173	57	24	Comb U- 3	1,313.5	6,152	0000	1048.3	68.65	2	-1.53	4	3,011	*	195.3
81	110	7,065.3	9.276	58	24	Comb D- 0	2,022.6	17,236	0000	1088.6	71.51	2	-1.48	8	35,817		194.1
81	110	7,065.3	9.276	58	24	Comb D- 1	1,155.9	9,696	0000	1088.6	71.51	2	-1.48	8	43,375		194.1
81	110	7,065.3	9.276	58	24	Comb D- 2	2,201.2	18,707	0000	1088.6	71.51	2	-1.48	8	34,349		194.1
81	110	7,065.3	9.276	58	24	Comb D- 3	2,286.0	19,443	0000	1088.6	71.51	2	-1.48	8	33,608		194.1
81	110	7,065.3	9.276	58	24	Comb D- 4	2,374.1	20,154	0000	1088.6	71.51	2	-1.48	8	32,907		194.1
81	110	7,065.3	9.276	58	24	Comb D- 5	2,342.3	19,855	0000	1088.6	71.51	2	-1.48	8	33,201		194.1
81	110	7,065.3	9.276	58	24	Comb D- 6	1,315.6	10,973	0000	1088.6	71.51	2	-1.48	8	42,103		194.1
81	110	7,065.3	9.276	58	24	Comb D- 7	2,193.8	18,553	0000	1088.6	71.51	2	-1.48	8	34,505		194.1
81	110	7,065.3	9.276	58	24	Comb U- 0	2,687.4	12,339	0000	1088.6	71.51	2	-1.48	4	3,042		194.1
81	110	7,065.3	9.276	58	24	Comb U- 1	1,458.4	6,475	0000	1088.6	71.51	2	-1.48	4	13,530		194.1
81	110	7,065.3	9.276	58	24	Comb U- 2	1,615.5	7,493	0000	1088.6	71.51	2	-1.48	4	3,062		194.1
81	110	7,065.3	9.276	58	24	Comb U- 3	794.2	4,442	0000	1088.6	71.51	2	-1.48	4	3,097		194.1

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
82	111	7,385.6	7.490	59	24	Comb D- 0	2,247.2	18,872	0000	620.9	72.14	2	-1.48	8	34,246		193
82	111	7,385.6	7.490	59	24	Comb D- 1	1,163.3	9,702	0000	620.9	72.14	2	-1.48	8	43,441		193
82	111	7,385.6	7.490	59	24	Comb D- 2	2,101.8	17,865	0000	620.9	72.14	2	-1.48	8	35,253		193
82	111	7,385.6	7.490	59	24	Comb D- 3	2,160.3	18,266	0000	620.9	72.14	2	-1.48	8	34,858		193
82	111	7,385.6	7.490	59	24	Comb D- 4	2,206.8	18,657	0000	620.9	72.14	2	-1.48	8	34,465		193
82	111	7,385.6	7.490	59	24	Comb D- 5	2,273.0	19,231	0000	620.9	72.14	2	-1.48	8	33,896		193
82	111	7,385.6	7.490	59	24	Comb D- 6	1,233.8	10,370	0000	620.9	72.14	2	-1.48	8	42,775		193
82	111	7,385.6	7.490	59	24	Comb D- 7	2,256.8	19,047	0000	620.9	72.14	2	-1.48	8	34,072		193
82	111	7,385.6	7.490	59	24	Comb U- 0	3,216.1	15,217	0000	620.9	72.14	2	-1.48	4	3,144		193
82	111	7,385.6	7.490	59	24	Comb U- 1	1,874.3	8,618	0000	620.9	72.14	2	-1.48	4	15,305		193
82	111	7,385.6	7.490	59	24	Comb U- 2	1,957.4	9,901	0000	620.9	72.14	2	-1.48	4	3,293		193
82	111	7,385.6	7.490	59	24	Comb U- 3	2,718.4	12,709	0000	620.9	72.14	2	-1.48	4	3,234		193
83	112	7,724.7	5.670	60	24	Comb D- 0	2,309.3	19,210	0000	645.1	74.46	2	-1.48	8	33,975		191.9
83	112	7,724.7	5.670	60	24	Comb D- 1	1,231.3	10,139	0000	645.1	74.46	2	-1.48	8	43,065		191.9
83	112	7,724.7	5.670	60	24	Comb D- 2	2,135.3	17,918	0000	645.1	74.46	2	-1.48	8	35,268		191.9
83	112	7,724.7	5.670	60	24	Comb D- 3	2,193.6	18,371	0000	645.1	74.46	2	-1.48	8	34,814		191.9
83	112	7,724.7	5.670	60	24	Comb D- 4	2,242.2	18,808	0000	645.1	74.46	2	-1.48	8	34,376		191.9
83	112	7,724.7	5.670	60	24	Comb D- 5	2,261.9	18,911	0000	645.1	74.46	2	-1.48	8	34,273		191.9
83	112	7,724.7	5.670	60	24	Comb D- 6	1,285.9	10,617	0000	645.1	74.46	2	-1.48	8	42,581		191.9
83	112	7,724.7	5.670	60	24	Comb D- 7	2,367.7	19,721	0000	645.1	74.46	2	-1.48	8	33,459		191.9
83	112	7,724.7	5.670	60	24	Comb U- 0	2,649.2	13,493	0000	645.1	74.46	2	-1.48	4	3,466		191.9
83	112	7,724.7	5.670	60	24	Comb U- 1	1,694.8	8,235	0000	645.1	74.46	2	-1.48	4	17,212		191.9
83	112	7,724.7	5.670	60	24	Comb U- 2	2,893.4	14,263	0000	645.1	74.46	2	-1.48	4	3,391		191.9
83	112	7,724.7	5.670	60	24	Comb U- 3	2,782.4	13,996	0000	645.1	74.46	2	-1.48	4	3,383		191.9
84	113	8,046.9	4.009	61	2	DLIS	227.8	1,866	0000	129.0	0.6	1	-0.01	1	51,390		191.2
85	115	8,048.3	4.002	61	2	DLIS	239.1	1,878	0000	129.0	0.6	1	-0.01	1	51,366		191.2
86	116	8,049.0	3.999	61	2	DLIS	239.1	1,884	0000	129.0	0.6	1	-0.01	1	51,380		191.2
87	119	8,051.0	3.989	61	2	DLIS	239.3	1,880	0000	129.0	0.6	1	-0.01	1	51,380		191.2
88	122	8,053.1	3.978	61	2	DLIS	240.4	1,888	0000	129.0	0.6	1	-0.01	1	51,376		191.2
89	123	8,053.8	3.975	61	2	DLIS	241.6	1,900	0000	129.0	0.6	1	-0.01	1	51,356		191.2
90	126	8,055.8	3.965	61	2	DLIS	245.0	1,932	0000	129.0	0.6	1	-0.01	1	51,330		191.2
91	129	8,057.9	3.954	61	2	DLIS	245.8	1,966	0000	129.0	0.6	1	-0.01	1	51,298		191.1
92	130	8,058.6	3.951	61	2	DLIS	252.3	1,992	0000	129.0	0.6	1	-0.01	1	51,270		191.1

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
93	132	8,060.0	3.944	61	2	DLIS	254.6	1,986	0000	129.0	0.6	1	-0.01	1	51,268		191.1
94	133	8,060.6	3.940	61	2	DLIS	256.4	2,020	0000	129.0	0.6	1	-0.01	1	51,246		191.1
95	136	8,062.7	3.930	61	2	DLIS	259.1	2,052	0000	129.0	0.6	1	-0.01	1	51,204		191.1
96	139	8,064.8	3.919	61	2	DLIS	266.4	2,102	0000	129.0	0.6	1	-0.01	1	51,160		191.1
97	140	8,065.5	3.916	61	2	DLIS	271.9	2,170	0000	129.0	0.6	1	-0.01	1	51,086		191.1
98	142	8,066.8	3.909	61	2	DLIS	276.4	2,176	0000	129.0	0.6	1	-0.01	1	51,090		191.1
99	143	8,067.5	3.906	61	2	DLIS	272.7	2,176	0000	129.0	0.6	1	-0.01	1	51,078		191.1
100	146	8,069.6	3.895	61	2	DLIS	284.2	2,236	0000	129.0	0.6	1	-0.01	1	51,030		191.1
101	149	8,071.6	3.884	61	2	DLIS	286.4	2,262	0000	129.0	0.6	1	-0.01	1	50,996		191.1
102	150	8,072.3	3.881	61	2	DLIS	289.8	2,262	0000	129.0	0.6	1	-0.01	1	51,000		191.1
103	152	8,073.7	3.874	61	2	DLIS	281.9	2,256	0000	129.0	0.6	1	-0.01	1	51,008		191.1
104	153	8,074.4	3.870	61	2	DLIS	284.1	2,226	0000	129.0	0.6	1	-0.01	1	51,032		191.1
105	156	8,076.4	3.860	61	2	DLIS	281.1	2,194	0000	129.0	0.6	1	-0.01	1	51,068		191.1
106	159	8,078.5	3.850	61	2	DLIS	273.2	2,162	0000	129.0	0.6	1	-0.01	1	51,094		191.1
107	160	8,079.2	3.847	61	2	DLIS	272.9	2,162	0000	129.0	0.6	1	-0.01	1	51,100		191.1
108	162	8,080.5	3.840	61	2	DLIS	279.1	2,202	0000	129.0	0.6	1	-0.01	1	51,068		191.1
109	163	8,081.2	3.836	61	2	DLIS	276.7	2,198	0000	129.0	0.6	1	-0.01	1	51,064		191.1
110	166	8,083.3	3.825	61	2	DLIS	274.9	2,144	0000	129.0	0.6	1	-0.01	1	51,122		191.1
111	169	8,085.3	3.815	61	2	DLIS	262.6	2,106	0000	129.0	0.6	1	-0.01	1	51,162		191.1
112	171	8,232.2	3.079	64	4	Comb dwn	4,101.1	33,558	0000	1991.8	8.02	1	-0.15	1	19,664		190.7
112	171	8,232.2	3.079	64	4	Comb up	1,130.2	7,314	0000	1991.8	8.02	1	-0.15	1	3,014		190.7
113	172	8,271.8	2.880	65	4	Comb dwn	3,947.6	32,402	0000	1991.8	8.02	1	-0.14	1	20,832		190.7
113	172	8,271.8	2.880	65	4	Comb up	1,422.3	9,136	0000	1991.8	8.02	1	-0.14	1	3,042		190.7
114	174	8,320.9	2.638	67	4	Comb dwn	3,699.2	30,132	0000	1991.8	8.02	1	-0.15	1	23,112		190.6
114	174	8,320.9	2.638	67	4	Comb up	4,407.8	24,166	0000	1991.8	8.02	1	-0.15	1	3,044		190.6
115	176	8,369.4	2.399	69	4	Comb dwn	3,623.4	29,392	0000	1991.8	8.02	1	-0.15	1	23,854		190.4
115	176	8,369.4	2.399	69	4	Comb up	7,568.2	42,304	0000	1991.8	8.02	1	-0.15	1	3,050		190.4
116	178	8,417.8	2.163	71	4	Comb dwn	3,545.5	28,548	0000	1991.8	8.02	1	-0.15	1	24,720		190.3
116	178	8,417.8	2.163	71	4	Comb up	5,987.4	33,246	0000	1991.8	8.02	1	-0.15	1	3,046		190.3
117	182	8,516.8	1.680	75	4	Comb dwn	3,164.7	25,438	0000	1677.3	8.02	1	-0.16	1	27,846		190.1
117	182	8,516.8	1.680	75	4	Comb up	4,059.3	22,902	0000	1677.3	8.02	1	-0.16	1	3,078		190.1
118	184	8,566.1	1.444	77	4	Comb dwn	3,351.4	26,940	0000	1749.9	8.02	1	-0.15	1	26,346		190
118	184	8,566.1	1.444	77	4	Comb up	2,628.2	15,604	0000	1749.9	8.02	1	-0.15	1	3,080		190

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
119	186	8,614.7	1.207	79	4	Comb dwn	3,964.2	31,722	0000	1991.8	8.02	1	-0.17	1	21,576		189.9
119	186	8,614.7	1.207	79	4	Comb up	1,382.6	9,274	0000	1991.8	8.02	1	-0.17	1	3,010		189.9
120	188	8,664.5	0.966	81	4	Comb dwn	4,168.0	33,154	0000	1991.8	8.02	1	-0.14	1	20,132		189.9
120	188	8,664.5	0.966	81	4	Comb up	914.1	6,560	0000	1991.8	8.02	1	-0.14	1	3,062		189.9
121	190	8,712.5	0.734	83	4	Comb dwn	4,273.0	33,858	0000	1991.8	8.02	1	-0.15	1	19,428		189.8
121	190	8,712.5	0.734	83	4	Comb up	846.6	5,912	0000	1991.8	8.02	1	-0.15	1	3,018		189.8
122	192	8,762.8	0.495	85	4	Comb dwn	4,401.7	33,890	0001	1991.8	8.02	1	-0.15	1	19,332		189.7
122	192	8,762.8	0.495	85	4	Comb up	1,158.4	7,212	0001	1991.8	8.02	1	-0.15	1	3,056		189.7
123	194	8,825.2	0.203	91	2	Comb-b D	2,014.5	17,326	0001	999.9	1.02	1	-0.02	1	35,896		189.6
123	194	8,825.2	0.203	91	2	Comb-b U	289.7	3,056	0001	999.9	1.02	1	-0.02	1	12,772		189.6
124	196	8,832.0	0.170	93	2	Comb-b D	1,949.2	16,826	0001	999.9	1.02	1	-0.02	1	36,396		189.6
124	196	8,832.0	0.170	93	2	Comb-b U	297.2	3,168	0001	999.9	1.02	1	-0.02	1	12,932		189.6
125	199	8,845.0	0.109	96	2	Comb-b D	1,796.7	15,598	0001	999.9	1.02	1	-0.02	1	37,624		189.6
125	199	8,845.0	0.109	96	2	Comb-b U	1,843.6	11,584	0001	999.9	1.02	1	-0.02	1	12,176		189.6
126	202	8,850.2	0.085	99	2	Comb-b D	1,793.7	15,330	0001	999.9	1.02	1	-0.02	1	37,892		189.6
126	202	8,850.2	0.085	99	2	Comb-b U	2,447.9	15,052	0001	999.9	1.02	1	-0.02	1	11,176		189.6
127	204	8,853.6	0.069	101	2	Comb-b D	1,802.0	15,338	0001	999.9	1.02	1	-0.02	1	37,884		189.5
127	204	8,853.6	0.069	101	2	Comb-b U	2,737.9	16,868	0001	999.9	1.02	1	-0.02	1	10,660		189.5
128	206	8,857.0	0.053	103	2	Comb-b D	1,877.6	15,582	0001	999.9	1.02	1	-0.02	1	37,640		189.5
128	206	8,857.0	0.053	103	2	Comb-b U	3,072.5	18,960	0001	999.9	1.02	1	-0.02	1	11,520		189.5
129	208	8,860.4	0.036	105	2	Comb-d D	-284.7	-38	0001	999.9	1.02	1	-0.02	1	48,024		189.5
129	208	8,860.4	0.036	105	2	Comb-d U	-227.0	-40	0001	999.9	1.02	1	-0.02	1	12,340		189.5
130	210	8,863.9	0.021	107	2	Comb-b D	2,649.7	17,402	0001	999.9	1.02	1	-0.02	1	35,820		189.5
130	210	8,863.9	0.021	107	2	Comb-b U	3,166.2	19,636	0001	999.9	1.02	1	-0.02	1	10,568		189.5
131	213	8,869.0	0.004	110	2	Comb-d D	-279.1	-34	0001	999.9	1.02	1	-0.02	1	48,044		189.5
131	213	8,869.0	0.004	110	2	Comb-d U	-228.7	-42	0001	999.9	1.02	1	-0.02	1	12,468		189.5
132	219	8,879.2	0.000	116	2	Comb-b D	49,544.8	50,132	0001	999.9	1.02	1	0.00	1	3,076		189.5
132	219	8,879.2	0.000	116	2	Comb-b U	4,216.7	18,900	0001	999.9	1.02	1	0.00	1	10,024		189.5
133	220	8,880.4	0.000	117	2	Comb-b D	49,551.7	50,144	0001	999.9	1.02	1	0.00	1	3,068		189.5
133	220	8,880.4	0.000	117	2	Comb-b U	4,293.5	19,088	0001	999.9	1.02	1	0.00	1	9,540		189.5
134	221	8,882.2	0.000	118	2	Comb-b D	49,544.7	50,132	0001	999.9	1.02	1	0.00	1	3,068		189.5
134	221	8,882.2	0.000	118	2	Comb-b U	4,295.7	19,208	0001	999.9	1.02	1	0.00	1	9,656		189.5
135	222	8,883.4	0.000	119	2	Comb-b D	49,544.5	50,132	0001	999.9	1.02	1	0.00	1	3,072		189.5

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
135	222	8,883.4	0.000	119	2	Comb-b U	4,384.6	19,764	0001	999.9	1.02	1	0.00	1	9,656		189.5
136	225	8,888.4	0.000	122	2	Comb-b D	49,545.1	50,136	0001	999.9	1.02	1	0.00	1	3,068		189.5
136	225	8,888.4	0.000	122	2	Comb-b U	4,450.1	20,240	0001	999.9	1.02	1	0.00	1	9,532		189.5
137	229	8,894.3	0.000	126	2	Comb-b D	49,545.8	50,140	0001	999.9	1.02	1	0.00	1	3,072		189.5
137	229	8,894.3	0.000	126	2	Comb-b U	4,459.7	20,132	0001	999.9	1.02	1	0.00	1	9,436		189.5
138	230	8,895.4	0.000	127	2	Comb-b D	49,545.6	50,136	0001	999.9	1.02	1	0.00	1	3,068		189.5
138	230	8,895.4	0.000	127	2	Comb-b U	4,479.0	20,236	0001	999.9	1.02	1	0.00	1	9,448		189.5
139	233	8,900.6	0.000	130	2	Comb-d D	-139.5	226	0001	999.9	1.02	1	0.00	1	47,848		189.5
139	233	8,900.6	0.000	130	2	Comb-d U	-187.8	26	0001	999.9	1.02	1	0.00	1	13,268		189.5
140	235	8,903.5	0.000	132	2	Comb-b D	49,545.6	50,136	0001	999.9	1.02	1	0.00	1	3,068		189.5
140	235	8,903.5	0.000	132	2	Comb-b U	4,504.1	20,384	0001	999.9	1.02	1	0.00	1	10,248		189.5
141	239	8,909.7	0.000	136	2	Comb-b D	49,545.7	50,136	0001	999.9	1.02	1	0.00	1	3,068		189.5
141	239	8,909.7	0.000	136	2	Comb-b U	4,464.9	20,116	0001	999.9	1.02	1	0.00	1	10,260		189.5
142	242	8,914.6	0.000	139	2	Comb-b D	49,544.5	50,132	0001	999.9	1.02	1	0.00	1	3,072		189.5
142	242	8,914.6	0.000	139	2	Comb-b U	4,489.2	20,324	0001	999.9	1.02	1	0.00	1	9,416		189.5
143	243	8,915.8	0.000	140	2	Comb-d D	15.4	358	0001	999.9	1.02	1	0.00	1	47,820		189.5
143	243	8,915.8	0.000	140	2	Comb-d U	-213.5	-24	0001	999.9	1.02	1	0.00	1	12,308		189.5
144	244	8,918.0	0.000	141	4	Comb dwn	43,207.5	50,038	0001	467.7	2.08	1	0.00	1	3,082		189.5
144	244	8,918.0	0.000	141	4	Comb up	2,231.2	9,578	0001	467.7	2.08	1	0.00	1	29,828		189.5
145	245	8,924.1	0.000	142	4	Comb dwn	41,058.0	50,071	0001	250.0	2.08	1	0.00	1	3,068		189.5
145	245	8,924.1	0.000	142	4	Comb up	1,208.4	5,183	0001	250.0	2.08	1	0.00	1	41,741		189.5
146	246	8,932.1	0.000	143	4	Comb dwn	38,849.1	50,106	0001	121.0	2.08	1	0.00	1	3,070		189.5
146	246	8,932.1	0.000	143	4	Comb up	590.8	2,523	0001	121.0	2.08	1	0.00	1	49,343		189.5
147	247	8,942.0	0.000	144	4	Comb dwn	35,414.4	50,204	0001	64.5	2.08	1	0.00	1	3,070		189.5
147	247	8,942.0	0.000	144	4	Comb up	322.4	1,355	0001	64.5	2.08	1	0.00	1	53,242		189.5
148	248	8,950.3	0.000	145	4	Comb dwn	31,160.3	50,208	0001	32.3	2.08	1	0.00	1	3,125		189.5
148	248	8,950.3	0.000	145	4	Comb up	169.6	685	0001	32.3	2.08	1	0.00	1	55,438		189.5
149	249	8,959.2	0.000	146	4	Comb dwn	17,352.3	34,693	0001	16.1	2.08	1	0.00	1	18,667		189.5
149	249	8,959.2	0.000	146	4	Comb up	92.0	351	0001	16.1	2.08	1	0.00	1	56,557		189.5
150	250	8,967.5	0.000	147	4	Comb dwn	8,692.4	17,364	0001	8.1	2.08	1	0.00	1	35,997		189.5
150	250	8,967.5	0.000	147	4	Comb up	52.5	181	0001	8.1	2.08	1	0.00	1	57,151		189.5
151	251	8,975.9	0.000	148	4	Comb dwn	8,670.3	17,318	0001	8.1	2.08	1	0.00	1	36,043		189.5
151	251	8,975.9	0.000	148	4	Comb up	52.5	182	0001	8.1	2.08	1	0.00	1	57,155		189.5

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
152	252	8,984.1	0.000	149	4	Comb dwn	8,650.0	17,277	0001	8.1	2.08	1	0.00	1	36,088		189.5
152	252	8,984.1	0.000	149	4	Comb up	52.5	182	0001	8.1	2.08	1	0.00	1	57,173		189.5
153	253	8,992.4	0.000	150	4	Comb dwn	8,664.4	17,309	0001	8.1	2.08	1	0.00	1	36,055		189.5
153	253	8,992.4	0.000	150	4	Comb up	52.6	182	0001	8.1	2.08	1	0.00	1	57,162		189.5
154	254	9,000.7	0.000	151	4	Comb dwn	8,659.7	17,295	0001	8.1	2.08	1	0.00	1	36,069		189.5
154	254	9,000.7	0.000	151	4	Comb up	52.7	183	0001	8.1	2.08	1	0.00	1	57,141		189.5
155	255	9,015.3	0.000	152	24	Comb D- 0	44,242.7	49,789	0001	693.5	81.74	2	0.00	8	3,068		189.5
155	255	9,015.3	0.000	152	24	Comb D- 1	44,463.0	50,023	0001	693.5	81.74	2	0.00	8	3,066		189.5
155	255	9,015.3	0.000	152	24	Comb D- 2	44,224.6	49,757	0001	693.5	81.74	2	0.00	8	3,069		189.5
155	255	9,015.3	0.000	152	24	Comb D- 3	44,230.9	49,777	0001	693.5	81.74	2	0.00	8	3,066		189.5
155	255	9,015.3	0.000	152	24	Comb D- 4	44,222.3	49,781	0001	693.5	81.74	2	0.00	8	3,071		189.5
155	255	9,015.3	0.000	152	24	Comb D- 5	44,246.8	49,783	0001	693.5	81.74	2	0.00	8	3,071		189.5
155	255	9,015.3	0.000	152	24	Comb D- 6	44,417.3	50,012	0001	693.5	81.74	2	0.00	8	3,070		189.5
155	255	9,015.3	0.000	152	24	Comb D- 7	44,218.3	49,788	0001	693.5	81.74	2	0.00	8	3,068		189.5
155	255	9,015.3	0.000	152	24	Comb U- 0	5,918.8	25,717	0001	693.5	81.74	2	0.00	4	4,322		189.5
155	255	9,015.3	0.000	152	24	Comb U- 1	3,275.1	14,145	0001	693.5	81.74	2	0.00	4	20,538		189.5
155	255	9,015.3	0.000	152	24	Comb U- 2	5,918.7	25,710	0001	693.5	81.74	2	0.00	4	4,292		189.5
155	255	9,015.3	0.000	152	24	Comb U- 3	5,925.2	25,725	0001	693.5	81.74	2	0.00	4	4,298		189.5
156	256	9,373.3	0.000	153	24	Comb D- 0	44,425.2	50,012	0001	620.9	81.76	2	0.00	8	3,064		190.3
156	256	9,373.3	0.000	153	24	Comb D- 1	42,076.2	50,104	0001	620.9	81.76	2	0.00	8	3,064		190.3
156	256	9,373.3	0.000	153	24	Comb D- 2	44,496.2	50,005	0001	620.9	81.76	2	0.00	8	3,070		190.3
156	256	9,373.3	0.000	153	24	Comb D- 3	44,461.2	50,004	0001	620.9	81.76	2	0.00	8	3,064		190.3
156	256	9,373.3	0.000	153	24	Comb D- 4	44,444.6	50,005	0001	620.9	81.76	2	0.00	8	3,065		190.3
156	256	9,373.3	0.000	153	24	Comb D- 5	44,503.8	50,008	0001	620.9	81.76	2	0.00	8	3,063		190.3
156	256	9,373.3	0.000	153	24	Comb D- 6	42,102.6	50,098	0001	620.9	81.76	2	0.00	8	3,066		190.3
156	256	9,373.3	0.000	153	24	Comb D- 7	44,432.9	50,012	0001	620.9	81.76	2	0.00	8	3,065		190.3
156	256	9,373.3	0.000	153	24	Comb U- 0	2,928.6	12,636	0001	620.9	81.76	2	0.00	4	21,693		190.3
156	256	9,373.3	0.000	153	24	Comb U- 1	1,611.5	6,940	0001	620.9	81.76	2	0.00	4	35,215		190.3
156	256	9,373.3	0.000	153	24	Comb U- 2	2,935.8	12,649	0001	620.9	81.76	2	0.00	4	21,618		190.3
156	256	9,373.3	0.000	153	24	Comb U- 3	2,936.4	12,652	0001	620.9	81.76	2	0.00	4	21,688		190.3
157	257	9,697.7	0.000	154	24	Comb D- 0	41,901.9	50,071	0001	161.3	79.5	2	0.00	8	3,053		191.4
157	257	9,697.7	0.000	154	24	Comb D- 1	40,274.5	50,072	0001	161.3	79.5	2	0.00	8	3,054		191.4
157	257	9,697.7	0.000	154	24	Comb D- 2	41,895.1	50,067	0001	161.3	79.5	2	0.00	8	3,057		191.4

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
157	257	9,697.7	0.000	154	24	Comb D- 3	41,907.1	50,066	0001	161.3	79.5	2	0.00	8	3,054		191.4
157	257	9,697.7	0.000	154	24	Comb D- 4	41,881.9	50,063	0001	161.3	79.5	2	0.00	8	3,059		191.4
157	257	9,697.7	0.000	154	24	Comb D- 5	41,909.3	50,059	0001	161.3	79.5	2	0.00	8	3,054		191.4
157	257	9,697.7	0.000	154	24	Comb D- 6	40,288.0	50,087	0001	161.3	79.5	2	0.00	8	3,054		191.4
157	257	9,697.7	0.000	154	24	Comb D- 7	41,865.1	50,073	0001	161.3	79.5	2	0.00	8	3,054		191.4
157	257	9,697.7	0.000	154	24	Comb U- 0	1,461.9	6,319	0001	161.3	79.5	2	0.00	4	35,173		191.4
157	257	9,697.7	0.000	154	24	Comb U- 1	779.3	3,351	0001	161.3	79.5	2	0.00	4	44,863		191.4
157	257	9,697.7	0.000	154	24	Comb U- 2	1,466.9	6,322	0001	161.3	79.5	2	0.00	4	35,207		191.4
157	257	9,697.7	0.000	154	24	Comb U- 3	1,461.9	6,316	0001	161.3	79.5	2	0.00	4	35,182		191.4
158	258	10,002.3	0.000	155	24	Comb D- 0	39,994.3	50,034	0001	145.2	79.54	2	0.00	8	3,044		192.7
158	258	10,002.3	0.000	155	24	Comb D- 1	36,061.7	50,066	0001	145.2	79.54	2	0.00	8	3,047		192.7
158	258	10,002.3	0.000	155	24	Comb D- 2	39,977.7	50,045	0001	145.2	79.54	2	0.00	8	3,044		192.7
158	258	10,002.3	0.000	155	24	Comb D- 3	39,988.9	50,040	0001	145.2	79.54	2	0.00	8	3,044		192.7
158	258	10,002.3	0.000	155	24	Comb D- 4	39,984.6	50,039	0001	145.2	79.54	2	0.00	8	3,045		192.7
158	258	10,002.3	0.000	155	24	Comb D- 5	39,997.1	50,036	0001	145.2	79.54	2	0.00	8	3,046		192.7
158	258	10,002.3	0.000	155	24	Comb D- 6	36,083.4	50,072	0001	145.2	79.54	2	0.00	8	3,053		192.7
158	258	10,002.3	0.000	155	24	Comb D- 7	39,976.6	50,036	0001	145.2	79.54	2	0.00	8	3,046		192.7
158	258	10,002.3	0.000	155	24	Comb U- 0	699.3	3,022	0001	145.2	79.54	2	0.00	4	44,655		192.7
158	258	10,002.3	0.000	155	24	Comb U- 1	357.7	1,524	0001	145.2	79.54	2	0.00	4	50,849		192.7
158	258	10,002.3	0.000	155	24	Comb U- 2	700.2	3,025	0001	145.2	79.54	2	0.00	4	44,780		192.7
158	258	10,002.3	0.000	155	24	Comb U- 3	698.2	3,019	0001	145.2	79.54	2	0.00	4	44,827		192.7
159	259	10,314.2	0.000	156	24	Comb D- 0	36,119.9	50,014	0001	72.6	81.75	2	0.00	8	3,037		193.9
159	259	10,314.2	0.000	156	24	Comb D- 1	30,546.6	50,023	0001	72.6	81.75	2	0.00	8	3,095		193.9
159	259	10,314.2	0.000	156	24	Comb D- 2	36,129.3	50,011	0001	72.6	81.75	2	0.00	8	3,034		193.9
159	259	10,314.2	0.000	156	24	Comb D- 3	36,116.2	50,010	0001	72.6	81.75	2	0.00	8	3,035		193.9
159	259	10,314.2	0.000	156	24	Comb D- 4	36,116.3	50,007	0001	72.6	81.75	2	0.00	8	3,033		193.9
159	259	10,314.2	0.000	156	24	Comb D- 5	36,123.2	50,006	0001	72.6	81.75	2	0.00	8	3,035		193.9
159	259	10,314.2	0.000	156	24	Comb D- 6	30,509.7	50,019	0001	72.6	81.75	2	0.00	8	3,091		193.9
159	259	10,314.2	0.000	156	24	Comb D- 7	36,128.2	50,013	0001	72.6	81.75	2	0.00	8	3,040		193.9
159	259	10,314.2	0.000	156	24	Comb U- 0	356.5	1,526	0001	72.6	81.75	2	0.00	4	50,058		193.9
159	259	10,314.2	0.000	156	24	Comb U- 1	167.0	686	0001	72.6	81.75	2	0.00	4	54,013		193.9
159	259	10,314.2	0.000	156	24	Comb U- 2	357.1	1,525	0001	72.6	81.75	2	0.00	4	50,012		193.9
159	259	10,314.2	0.000	156	24	Comb U- 3	357.3	1,527	0001	72.6	81.75	2	0.00	4	50,016		193.9

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
160	260	10,610.8	0.000	157	24	Comb D- 0	30,379.6	49,957	0001	16.1	81.73	2	0.00	8	3,088		195.1
160	260	10,610.8	0.000	157	24	Comb D- 1	16,936.2	33,910	0001	16.1	81.73	2	0.00	8	19,163		195.1
160	260	10,610.8	0.000	157	24	Comb D- 2	30,456.5	49,966	0001	16.1	81.73	2	0.00	8	3,085		195.1
160	260	10,610.8	0.000	157	24	Comb D- 3	30,434.3	49,965	0001	16.1	81.73	2	0.00	8	3,085		195.1
160	260	10,610.8	0.000	157	24	Comb D- 4	30,457.6	49,963	0001	16.1	81.73	2	0.00	8	3,087		195.1
160	260	10,610.8	0.000	157	24	Comb D- 5	30,472.5	49,961	0001	16.1	81.73	2	0.00	8	3,087		195.1
160	260	10,610.8	0.000	157	24	Comb D- 6	16,696.1	33,417	0001	16.1	81.73	2	0.00	8	19,648		195.1
160	260	10,610.8	0.000	157	24	Comb D- 7	30,366.7	49,958	0001	16.1	81.73	2	0.00	8	3,090		195.1
160	260	10,610.8	0.000	157	24	Comb U- 0	165.4	690	0001	16.1	81.73	2	0.00	4	53,601		195.1
160	260	10,610.8	0.000	157	24	Comb U- 1	88.6	349	0001	16.1	81.73	2	0.00	4	55,488		195.1
160	260	10,610.8	0.000	157	24	Comb U- 2	166.2	689	0001	16.1	81.73	2	0.00	4	53,585		195.1
160	260	10,610.8	0.000	157	24	Comb U- 3	165.9	689	0001	16.1	81.73	2	0.00	4	53,614		195.1
161	261	10,907.4	0.000	158	24	Comb D- 0	16,851.7	33,747	0001	16.1	81.8	2	0.00	8	19,255		196.3
161	261	10,907.4	0.000	158	24	Comb D- 1	8,419.8	16,854	0001	16.1	81.8	2	0.00	8	36,150		196.3
161	261	10,907.4	0.000	158	24	Comb D- 2	16,874.4	33,795	0001	16.1	81.8	2	0.00	8	19,204		196.3
161	261	10,907.4	0.000	158	24	Comb D- 3	16,925.0	33,898	0001	16.1	81.8	2	0.00	8	19,110		196.3
161	261	10,907.4	0.000	158	24	Comb D- 4	16,892.3	33,827	0001	16.1	81.8	2	0.00	8	19,179		196.3
161	261	10,907.4	0.000	158	24	Comb D- 5	16,807.4	33,653	0001	16.1	81.8	2	0.00	8	19,351		196.3
161	261	10,907.4	0.000	158	24	Comb D- 6	8,328.3	16,664	0001	16.1	81.8	2	0.00	8	36,342		196.3
161	261	10,907.4	0.000	158	24	Comb D- 7	16,840.0	33,723	0001	16.1	81.8	2	0.00	8	19,279		196.3
161	261	10,907.4	0.000	158	24	Comb U- 0	87.2	351	0001	16.1	81.8	2	0.00	4	55,227		196.3
161	261	10,907.4	0.000	158	24	Comb U- 1	47.6	178	0001	16.1	81.8	2	0.00	4	56,285		196.3
161	261	10,907.4	0.000	158	24	Comb U- 2	88.5	350	0001	16.1	81.8	2	0.00	4	55,214		196.3
161	261	10,907.4	0.000	158	24	Comb U- 3	88.0	351	0001	16.1	81.8	2	0.00	4	55,244		196.3
162	262	11,183.5	0.000	159	24	Comb D- 0	8,343.4	16,700	0001	8.1	81.73	2	0.00	8	36,242		197.4
162	262	11,183.5	0.000	159	24	Comb D- 1	8,342.6	16,695	0001	8.1	81.73	2	0.00	8	36,252		197.4
162	262	11,183.5	0.000	159	24	Comb D- 2	8,329.0	16,668	0001	8.1	81.73	2	0.00	8	36,279		197.4
162	262	11,183.5	0.000	159	24	Comb D- 3	8,320.1	16,651	0001	8.1	81.73	2	0.00	8	36,293		197.4
162	262	11,183.5	0.000	159	24	Comb D- 4	8,340.4	16,693	0001	8.1	81.73	2	0.00	8	36,251		197.4
162	262	11,183.5	0.000	159	24	Comb D- 5	8,347.4	16,706	0001	8.1	81.73	2	0.00	8	36,234		197.4
162	262	11,183.5	0.000	159	24	Comb D- 6	8,346.8	16,705	0001	8.1	81.73	2	0.00	8	36,237		197.4
162	262	11,183.5	0.000	159	24	Comb D- 7	8,359.3	16,733	0001	8.1	81.73	2	0.00	8	36,209		197.4
162	262	11,183.5	0.000	159	24	Comb U- 0	48.0	181	0001	8.1	81.73	2	0.00	4	56,102		197.4

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
162	262	11,183.5	0.000	159	24	Comb U- 1	48.6	181	0001	8.1	81.73	2	0.00	4	56,104		197.4
162	262	11,183.5	0.000	159	24	Comb U- 2	47.7	180	0001	8.1	81.73	2	0.00	4	56,116		197.4
162	262	11,183.5	0.000	159	24	Comb U- 3	47.9	180	0001	8.1	81.73	2	0.00	4	56,120		197.4
163	263	11,464.8	0.000	160	24	Comb D- 0	8,277.4	16,565	0001	8.1	81.74	2	0.00	8	36,321		198.6
163	263	11,464.8	0.000	160	24	Comb D- 1	8,311.9	16,635	0001	8.1	81.74	2	0.00	8	36,248		198.6
163	263	11,464.8	0.000	160	24	Comb D- 2	8,279.9	16,572	0001	8.1	81.74	2	0.00	8	36,311		198.6
163	263	11,464.8	0.000	160	24	Comb D- 3	8,273.6	16,561	0001	8.1	81.74	2	0.00	8	36,318		198.6
163	263	11,464.8	0.000	160	24	Comb D- 4	8,326.6	16,667	0001	8.1	81.74	2	0.00	8	36,213		198.6
163	263	11,464.8	0.000	160	24	Comb D- 5	8,293.3	16,599	0001	8.1	81.74	2	0.00	8	36,280		198.6
163	263	11,464.8	0.000	160	24	Comb D- 6	8,261.0	16,536	0001	8.1	81.74	2	0.00	8	36,341		198.6
163	263	11,464.8	0.000	160	24	Comb D- 7	8,271.2	16,554	0001	8.1	81.74	2	0.00	8	36,322		198.6
163	263	11,464.8	0.000	160	24	Comb U- 0	46.8	178	0001	8.1	81.74	2	0.00	4	55,929		198.6
163	263	11,464.8	0.000	160	24	Comb U- 1	47.6	179	0001	8.1	81.74	2	0.00	4	55,914		198.6
163	263	11,464.8	0.000	160	24	Comb U- 2	46.7	179	0001	8.1	81.74	2	0.00	4	55,928		198.6
163	263	11,464.8	0.000	160	24	Comb U- 3	47.3	179	0001	8.1	81.74	2	0.00	4	55,914		198.6
164	264	11,746.0	0.000	161	24	Comb D- 0	8,360.6	16,736	0001	8.1	81.75	2	0.00	8	36,082		199.7
164	264	11,746.0	0.000	161	24	Comb D- 1	8,283.5	16,580	0001	8.1	81.75	2	0.00	8	36,241		199.7
164	264	11,746.0	0.000	161	24	Comb D- 2	8,359.7	16,735	0001	8.1	81.75	2	0.00	8	36,079		199.7
164	264	11,746.0	0.000	161	24	Comb D- 3	8,320.5	16,656	0001	8.1	81.75	2	0.00	8	36,155		199.7
164	264	11,746.0	0.000	161	24	Comb D- 4	8,310.3	16,635	0001	8.1	81.75	2	0.00	8	36,178		199.7
164	264	11,746.0	0.000	161	24	Comb D- 5	8,324.7	16,664	0001	8.1	81.75	2	0.00	8	36,149		199.7
164	264	11,746.0	0.000	161	24	Comb D- 6	8,416.8	16,854	0001	8.1	81.75	2	0.00	8	35,956		199.7
164	264	11,746.0	0.000	161	24	Comb D- 7	8,371.2	16,757	0001	8.1	81.75	2	0.00	8	36,062		199.7
164	264	11,746.0	0.000	161	24	Comb U- 0	47.3	179	0001	8.1	81.75	2	0.00	4	55,742		199.7
164	264	11,746.0	0.000	161	24	Comb U- 1	46.7	178	0001	8.1	81.75	2	0.00	4	55,742		199.7
164	264	11,746.0	0.000	161	24	Comb U- 2	46.3	179	0001	8.1	81.75	2	0.00	4	55,730		199.7
164	264	11,746.0	0.000	161	24	Comb U- 3	47.1	179	0001	8.1	81.75	2	0.00	4	55,722		199.7
165	265	12,029.5	0.000	162	24	Comb D- 0	8,292.5	16,600	0001	8.1	79.49	2	0.00	8	36,152		200.8
165	265	12,029.5	0.000	162	24	Comb D- 1	8,307.7	16,631	0001	8.1	79.49	2	0.00	8	36,116		200.8
165	265	12,029.5	0.000	162	24	Comb D- 2	8,255.7	16,524	0001	8.1	79.49	2	0.00	8	36,226		200.8
165	265	12,029.5	0.000	162	24	Comb D- 3	8,290.3	16,598	0001	8.1	79.49	2	0.00	8	36,154		200.8
165	265	12,029.5	0.000	162	24	Comb D- 4	8,326.5	16,670	0001	8.1	79.49	2	0.00	8	36,080		200.8
165	265	12,029.5	0.000	162	24	Comb D- 5	8,275.7	16,568	0001	8.1	79.49	2	0.00	8	36,183		200.8

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
165	265	12,029.5	0.000	162	24	Comb D- 6	8,270.1	16,553	0001	8.1	79.49	2	0.00	8	36,200		200.8
165	265	12,029.5	0.000	162	24	Comb D- 7	8,311.8	16,638	0001	8.1	79.49	2	0.00	8	36,117		200.8
165	265	12,029.5	0.000	162	24	Comb U- 0	46.1	178	0001	8.1	79.49	2	0.00	4	55,552		200.8
165	265	12,029.5	0.000	162	24	Comb U- 1	46.2	178	0001	8.1	79.49	2	0.00	4	55,543		200.8
165	265	12,029.5	0.000	162	24	Comb U- 2	46.0	178	0001	8.1	79.49	2	0.00	4	55,539		200.8
165	265	12,029.5	0.000	162	24	Comb U- 3	46.1	179	0001	8.1	79.49	2	0.00	4	55,538		200.8
166	266	12,308.5	0.000	163	24	Comb D- 0	8,273.2	16,564	0001	8.1	81.77	2	0.00	8	36,129		201.7
166	266	12,308.5	0.000	163	24	Comb D- 1	8,264.6	16,546	0001	8.1	81.77	2	0.00	8	36,146		201.7
166	266	12,308.5	0.000	163	24	Comb D- 2	8,241.7	16,501	0001	8.1	81.77	2	0.00	8	36,191		201.7
166	266	12,308.5	0.000	163	24	Comb D- 3	8,299.3	16,617	0001	8.1	81.77	2	0.00	8	36,075		201.7
166	266	12,308.5	0.000	163	24	Comb D- 4	8,256.1	16,530	0001	8.1	81.77	2	0.00	8	36,162		201.7
166	266	12,308.5	0.000	163	24	Comb D- 5	8,300.9	16,618	0001	8.1	81.77	2	0.00	8	36,079		201.7
166	266	12,308.5	0.000	163	24	Comb D- 6	8,252.2	16,520	0001	8.1	81.77	2	0.00	8	36,177		201.7
166	266	12,308.5	0.000	163	24	Comb D- 7	8,252.7	16,521	0001	8.1	81.77	2	0.00	8	36,172		201.7
166	266	12,308.5	0.000	163	24	Comb U- 0	45.8	179	0001	8.1	81.77	2	0.00	4	55,380		201.7
166	266	12,308.5	0.000	163	24	Comb U- 1	45.7	178	0001	8.1	81.77	2	0.00	4	55,391		201.7
166	266	12,308.5	0.000	163	24	Comb U- 2	45.8	179	0001	8.1	81.77	2	0.00	4	55,402		201.7
166	266	12,308.5	0.000	163	24	Comb U- 3	45.0	179	0001	8.1	81.77	2	0.00	4	55,401		201.7
167	267	12,589.8	0.000	164	24	Comb D- 0	8,324.5	16,668	0001	8.1	81.78	2	0.00	8	35,976		202.6
167	267	12,589.8	0.000	164	24	Comb D- 1	8,313.7	16,646	0001	8.1	81.78	2	0.00	8	35,996		202.6
167	267	12,589.8	0.000	164	24	Comb D- 2	8,356.8	16,733	0001	8.1	81.78	2	0.00	8	35,909		202.6
167	267	12,589.8	0.000	164	24	Comb D- 3	8,367.0	16,753	0001	8.1	81.78	2	0.00	8	35,886		202.6
167	267	12,589.8	0.000	164	24	Comb D- 4	8,303.3	16,626	0001	8.1	81.78	2	0.00	8	36,019		202.6
167	267	12,589.8	0.000	164	24	Comb D- 5	8,351.7	16,728	0001	8.1	81.78	2	0.00	8	35,920		202.6
167	267	12,589.8	0.000	164	24	Comb D- 6	8,332.4	16,684	0001	8.1	81.78	2	0.00	8	35,960		202.6
167	267	12,589.8	0.000	164	24	Comb D- 7	8,363.0	16,747	0001	8.1	81.78	2	0.00	8	35,897		202.6
167	267	12,589.8	0.000	164	24	Comb U- 0	45.5	179	0001	8.1	81.78	2	0.00	4	55,195		202.6
167	267	12,589.8	0.000	164	24	Comb U- 1	45.0	178	0001	8.1	81.78	2	0.00	4	55,190		202.6
167	267	12,589.8	0.000	164	24	Comb U- 2	45.1	178	0001	8.1	81.78	2	0.00	4	55,209		202.6
167	267	12,589.8	0.000	164	24	Comb U- 3	45.3	178	0001	8.1	81.78	2	0.00	4	55,179		202.6
168	268	12,865.9	0.000	165	24	Comb D- 0	8,301.4	16,625	0001	8.1	79.54	2	0.00	8	35,974		203.3
168	268	12,865.9	0.000	165	24	Comb D- 1	8,263.7	16,547	0001	8.1	79.54	2	0.00	8	36,051		203.3
168	268	12,865.9	0.000	165	24	Comb D- 2	8,272.0	16,563	0001	8.1	79.54	2	0.00	8	36,038		203.3

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Max. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Min(p) (DN)	Sat ?	Temp. (K)
168	268	12,865.9	0.000	165	24	Comb D- 3	8,282.6	16,586	0001	8.1	79.54	2	0.00	8	36,017		203.3
168	268	12,865.9	0.000	165	24	Comb D- 4	8,287.0	16,595	0001	8.1	79.54	2	0.00	8	36,005		203.3
168	268	12,865.9	0.000	165	24	Comb D- 5	8,236.4	16,493	0001	8.1	79.54	2	0.00	8	36,107		203.3
168	268	12,865.9	0.000	165	24	Comb D- 6	8,261.2	16,543	0001	8.1	79.54	2	0.00	8	36,057		203.3
168	268	12,865.9	0.000	165	24	Comb D- 7	8,238.5	16,497	0001	8.1	79.54	2	0.00	8	36,101		203.3
168	268	12,865.9	0.000	165	24	Comb U- 0	44.7	178	0001	8.1	79.54	2	0.00	4	55,051		203.3
168	268	12,865.9	0.000	165	24	Comb U- 1	43.9	177	0001	8.1	79.54	2	0.00	4	55,055		203.3
168	268	12,865.9	0.000	165	24	Comb U- 2	44.7	178	0001	8.1	79.54	2	0.00	4	55,060		203.3
168	268	12,865.9	0.000	165	24	Comb U- 3	44.8	179	0001	8.1	79.54	2	0.00	4	55,070		203.3

Summary of DISR Downward Looking IR Spectrometer Data with Surface Footprint Information

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
0	1	143.2	142.145	1	24	Comb D- 0	58.0	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
0	1	143.2	142.145	1	24	Comb D- 1	57.9	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
0	1	143.2	142.145	1	24	Comb D- 2	56.3	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
0	1	143.2	142.145	1	24	Comb D- 3	56.3	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
0	1	143.2	142.145	1	24	Comb D- 4	56.9	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
0	1	143.2	142.145	1	24	Comb D- 5	57.1	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
0	1	143.2	142.145	1	24	Comb D- 6	57.6	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
0	1	143.2	142.145	1	24	Comb D- 7	57.7	0000	8.1	70.36	7	5.89	8		51.74	25.36	162.54	956.78
1	2	283.8	135.520	2	24	Comb D- 0	947.9	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
1	2	283.8	135.520	2	24	Comb D- 1	872.8	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
1	2	283.8	135.520	2	24	Comb D- 2	912.3	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
1	2	283.8	135.520	2	24	Comb D- 3	899.4	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
1	2	283.8	135.520	2	24	Comb D- 4	836.7	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
1	2	283.8	135.520	2	24	Comb D- 5	940.3	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
1	2	283.8	135.520	2	24	Comb D- 6	865.3	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
1	2	283.8	135.520	2	24	Comb D- 7	947.6	0000	129.0	61.11	3	3.45	8		49.33	24.18	154.96	533.99
2	3	436.4	128.856	3	24	Comb D- 0	1,000.0	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
2	3	436.4	128.856	3	24	Comb D- 1	918.4	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
2	3	436.4	128.856	3	24	Comb D- 2	1,073.0	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
2	3	436.4	128.856	3	24	Comb D- 3	1,027.1	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
2	3	436.4	128.856	3	24	Comb D- 4	975.0	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
2	3	436.4	128.856	3	24	Comb D- 5	1,059.9	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
2	3	436.4	128.856	3	24	Comb D- 6	928.3	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
2	3	436.4	128.856	3	24	Comb D- 7	1,042.2	0000	185.5	85.59	2	1.82	8		46.90	22.99	147.34	268.28
3	4	528.1	125.159	4	24	Comb D- 0	1,040.6	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
3	4	528.1	125.159	4	24	Comb D- 1	957.0	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
3	4	528.1	125.159	4	24	Comb D- 2	1,084.6	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
3	4	528.1	125.159	4	24	Comb D- 3	1,037.7	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
3	4	528.1	125.159	4	24	Comb D- 4	1,010.2	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
3	4	528.1	125.159	4	24	Comb D- 5	1,017.8	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
3	4	528.1	125.159	4	24	Comb D- 6	972.1	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
3	4	528.1	125.159	4	24	Comb D- 7	1,051.6	0000	145.2	83.58	2	0.24	8		45.55	22.33	143.11	34.95
4	5	715.3	118.082	5	4	Comb dwn	18,727.4	1110	8.1	10	1	-0.25	1		42.98	21.07	135.02	-34.34
5	6	781.6	115.736	6	4	Comb dwn	45.2	0000	8.1	7.89	1	-0.27	1		42.12	20.65	132.34	-35.94
6	7	789.9	115.431	6	2	Long down	39,765.7	0000	508.0	0.52	1	-0.02	1		42.01	20.59	131.99	-2.44

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
7	8	822.2	114.336	7	4	Comb dwn	18,743.9	1110	8.1	5.95	1	-0.24	1		41.61	20.4	130.74	-31.06
8	9	832.4	113.987	8	24	Comb D- 0	881.9	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
8	9	832.4	113.987	8	24	Comb D- 1	797.5	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
8	9	832.4	113.987	8	24	Comb D- 2	895.4	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
8	9	832.4	113.987	8	24	Comb D- 3	901.8	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
8	9	832.4	113.987	8	24	Comb D- 4	870.9	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
8	9	832.4	113.987	8	24	Comb D- 5	848.9	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
8	9	832.4	113.987	8	24	Comb D- 6	696.8	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
8	9	832.4	113.987	8	24	Comb D- 7	896.5	0000	121.0	68.19	3	-2.82	8		41.49	20.34	130.34	-368.18
9	10	958.8	107.005	9	24	Comb D- 0	811.8	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
9	10	958.8	107.005	9	24	Comb D- 1	643.0	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
9	10	958.8	107.005	9	24	Comb D- 2	837.7	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
9	10	958.8	107.005	9	24	Comb D- 3	840.9	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
9	10	958.8	107.005	9	24	Comb D- 4	826.5	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
9	10	958.8	107.005	9	24	Comb D- 5	775.1	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
9	10	958.8	107.005	9	24	Comb D- 6	596.8	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
9	10	958.8	107.005	9	24	Comb D- 7	813.4	0000	161.3	69.35	5	-4.49	8		38.95	19.09	122.35	-548.83
10	11	1,049.5	100.231	10	24	Comb D- 0	-281.8	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
10	11	1,049.5	100.231	10	24	Comb D- 1	626.3	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
10	11	1,049.5	100.231	10	24	Comb D- 2	720.6	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
10	11	1,049.5	100.231	10	24	Comb D- 3	713.5	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
10	11	1,049.5	100.231	10	24	Comb D- 4	702.8	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
10	11	1,049.5	100.231	10	24	Comb D- 5	708.1	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
10	11	1,049.5	100.231	10	24	Comb D- 6	744.2	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
10	11	1,049.5	100.231	10	24	Comb D- 7	729.5	0000	169.3	67.15	7	-6.82	8		36.48	17.88	114.61	-781.68
11	12	1,139.4	94.414	11	24	Comb D- 0	568.7	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
11	12	1,139.4	94.414	11	24	Comb D- 1	481.0	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
11	12	1,139.4	94.414	11	24	Comb D- 2	566.9	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
11	12	1,139.4	94.414	11	24	Comb D- 3	539.3	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
11	12	1,139.4	94.414	11	24	Comb D- 4	547.9	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
11	12	1,139.4	94.414	11	24	Comb D- 5	548.3	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
11	12	1,139.4	94.414	11	24	Comb D- 6	646.0	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
11	12	1,139.4	94.414	11	24	Comb D- 7	567.4	0000	112.9	61.71	8	-8.18	8		34.36	16.84	107.96	-883.19
12	13	1,229.1	89.113	12	24	Comb D- 0	642.0	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82
12	13	1,229.1	89.113	12	24	Comb D- 1	414.3	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82
12	13	1,229.1	89.113	12	24	Comb D- 2	605.2	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
12	13	1,229.1	89.113	12	24	Comb D- 3	606.3	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82
12	13	1,229.1	89.113	12	24	Comb D- 4	659.6	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82
12	13	1,229.1	89.113	12	24	Comb D- 5	599.8	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82
12	13	1,229.1	89.113	12	24	Comb D- 6	463.1	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82
12	13	1,229.1	89.113	12	24	Comb D- 7	640.1	0000	80.6	62.13	10	-10.06	8		32.43	15.9	101.9	-1024.82
13	14	1,318.5	84.362	13	24	Comb D- 0	762.9	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
13	14	1,318.5	84.362	13	24	Comb D- 1	431.8	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
13	14	1,318.5	84.362	13	24	Comb D- 2	799.1	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
13	14	1,318.5	84.362	13	24	Comb D- 3	786.1	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
13	14	1,318.5	84.362	13	24	Comb D- 4	750.9	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
13	14	1,318.5	84.362	13	24	Comb D- 5	782.2	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
13	14	1,318.5	84.362	13	24	Comb D- 6	461.4	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
13	14	1,318.5	84.362	13	24	Comb D- 7	771.6	0000	80.6	62.08	10	-9.73	8		30.71	15.05	96.46	-938.67
14	15	1,408.9	79.950	14	24	Comb D- 0	709.8	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
14	15	1,408.9	79.950	14	24	Comb D- 1	423.0	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
14	15	1,408.9	79.950	14	24	Comb D- 2	725.7	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
14	15	1,408.9	79.950	14	24	Comb D- 3	754.2	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
14	15	1,408.9	79.950	14	24	Comb D- 4	743.2	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
14	15	1,408.9	79.950	14	24	Comb D- 5	743.5	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
14	15	1,408.9	79.950	14	24	Comb D- 6	502.3	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
14	15	1,408.9	79.950	14	24	Comb D- 7	710.2	0000	112.9	62.9	9	-8.42	8		29.10	14.26	91.42	-769.61
15	16	1,532.8	74.559	15	24	Comb D- 0	500.3	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
15	16	1,532.8	74.559	15	24	Comb D- 1	555.0	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
15	16	1,532.8	74.559	15	24	Comb D- 2	502.8	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
15	16	1,532.8	74.559	15	24	Comb D- 3	511.2	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
15	16	1,532.8	74.559	15	24	Comb D- 4	506.0	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
15	16	1,532.8	74.559	15	24	Comb D- 5	509.2	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
15	16	1,532.8	74.559	15	24	Comb D- 6	571.3	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
15	16	1,532.8	74.559	15	24	Comb D- 7	505.6	0000	137.1	60.53	7	-6.85	8		27.14	13.3	85.25	-584.12
16	17	1,622.1	71.060	16	24	Comb D- 0	551.0	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41
16	17	1,622.1	71.060	16	24	Comb D- 1	619.4	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41
16	17	1,622.1	71.060	16	24	Comb D- 2	562.4	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41
16	17	1,622.1	71.060	16	24	Comb D- 3	559.6	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41
16	17	1,622.1	71.060	16	24	Comb D- 4	560.3	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41
16	17	1,622.1	71.060	16	24	Comb D- 5	577.4	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41
16	17	1,622.1	71.060	16	24	Comb D- 6	662.0	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
16	17	1,622.1	71.060	16	24	Comb D- 7	560.0	0000	112.9	60.68	7	-5.99	8		25.86	12.68	81.25	-486.41
17	18	1,711.7	67.959	17	24	Comb D- 0	579.9	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
17	18	1,711.7	67.959	17	24	Comb D- 1	647.6	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
17	18	1,711.7	67.959	17	24	Comb D- 2	602.6	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
17	18	1,711.7	67.959	17	24	Comb D- 3	597.3	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
17	18	1,711.7	67.959	17	24	Comb D- 4	594.3	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
17	18	1,711.7	67.959	17	24	Comb D- 5	590.8	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
17	18	1,711.7	67.959	17	24	Comb D- 6	664.1	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
17	18	1,711.7	67.959	17	24	Comb D- 7	576.8	0000	129.0	67.38	7	-6.16	8		24.74	12.12	77.71	-478.83
18	19	1,802.5	65.151	18	24	Comb D- 0	616.4	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
18	19	1,802.5	65.151	18	24	Comb D- 1	703.9	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
18	19	1,802.5	65.151	18	24	Comb D- 2	632.4	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
18	19	1,802.5	65.151	18	24	Comb D- 3	620.6	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
18	19	1,802.5	65.151	18	24	Comb D- 4	619.8	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
18	19	1,802.5	65.151	18	24	Comb D- 5	619.6	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
18	19	1,802.5	65.151	18	24	Comb D- 6	721.1	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
18	19	1,802.5	65.151	18	24	Comb D- 7	620.0	0000	145.2	64.22	6	-5.12	8		23.71	11.62	74.5	-381.11
19	20	1,897.7	62.529	19	4	Comb dwn	18,692.7	1110	8.1	2.83	1	-0.22	1		22.76	11.16	71.5	-15.62
20	21	1,955.9	61.062	20	4	Comb dwn	25.6	0000	8.1	3	1	-0.22	1		22.22	10.89	69.82	-15.24
21	22	1,959.4	60.975	20	2	Long down	28,597.1	0000	508.0	0.52	1	-0.04	1		22.19	10.88	69.72	-2.64
22	23	1,989.7	60.237	21	4	Comb dwn	18,677.5	1110	8.1	3	1	-0.21	1		21.92	10.75	68.88	-14.63
23	24	2,006.4	59.841	22	24	Comb D- 0	692.0	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
23	24	2,006.4	59.841	22	24	Comb D- 1	709.7	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
23	24	2,006.4	59.841	22	24	Comb D- 2	688.0	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
23	24	2,006.4	59.841	22	24	Comb D- 3	688.9	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
23	24	2,006.4	59.841	22	24	Comb D- 4	769.5	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
23	24	2,006.4	59.841	22	24	Comb D- 5	749.6	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
23	24	2,006.4	59.841	22	24	Comb D- 6	817.1	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
23	24	2,006.4	59.841	22	24	Comb D- 7	697.5	0000	209.7	63.53	5	-4.65	8		21.78	10.68	68.43	-317.92
24	25	2,095.5	57.809	23	24	Comb D- 0	663.0	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85
24	25	2,095.5	57.809	23	24	Comb D- 1	742.0	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85
24	25	2,095.5	57.809	23	24	Comb D- 2	715.0	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85
24	25	2,095.5	57.809	23	24	Comb D- 3	731.3	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85
24	25	2,095.5	57.809	23	24	Comb D- 4	735.0	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85
24	25	2,095.5	57.809	23	24	Comb D- 5	722.3	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85
24	25	2,095.5	57.809	23	24	Comb D- 6	806.5	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
24	25	2,095.5	57.809	23	24	Comb D- 7	677.5	0000	185.5	68.05	5	-4.61	8		21.04	10.31	66.1	-304.85
25	26	2,229.0	55.012	24	24	Comb D- 0	774.4	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
25	26	2,229.0	55.012	24	24	Comb D- 1	858.0	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
25	26	2,229.0	55.012	24	24	Comb D- 2	780.2	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
25	26	2,229.0	55.012	24	24	Comb D- 3	766.3	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
25	26	2,229.0	55.012	24	24	Comb D- 4	782.4	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
25	26	2,229.0	55.012	24	24	Comb D- 5	783.9	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
25	26	2,229.0	55.012	24	24	Comb D- 6	884.1	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
25	26	2,229.0	55.012	24	24	Comb D- 7	765.8	0000	201.6	82.71	5	-4.25	8		20.02	9.81	62.9	-267.20
26	27	2,320.6	53.229	25	24	Comb D- 0	861.9	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
26	27	2,320.6	53.229	25	24	Comb D- 1	969.5	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
26	27	2,320.6	53.229	25	24	Comb D- 2	875.5	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
26	27	2,320.6	53.229	25	24	Comb D- 3	862.8	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
26	27	2,320.6	53.229	25	24	Comb D- 4	861.2	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
26	27	2,320.6	53.229	25	24	Comb D- 5	855.1	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
26	27	2,320.6	53.229	25	24	Comb D- 6	960.8	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
26	27	2,320.6	53.229	25	24	Comb D- 7	855.2	0000	233.9	65.77	4	-3.10	8		19.37	9.5	60.86	-188.98
27	28	2,410.0	51.592	26	24	Comb D- 0	918.9	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
27	28	2,410.0	51.592	26	24	Comb D- 1	1,013.6	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
27	28	2,410.0	51.592	26	24	Comb D- 2	920.4	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
27	28	2,410.0	51.592	26	24	Comb D- 3	914.0	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
27	28	2,410.0	51.592	26	24	Comb D- 4	912.2	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
27	28	2,410.0	51.592	26	24	Comb D- 5	912.0	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
27	28	2,410.0	51.592	26	24	Comb D- 6	1,018.7	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
27	28	2,410.0	51.592	26	24	Comb D- 7	914.4	0000	250.0	70.41	4	-3.11	8		18.78	9.2	58.99	-183.59
28	29	2,509.2	49.865	27	4	Comb dwn	18,597.9	1110	8.1	4.54	1	-0.19	1		18.15	8.9	57.02	-10.90
29	30	2,561.9	48.979	28	4	Comb dwn	26.4	0000	8.1	4.41	1	-0.20	1		17.83	8.74	56.01	-11.28
30	31	2,566.7	48.897	28	2	Long down	14,489.3	0000	508.0	0.52	1	-0.02	1		17.80	8.72	55.91	-1.35
31	32	2,588.3	48.545	29	4	Comb dwn	18,580.2	1110	8.1	4.29	1	-0.19	1		17.67	8.66	55.51	-10.57
32	33	2,615.4	48.105	30	24	Comb D- 0	990.6	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68
32	33	2,615.4	48.105	30	24	Comb D- 1	930.0	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68
32	33	2,615.4	48.105	30	24	Comb D- 2	1,148.5	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68
32	33	2,615.4	48.105	30	24	Comb D- 3	1,164.3	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68
32	33	2,615.4	48.105	30	24	Comb D- 4	1,714.9	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68
32	33	2,615.4	48.105	30	24	Comb D- 5	1,376.3	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68
32	33	2,615.4	48.105	30	24	Comb D- 6	985.1	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
32	33	2,615.4	48.105	30	24	Comb D- 7	1,696.7	0000	516.1	69.45	4	-2.99	8		17.51	8.58	55.01	-164.68
33	34	2,705.7	46.687	31	24	Comb D- 0	1,760.1	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
33	34	2,705.7	46.687	31	24	Comb D- 1	978.6	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
33	34	2,705.7	46.687	31	24	Comb D- 2	1,348.3	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
33	34	2,705.7	46.687	31	24	Comb D- 3	1,965.8	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
33	34	2,705.7	46.687	31	24	Comb D- 4	2,025.0	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
33	34	2,705.7	46.687	31	24	Comb D- 5	1,953.4	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
33	34	2,705.7	46.687	31	24	Comb D- 6	1,021.4	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
33	34	2,705.7	46.687	31	24	Comb D- 7	1,802.2	0000	548.4	60.62	3	-2.73	8		16.99	8.33	53.38	-145.88
34	35	2,794.3	45.364	32	24	Comb D- 0	1,644.8	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
34	35	2,794.3	45.364	32	24	Comb D- 1	833.6	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
34	35	2,794.3	45.364	32	24	Comb D- 2	1,643.7	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
34	35	2,794.3	45.364	32	24	Comb D- 3	1,624.4	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
34	35	2,794.3	45.364	32	24	Comb D- 4	1,607.6	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
34	35	2,794.3	45.364	32	24	Comb D- 5	1,616.9	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
34	35	2,794.3	45.364	32	24	Comb D- 6	912.0	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
34	35	2,794.3	45.364	32	24	Comb D- 7	1,624.5	0000	516.1	66.38	4	-3.22	8		16.51	8.09	51.87	-167.07
35	36	2,885.4	44.052	33	24	Comb D- 0	1,553.6	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
35	36	2,885.4	44.052	33	24	Comb D- 1	1,079.7	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
35	36	2,885.4	44.052	33	24	Comb D- 2	1,584.2	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
35	36	2,885.4	44.052	33	24	Comb D- 3	2,053.9	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
35	36	2,885.4	44.052	33	24	Comb D- 4	2,189.6	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
35	36	2,885.4	44.052	33	24	Comb D- 5	2,038.3	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
35	36	2,885.4	44.052	33	24	Comb D- 6	1,119.4	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
35	36	2,885.4	44.052	33	24	Comb D- 7	1,502.3	0000	677.4	61.44	2	-2.66	8		16.03	7.86	50.37	-133.83
36	37	2,975.5	42.807	34	24	Comb D- 0	1,594.7	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
36	37	2,975.5	42.807	34	24	Comb D- 1	888.4	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
36	37	2,975.5	42.807	34	24	Comb D- 2	1,666.7	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
36	37	2,975.5	42.807	34	24	Comb D- 3	1,679.2	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
36	37	2,975.5	42.807	34	24	Comb D- 4	1,677.0	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
36	37	2,975.5	42.807	34	24	Comb D- 5	1,659.5	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
36	37	2,975.5	42.807	34	24	Comb D- 6	919.6	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
36	37	2,975.5	42.807	34	24	Comb D- 7	1,368.5	0000	290.3	70.83	4	-2.87	8		15.58	7.64	48.95	-140.34
37	38	3,115.4	40.959	35	24	Comb D- 0	1,642.5	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14
37	38	3,115.4	40.959	35	24	Comb D- 1	891.4	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14
37	38	3,115.4	40.959	35	24	Comb D- 2	1,536.2	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
37	38	3,115.4	40.959	35	24	Comb D- 3	1,563.7	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14
37	38	3,115.4	40.959	35	24	Comb D- 4	1,569.3	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14
37	38	3,115.4	40.959	35	24	Comb D- 5	1,553.1	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14
37	38	3,115.4	40.959	35	24	Comb D- 6	847.9	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14
37	38	3,115.4	40.959	35	24	Comb D- 7	1,531.0	0000	491.9	66.27	4	-2.69	8		14.91	7.31	46.83	-126.14
38	39	3,205.0	39.836	36	24	Comb D- 0	1,611.1	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
38	39	3,205.0	39.836	36	24	Comb D- 1	913.3	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
38	39	3,205.0	39.836	36	24	Comb D- 2	1,695.7	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
38	39	3,205.0	39.836	36	24	Comb D- 3	1,556.1	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
38	39	3,205.0	39.836	36	24	Comb D- 4	1,551.1	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
38	39	3,205.0	39.836	36	24	Comb D- 5	1,605.7	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
38	39	3,205.0	39.836	36	24	Comb D- 6	905.5	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
38	39	3,205.0	39.836	36	24	Comb D- 7	1,574.5	0000	508.0	68.57	4	-2.64	8		14.50	7.11	45.55	-120.35
39	40	3,295.3	38.729	37	24	Comb D- 0	1,604.6	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
39	40	3,295.3	38.729	37	24	Comb D- 1	895.1	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
39	40	3,295.3	38.729	37	24	Comb D- 2	1,666.9	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
39	40	3,295.3	38.729	37	24	Comb D- 3	1,589.1	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
39	40	3,295.3	38.729	37	24	Comb D- 4	1,586.6	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
39	40	3,295.3	38.729	37	24	Comb D- 5	1,696.0	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
39	40	3,295.3	38.729	37	24	Comb D- 6	941.5	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
39	40	3,295.3	38.729	37	24	Comb D- 7	1,656.9	0000	524.2	70.79	4	-3.01	8		14.10	6.91	44.28	-133.31
40	41	3,383.8	37.685	38	24	Comb D- 0	1,656.4	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
40	41	3,383.8	37.685	38	24	Comb D- 1	910.7	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
40	41	3,383.8	37.685	38	24	Comb D- 2	1,654.8	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
40	41	3,383.8	37.685	38	24	Comb D- 3	1,681.1	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
40	41	3,383.8	37.685	38	24	Comb D- 4	1,645.6	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
40	41	3,383.8	37.685	38	24	Comb D- 5	1,679.4	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
40	41	3,383.8	37.685	38	24	Comb D- 6	953.5	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
40	41	3,383.8	37.685	38	24	Comb D- 7	1,711.0	0000	298.4	72.96	4	-3.14	8		13.72	6.72	43.09	-135.28
41	42	3,475.4	36.636	39	24	Comb D- 0	1,752.0	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80
41	42	3,475.4	36.636	39	24	Comb D- 1	935.8	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80
41	42	3,475.4	36.636	39	24	Comb D- 2	1,690.9	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80
41	42	3,475.4	36.636	39	24	Comb D- 3	1,682.1	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80
41	42	3,475.4	36.636	39	24	Comb D- 4	1,716.5	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80
41	42	3,475.4	36.636	39	24	Comb D- 5	1,741.8	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80
41	42	3,475.4	36.636	39	24	Comb D- 6	951.8	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
41	42	3,475.4	36.636	39	24	Comb D- 7	1,653.0	0000	306.4	77.7	4	-3.05	8		13.33	6.54	41.89	-127.80
42	43	3,566.2	35.631	40	24	Comb D- 0	1,756.8	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
42	43	3,566.2	35.631	40	24	Comb D- 1	990.5	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
42	43	3,566.2	35.631	40	24	Comb D- 2	1,722.8	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
42	43	3,566.2	35.631	40	24	Comb D- 3	1,730.0	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
42	43	3,566.2	35.631	40	24	Comb D- 4	1,720.5	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
42	43	3,566.2	35.631	40	24	Comb D- 5	1,735.2	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
42	43	3,566.2	35.631	40	24	Comb D- 6	968.1	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
42	43	3,566.2	35.631	40	24	Comb D- 7	1,756.7	0000	314.5	76.52	4	-2.78	8		12.97	6.36	40.74	-113.28
43	44	3,656.0	34.675	41	24	Comb D- 0	1,814.2	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
43	44	3,656.0	34.675	41	24	Comb D- 1	876.9	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
43	44	3,656.0	34.675	41	24	Comb D- 2	1,812.4	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
43	44	3,656.0	34.675	41	24	Comb D- 3	1,796.7	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
43	44	3,656.0	34.675	41	24	Comb D- 4	1,777.8	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
43	44	3,656.0	34.675	41	24	Comb D- 5	1,781.1	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
43	44	3,656.0	34.675	41	24	Comb D- 6	975.0	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
43	44	3,656.0	34.675	41	24	Comb D- 7	1,800.5	0000	596.7	79.08	4	-3.10	8		12.62	6.19	39.65	-122.85
44	45	3,796.3	33.222	42	24	Comb D- 0	1,870.3	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
44	45	3,796.3	33.222	42	24	Comb D- 1	1,012.9	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
44	45	3,796.3	33.222	42	24	Comb D- 2	1,794.4	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
44	45	3,796.3	33.222	42	24	Comb D- 3	1,821.9	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
44	45	3,796.3	33.222	42	24	Comb D- 4	1,836.8	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
44	45	3,796.3	33.222	42	24	Comb D- 5	1,881.5	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
44	45	3,796.3	33.222	42	24	Comb D- 6	1,011.1	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
44	45	3,796.3	33.222	42	24	Comb D- 7	1,838.3	0000	620.9	62.38	3	-2.22	8		12.09	5.93	37.99	-84.17
45	46	3,885.1	32.330	43	24	Comb D- 0	2,002.9	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
45	46	3,885.1	32.330	43	24	Comb D- 1	1,087.3	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
45	46	3,885.1	32.330	43	24	Comb D- 2	1,807.7	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
45	46	3,885.1	32.330	43	24	Comb D- 3	1,799.6	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
45	46	3,885.1	32.330	43	24	Comb D- 4	1,781.4	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
45	46	3,885.1	32.330	43	24	Comb D- 5	1,744.4	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
45	46	3,885.1	32.330	43	24	Comb D- 6	1,026.9	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
45	46	3,885.1	32.330	43	24	Comb D- 7	1,976.5	0000	645.1	64	3	-1.75	8		11.77	5.77	36.97	-64.53
46	47	3,976.2	31.445	44	24	Comb D- 0	1,732.0	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67
46	47	3,976.2	31.445	44	24	Comb D- 1	733.6	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67
46	47	3,976.2	31.445	44	24	Comb D- 2	2,051.2	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
46	47	3,976.2	31.445	44	24	Comb D- 3	2,176.7	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67
46	47	3,976.2	31.445	44	24	Comb D- 4	2,084.1	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67
46	47	3,976.2	31.445	44	24	Comb D- 5	1,858.0	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67
46	47	3,976.2	31.445	44	24	Comb D- 6	897.0	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67
46	47	3,976.2	31.445	44	24	Comb D- 7	1,616.2	0000	362.9	64.13	3	-2.72	8		11.45	5.61	35.96	-97.67
47	48	4,065.4	30.595	45	24	Comb D- 0	2,070.2	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
47	48	4,065.4	30.595	45	24	Comb D- 1	1,074.0	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
47	48	4,065.4	30.595	45	24	Comb D- 2	1,750.2	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
47	48	4,065.4	30.595	45	24	Comb D- 3	1,820.0	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
47	48	4,065.4	30.595	45	24	Comb D- 4	1,917.5	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
47	48	4,065.4	30.595	45	24	Comb D- 5	2,067.1	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
47	48	4,065.4	30.595	45	24	Comb D- 6	1,191.7	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
47	48	4,065.4	30.595	45	24	Comb D- 7	2,101.0	0000	677.4	66.2	3	-2.51	8		11.14	5.46	34.98	-87.89
48	49	4,155.7	29.757	46	24	Comb D- 0	2,113.7	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
48	49	4,155.7	29.757	46	24	Comb D- 1	1,120.8	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
48	49	4,155.7	29.757	46	24	Comb D- 2	1,925.6	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
48	49	4,155.7	29.757	46	24	Comb D- 3	1,847.8	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
48	49	4,155.7	29.757	46	24	Comb D- 4	1,920.1	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
48	49	4,155.7	29.757	46	24	Comb D- 5	2,019.3	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
48	49	4,155.7	29.757	46	24	Comb D- 6	1,137.6	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
48	49	4,155.7	29.757	46	24	Comb D- 7	2,094.6	0000	693.5	67.89	3	-1.87	8		10.83	5.31	34.03	-63.67
49	50	4,245.3	28.946	47	24	Comb D- 0	1,999.7	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
49	50	4,245.3	28.946	47	24	Comb D- 1	1,065.8	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
49	50	4,245.3	28.946	47	24	Comb D- 2	1,895.1	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
49	50	4,245.3	28.946	47	24	Comb D- 3	2,037.0	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
49	50	4,245.3	28.946	47	24	Comb D- 4	2,089.8	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
49	50	4,245.3	28.946	47	24	Comb D- 5	2,144.2	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
49	50	4,245.3	28.946	47	24	Comb D- 6	1,185.5	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
49	50	4,245.3	28.946	47	24	Comb D- 7	2,013.9	0000	387.1	70.73	3	-2.41	8		10.54	5.16	33.1	-79.81
50	51	4,337.1	28.133	48	24	Comb D- 0	2,006.9	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47
50	51	4,337.1	28.133	48	24	Comb D- 1	1,069.5	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47
50	51	4,337.1	28.133	48	24	Comb D- 2	1,957.2	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47
50	51	4,337.1	28.133	48	24	Comb D- 3	1,996.5	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47
50	51	4,337.1	28.133	48	24	Comb D- 4	2,007.0	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47
50	51	4,337.1	28.133	48	24	Comb D- 5	2,022.9	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47
50	51	4,337.1	28.133	48	24	Comb D- 6	1,120.6	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
50	51	4,337.1	28.133	48	24	Comb D- 7	2,052.4	0000	725.8	72.49	3	-2.07	8		10.24	5.02	32.17	-66.47
51	52	4,861.1	23.830	50	24	Comb D- 0	2,791.1	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
51	52	4,861.1	23.830	50	24	Comb D- 1	1,692.3	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
51	52	4,861.1	23.830	50	24	Comb D- 2	3,067.3	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
51	52	4,861.1	23.830	50	24	Comb D- 3	2,805.1	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
51	52	4,861.1	23.830	50	24	Comb D- 4	2,426.4	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
51	52	4,861.1	23.830	50	24	Comb D- 5	2,193.5	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
51	52	4,861.1	23.830	50	24	Comb D- 6	1,298.3	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
51	52	4,861.1	23.830	50	24	Comb D- 7	2,432.7	0000	1032.2	65.72	2	-1.95	8		8.67	4.25	27.25	-53.23
52	53	5,199.2	21.260	51	24	Comb D- 0	2,274.4	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
52	53	5,199.2	21.260	51	24	Comb D- 1	1,331.5	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
52	53	5,199.2	21.260	51	24	Comb D- 2	2,843.3	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
52	53	5,199.2	21.260	51	24	Comb D- 3	3,216.8	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
52	53	5,199.2	21.260	51	24	Comb D- 4	3,107.3	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
52	53	5,199.2	21.260	51	24	Comb D- 5	2,918.5	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
52	53	5,199.2	21.260	51	24	Comb D- 6	1,399.2	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
52	53	5,199.2	21.260	51	24	Comb D- 7	2,276.0	0000	580.6	69.54	2	-2.01	8		7.74	3.79	24.31	-48.89
53	58	5,538.2	18.841	52	2	DLIS	401.5	0000	129.0	0.6	1	-0.02	1		6.86	3.36	21.54	-0.34
54	59	5,538.9	18.836	52	2	DLIS	409.2	0000	129.0	0.6	1	-0.02	1		6.86	3.36	21.54	-0.34
55	60	5,539.6	18.831	52	2	DLIS	401.9	0000	129.0	0.6	1	-0.02	1		6.85	3.36	21.53	-0.34
56	65	5,543.0	18.806	52	2	DLIS	392.6	0000	129.0	0.6	1	-0.02	1		6.84	3.35	21.5	-0.34
57	68	5,545.0	18.792	52	2	DLIS	374.7	0000	129.0	0.6	1	-0.02	1		6.84	3.35	21.49	-0.34
58	69	5,545.7	18.787	52	2	DLIS	370.7	0000	129.0	0.6	1	-0.02	1		6.84	3.35	21.48	-0.34
59	71	5,547.1	18.778	52	2	DLIS	371.9	0000	129.0	0.6	1	-0.02	1		6.83	3.35	21.47	-0.34
60	72	5,547.8	18.773	52	2	DLIS	365.4	0000	129.0	0.6	1	-0.02	1		6.83	3.35	21.47	-0.34
61	75	5,549.8	18.760	52	2	DLIS	355.1	0000	129.0	0.6	1	-0.02	1		6.83	3.35	21.45	-0.34
62	78	5,551.9	18.746	52	2	DLIS	286.2	0000	129.0	0.6	1	-0.02	1		6.82	3.34	21.44	-0.34
63	79	5,552.6	18.741	52	2	DLIS	293.9	0000	129.0	0.6	1	-0.02	1		6.82	3.34	21.43	-0.34
64	82	5,554.6	18.726	52	2	DLIS	295.4	0000	129.0	0.6	1	-0.02	1		6.82	3.34	21.41	-0.34
65	85	5,556.7	18.710	52	2	DLIS	275.3	0000	129.0	0.6	1	-0.02	1		6.81	3.34	21.39	-0.34
66	86	5,557.4	18.706	52	2	DLIS	264.2	0000	129.0	0.6	1	-0.02	1		6.81	3.34	21.39	-0.34
67	88	5,558.7	18.696	52	2	DLIS	270.7	0000	129.0	0.6	1	-0.02	1		6.80	3.34	21.38	-0.34
68	89	5,559.4	18.692	52	2	DLIS	275.4	0000	129.0	0.6	1	-0.02	1		6.80	3.33	21.37	-0.34
69	91	5,560.8	18.682	52	2	DLIS	287.0	0000	129.0	0.6	1	-0.02	1		6.80	3.33	21.36	-0.34
70	92	5,561.5	18.677	52	2	DLIS	304.8	0000	129.0	0.6	1	-0.02	1		6.80	3.33	21.36	-0.34
71	95	5,563.5	18.663	52	2	DLIS	325.8	0000	129.0	0.6	1	-0.02	1		6.79	3.33	21.34	-0.34

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
72	96	5,564.2	18.658	52	2	DLIS	306.6	0000	129.0	0.6	1	-0.02	1		6.79	3.33	21.33	-0.34
73	99	5,566.3	18.643	52	2	DLIS	299.2	0000	129.0	0.6	1	-0.02	1		6.79	3.33	21.32	-0.35
74	102	5,568.3	18.628	52	2	DLIS	302.0	0000	129.0	0.6	1	-0.02	1		6.78	3.32	21.3	-0.35
75	103	5,569.0	18.623	52	2	DLIS	306.2	0000	129.0	0.6	1	-0.02	1		6.78	3.32	21.29	-0.35
76	105	5,570.4	18.613	52	2	DLIS	318.5	0000	129.0	0.6	1	-0.02	1		6.77	3.32	21.28	-0.36
77	106	5,727.2	17.540	54	24	Comb D- 0	2,542.6	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
77	106	5,727.2	17.540	54	24	Comb D- 1	1,264.2	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
77	106	5,727.2	17.540	54	24	Comb D- 2	2,729.8	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
77	106	5,727.2	17.540	54	24	Comb D- 3	2,460.5	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
77	106	5,727.2	17.540	54	24	Comb D- 4	2,113.8	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
77	106	5,727.2	17.540	54	24	Comb D- 5	2,117.6	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
77	106	5,727.2	17.540	54	24	Comb D- 6	1,184.7	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
77	106	5,727.2	17.540	54	24	Comb D- 7	2,269.7	0000	580.6	66.03	2	-1.69	8		6.38	3.13	20.06	-33.91
78	107	6,069.5	15.278	55	24	Comb D- 0	2,042.0	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
78	107	6,069.5	15.278	55	24	Comb D- 1	1,355.9	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
78	107	6,069.5	15.278	55	24	Comb D- 2	2,533.3	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
78	107	6,069.5	15.278	55	24	Comb D- 3	2,284.9	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
78	107	6,069.5	15.278	55	24	Comb D- 4	1,982.5	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
78	107	6,069.5	15.278	55	24	Comb D- 5	1,897.8	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
78	107	6,069.5	15.278	55	24	Comb D- 6	1,024.7	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
78	107	6,069.5	15.278	55	24	Comb D- 7	1,937.2	0000	516.1	61.87	2	-1.50	8		5.56	2.73	17.47	-26.26
79	108	6,408.9	13.149	56	24	Comb D- 0	2,313.5	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
79	108	6,408.9	13.149	56	24	Comb D- 1	1,370.8	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
79	108	6,408.9	13.149	56	24	Comb D- 2	2,484.7	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
79	108	6,408.9	13.149	56	24	Comb D- 3	2,403.7	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
79	108	6,408.9	13.149	56	24	Comb D- 4	2,310.7	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
79	108	6,408.9	13.149	56	24	Comb D- 5	1,993.5	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
79	108	6,408.9	13.149	56	24	Comb D- 6	1,107.6	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
79	108	6,408.9	13.149	56	24	Comb D- 7	2,094.1	0000	548.4	63.69	2	-1.61	8		4.79	2.35	15.03	-24.26
80	109	6,737.6	11.173	57	24	Comb D- 0	2,003.6	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53
80	109	6,737.6	11.173	57	24	Comb D- 1	1,077.2	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53
80	109	6,737.6	11.173	57	24	Comb D- 2	2,094.6	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53
80	109	6,737.6	11.173	57	24	Comb D- 3	2,185.6	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53
80	109	6,737.6	11.173	57	24	Comb D- 4	2,390.3	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53
80	109	6,737.6	11.173	57	24	Comb D- 5	2,348.3	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53
80	109	6,737.6	11.173	57	24	Comb D- 6	1,168.6	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
80	109	6,737.6	11.173	57	24	Comb D- 7	2,013.4	0000	1048.3	68.65	2	-1.53	8		4.07	1.99	12.78	-19.53
81	110	7,065.3	9.276	58	24	Comb D- 0	2,022.6	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
81	110	7,065.3	9.276	58	24	Comb D- 1	1,155.9	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
81	110	7,065.3	9.276	58	24	Comb D- 2	2,201.2	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
81	110	7,065.3	9.276	58	24	Comb D- 3	2,286.0	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
81	110	7,065.3	9.276	58	24	Comb D- 4	2,374.1	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
81	110	7,065.3	9.276	58	24	Comb D- 5	2,342.3	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
81	110	7,065.3	9.276	58	24	Comb D- 6	1,315.6	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
81	110	7,065.3	9.276	58	24	Comb D- 7	2,193.8	0000	1088.6	71.51	2	-1.48	8		3.38	1.65	10.61	-15.65
82	111	7,385.6	7.490	59	24	Comb D- 0	2,247.2	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
82	111	7,385.6	7.490	59	24	Comb D- 1	1,163.3	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
82	111	7,385.6	7.490	59	24	Comb D- 2	2,101.8	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
82	111	7,385.6	7.490	59	24	Comb D- 3	2,160.3	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
82	111	7,385.6	7.490	59	24	Comb D- 4	2,206.8	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
82	111	7,385.6	7.490	59	24	Comb D- 5	2,273.0	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
82	111	7,385.6	7.490	59	24	Comb D- 6	1,233.8	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
82	111	7,385.6	7.490	59	24	Comb D- 7	2,256.8	0000	620.9	72.14	2	-1.48	8		2.73	1.34	8.56	-12.64
83	112	7,724.7	5.670	60	24	Comb D- 0	2,309.3	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
83	112	7,724.7	5.670	60	24	Comb D- 1	1,231.3	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
83	112	7,724.7	5.670	60	24	Comb D- 2	2,135.3	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
83	112	7,724.7	5.670	60	24	Comb D- 3	2,193.6	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
83	112	7,724.7	5.670	60	24	Comb D- 4	2,242.2	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
83	112	7,724.7	5.670	60	24	Comb D- 5	2,261.9	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
83	112	7,724.7	5.670	60	24	Comb D- 6	1,285.9	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
83	112	7,724.7	5.670	60	24	Comb D- 7	2,367.7	0000	645.1	74.46	2	-1.48	8		2.06	1.01	6.48	-9.60
84	113	8,046.9	4.009	61	2	DLIS	227.8	0000	129.0	0.6	1	-0.01	1		1.46	0.72	4.58	-0.05
85	115	8,048.3	4.002	61	2	DLIS	239.1	0000	129.0	0.6	1	-0.01	1		1.46	0.71	4.58	-0.05
86	116	8,049.0	3.999	61	2	DLIS	239.1	0000	129.0	0.6	1	-0.01	1		1.46	0.71	4.57	-0.05
87	119	8,051.0	3.989	61	2	DLIS	239.3	0000	129.0	0.6	1	-0.01	1		1.45	0.71	4.56	-0.05
88	122	8,053.1	3.978	61	2	DLIS	240.4	0000	129.0	0.6	1	-0.01	1		1.45	0.71	4.55	-0.05
89	123	8,053.8	3.975	61	2	DLIS	241.6	0000	129.0	0.6	1	-0.01	1		1.45	0.71	4.55	-0.05
90	126	8,055.8	3.965	61	2	DLIS	245.0	0000	129.0	0.6	1	-0.01	1		1.44	0.71	4.53	-0.05
91	129	8,057.9	3.954	61	2	DLIS	245.8	0000	129.0	0.6	1	-0.01	1		1.44	0.71	4.52	-0.05
92	130	8,058.6	3.951	61	2	DLIS	252.3	0000	129.0	0.6	1	-0.01	1		1.44	0.7	4.52	-0.05
93	132	8,060.0	3.944	61	2	DLIS	254.6	0000	129.0	0.6	1	-0.01	1		1.44	0.7	4.51	-0.05
94	133	8,060.6	3.940	61	2	DLIS	256.4	0000	129.0	0.6	1	-0.01	1		1.43	0.7	4.51	-0.05

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
95	136	8,062.7	3.930	61	2	DLIS	259.1	0000	129.0	0.6	1	-0.01	1		1.43	0.7	4.49	-0.05
96	139	8,064.8	3.919	61	2	DLIS	266.4	0000	129.0	0.6	1	-0.01	1		1.43	0.7	4.48	-0.05
97	140	8,065.5	3.916	61	2	DLIS	271.9	0000	129.0	0.6	1	-0.01	1		1.43	0.7	4.48	-0.05
98	142	8,066.8	3.909	61	2	DLIS	276.4	0000	129.0	0.6	1	-0.01	1		1.42	0.7	4.47	-0.05
99	143	8,067.5	3.906	61	2	DLIS	272.7	0000	129.0	0.6	1	-0.01	1		1.42	0.7	4.47	-0.05
100	146	8,069.6	3.895	61	2	DLIS	284.2	0000	129.0	0.6	1	-0.01	1		1.42	0.69	4.45	-0.05
101	149	8,071.6	3.884	61	2	DLIS	286.4	0000	129.0	0.6	1	-0.01	1		1.41	0.69	4.44	-0.05
102	150	8,072.3	3.881	61	2	DLIS	289.8	0000	129.0	0.6	1	-0.01	1		1.41	0.69	4.44	-0.05
103	152	8,073.7	3.874	61	2	DLIS	281.9	0000	129.0	0.6	1	-0.01	1		1.41	0.69	4.43	-0.05
104	153	8,074.4	3.870	61	2	DLIS	284.1	0000	129.0	0.6	1	-0.01	1		1.41	0.69	4.43	-0.05
105	156	8,076.4	3.860	61	2	DLIS	281.1	0000	129.0	0.6	1	-0.01	1		1.40	0.69	4.41	-0.05
106	159	8,078.5	3.850	61	2	DLIS	273.2	0000	129.0	0.6	1	-0.01	1		1.40	0.69	4.4	-0.05
107	160	8,079.2	3.847	61	2	DLIS	272.9	0000	129.0	0.6	1	-0.01	1		1.40	0.69	4.4	-0.05
108	162	8,080.5	3.840	61	2	DLIS	279.1	0000	129.0	0.6	1	-0.01	1		1.40	0.69	4.39	-0.05
109	163	8,081.2	3.836	61	2	DLIS	276.7	0000	129.0	0.6	1	-0.01	1		1.40	0.68	4.39	-0.05
110	166	8,083.3	3.825	61	2	DLIS	274.9	0000	129.0	0.6	1	-0.01	1		1.39	0.68	4.37	-0.05
111	169	8,085.3	3.815	61	2	DLIS	262.6	0000	129.0	0.6	1	-0.01	1		1.39	0.68	4.36	-0.05
112	171	8,232.2	3.079	64	4	Comb dwn	4,101.1	0000	1991.8	8.02	1	-0.15	1		1.12	0.55	3.52	-0.54
113	172	8,271.8	2.880	65	4	Comb dwn	3,947.6	0000	1991.8	8.02	1	-0.14	1		1.05	0.51	3.29	-0.45
114	174	8,320.9	2.638	67	4	Comb dwn	3,699.2	0000	1991.8	8.02	1	-0.15	1		0.96	0.47	3.02	-0.44
115	176	8,369.4	2.399	69	4	Comb dwn	3,623.4	0000	1991.8	8.02	1	-0.15	1		0.87	0.43	2.74	-0.42
116	178	8,417.8	2.163	71	4	Comb dwn	3,545.5	0000	1991.8	8.02	1	-0.15	1		0.79	0.39	2.47	-0.36
117	182	8,516.8	1.680	75	4	Comb dwn	3,164.7	0000	1677.3	8.02	1	-0.16	1		0.61	0.3	1.92	-0.31
118	184	8,566.1	1.444	77	4	Comb dwn	3,351.4	0000	1749.9	8.02	1	-0.15	1		0.53	0.26	1.65	-0.24
119	186	8,614.7	1.207	79	4	Comb dwn	3,964.2	0000	1991.8	8.02	1	-0.17	1		0.44	0.22	1.38	-0.23
120	188	8,664.5	0.966	81	4	Comb dwn	4,168.0	0000	1991.8	8.02	1	-0.14	1		0.35	0.17	1.1	-0.15
121	190	8,712.5	0.734	83	4	Comb dwn	4,273.0	0000	1991.8	8.02	1	-0.15	1		0.27	0.13	0.84	-0.12
122	192	8,762.8	0.495	85	4	Comb dwn	4,401.7	0001	1991.8	8.02	1	-0.15	1		0.18	0.09	0.57	-0.09
123	194	8,825.2	0.203	91	2	Comb-b D	2,014.5	0001	999.9	1.02	1	-0.02	1		0.07	0.04	0.23	0.00
124	196	8,832.0	0.170	93	2	Comb-b D	1,949.2	0001	999.9	1.02	1	-0.02	1		0.06	0.03	0.19	0.00
125	199	8,845.0	0.109	96	2	Comb-b D	1,796.7	0001	999.9	1.02	1	-0.02	1		0.04	0.02	0.13	0.00
126	202	8,850.2	0.085	99	2	Comb-b D	1,793.7	0001	999.9	1.02	1	-0.02	1		0.03	0.02	0.1	0.00
127	204	8,853.6	0.069	101	2	Comb-b D	1,802.0	0001	999.9	1.02	1	-0.02	1		0.03	0.01	0.08	0.00
128	206	8,857.0	0.053	103	2	Comb-b D	1,877.6	0001	999.9	1.02	1	-0.02	1		0.02	0.01	0.06	0.00
129	208	8,860.4	0.036	105	2	Comb-d D	-284.7	0001	999.9	1.02	1	-0.02	1		0.01	0.01	0.04	0.00
130	210	8,863.9	0.021	107	2	Comb-b D	2,649.7	0001	999.9	1.02	1	-0.02	1		0.01	0	0.02	0.00

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
131	213	8,869.0	0.004	110	2	Comb-d D	-279.1	0001	999.9	1.02	1	-0.02	1		0.00	0	0	0.00
132	219	8,879.2	0.000	116	2	Comb-b D	49,544.8	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
133	220	8,880.4	0.000	117	2	Comb-b D	49,551.7	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
134	221	8,882.2	0.000	118	2	Comb-b D	49,544.7	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
135	222	8,883.4	0.000	119	2	Comb-b D	49,544.5	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
136	225	8,888.4	0.000	122	2	Comb-b D	49,545.1	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
137	229	8,894.3	0.000	126	2	Comb-b D	49,545.8	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
138	230	8,895.4	0.000	127	2	Comb-b D	49,545.6	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
139	233	8,900.6	0.000	130	2	Comb-d D	-139.5	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
140	235	8,903.5	0.000	132	2	Comb-b D	49,545.6	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
141	239	8,909.7	0.000	136	2	Comb-b D	49,545.7	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
142	242	8,914.6	0.000	139	2	Comb-b D	49,544.5	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
143	243	8,915.8	0.000	140	2	Comb-d D	15.4	0001	999.9	1.02	1	0.00	1		0.00	0	0	0.00
144	244	8,918.0	0.000	141	4	Comb dwn	43,207.5	0001	467.7	2.08	1	0.00	1		0.00	0	0	0.00
145	245	8,924.1	0.000	142	4	Comb dwn	41,058.0	0001	250.0	2.08	1	0.00	1		0.00	0	0	0.00
146	246	8,932.1	0.000	143	4	Comb dwn	38,849.1	0001	121.0	2.08	1	0.00	1		0.00	0	0	0.00
147	247	8,942.0	0.000	144	4	Comb dwn	35,414.4	0001	64.5	2.08	1	0.00	1		0.00	0	0	0.00
148	248	8,950.3	0.000	145	4	Comb dwn	31,160.3	0001	32.3	2.08	1	0.00	1		0.00	0	0	0.00
149	249	8,959.2	0.000	146	4	Comb dwn	17,352.3	0001	16.1	2.08	1	0.00	1		0.00	0	0	0.00
150	250	8,967.5	0.000	147	4	Comb dwn	8,692.4	0001	8.1	2.08	1	0.00	1		0.00	0	0	0.00
151	251	8,975.9	0.000	148	4	Comb dwn	8,670.3	0001	8.1	2.08	1	0.00	1		0.00	0	0	0.00
152	252	8,984.1	0.000	149	4	Comb dwn	8,650.0	0001	8.1	2.08	1	0.00	1		0.00	0	0	0.00
153	253	8,992.4	0.000	150	4	Comb dwn	8,664.4	0001	8.1	2.08	1	0.00	1		0.00	0	0	0.00
154	254	9,000.7	0.000	151	4	Comb dwn	8,659.7	0001	8.1	2.08	1	0.00	1		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 0	44,242.7	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 1	44,463.0	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 2	44,224.6	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 3	44,230.9	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 4	44,222.3	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 5	44,246.8	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 6	44,417.3	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
155	255	9,015.3	0.000	152	24	Comb D- 7	44,218.3	0001	693.5	81.74	2	0.00	8		0.00	0	0	0.00
156	256	9,373.3	0.000	153	24	Comb D- 0	44,425.2	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00
156	256	9,373.3	0.000	153	24	Comb D- 1	42,076.2	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00
156	256	9,373.3	0.000	153	24	Comb D- 2	44,496.2	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00
156	256	9,373.3	0.000	153	24	Comb D- 3	44,461.2	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
156	256	9,373.3	0.000	153	24	Comb D- 4	44,444.6	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00
156	256	9,373.3	0.000	153	24	Comb D- 5	44,503.8	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00
156	256	9,373.3	0.000	153	24	Comb D- 6	42,102.6	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00
156	256	9,373.3	0.000	153	24	Comb D- 7	44,432.9	0001	620.9	81.76	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 0	41,901.9	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 1	40,274.5	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 2	41,895.1	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 3	41,907.1	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 4	41,881.9	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 5	41,909.3	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 6	40,288.0	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
157	257	9,697.7	0.000	154	24	Comb D- 7	41,865.1	0001	161.3	79.5	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 0	39,994.3	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 1	36,061.7	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 2	39,977.7	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 3	39,988.9	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 4	39,984.6	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 5	39,997.1	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 6	36,083.4	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
158	258	10,002.3	0.000	155	24	Comb D- 7	39,976.6	0001	145.2	79.54	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 0	36,119.9	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 1	30,546.6	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 2	36,129.3	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 3	36,116.2	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 4	36,116.3	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 5	36,123.2	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 6	30,509.7	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
159	259	10,314.2	0.000	156	24	Comb D- 7	36,128.2	0001	72.6	81.75	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 0	30,379.6	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 1	16,936.2	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 2	30,456.5	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 3	30,434.3	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 4	30,457.6	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 5	30,472.5	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 6	16,696.1	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00
160	260	10,610.8	0.000	157	24	Comb D- 7	30,366.7	0001	16.1	81.73	2	0.00	8		0.00	0	0	0.00

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
161	261	10,907.4	0.000	158	24	Comb D- 0	16,851.7	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
161	261	10,907.4	0.000	158	24	Comb D- 1	8,419.8	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
161	261	10,907.4	0.000	158	24	Comb D- 2	16,874.4	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
161	261	10,907.4	0.000	158	24	Comb D- 3	16,925.0	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
161	261	10,907.4	0.000	158	24	Comb D- 4	16,892.3	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
161	261	10,907.4	0.000	158	24	Comb D- 5	16,807.4	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
161	261	10,907.4	0.000	158	24	Comb D- 6	8,328.3	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
161	261	10,907.4	0.000	158	24	Comb D- 7	16,840.0	0001	16.1	81.8	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 0	8,343.4	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 1	8,342.6	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 2	8,329.0	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 3	8,320.1	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 4	8,340.4	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 5	8,347.4	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 6	8,346.8	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
162	262	11,183.5	0.000	159	24	Comb D- 7	8,359.3	0001	8.1	81.73	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 0	8,277.4	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 1	8,311.9	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 2	8,279.9	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 3	8,273.6	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 4	8,326.6	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 5	8,293.3	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 6	8,261.0	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
163	263	11,464.8	0.000	160	24	Comb D- 7	8,271.2	0001	8.1	81.74	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 0	8,360.6	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 1	8,283.5	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 2	8,359.7	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 3	8,320.5	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 4	8,310.3	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 5	8,324.7	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 6	8,416.8	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
164	264	11,746.0	0.000	161	24	Comb D- 7	8,371.2	0001	8.1	81.75	2	0.00	8		0.00	0	0	0.00
165	265	12,029.5	0.000	162	24	Comb D- 0	8,292.5	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00
165	265	12,029.5	0.000	162	24	Comb D- 1	8,307.7	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00
165	265	12,029.5	0.000	162	24	Comb D- 2	8,255.7	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00
165	265	12,029.5	0.000	162	24	Comb D- 3	8,290.3	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00

N	IR #	Time (sec)	Altitude (km)	Cycle #	# Cols	Type	Ave. DN	Lamp	Exp. (ms)	Collect (s)	# Rots	Rots Act.	# Regns	Sat ?	To Nadir (km)	Resol. (km)	1 Rot. (km)	Annul. Ext. (km)
165	265	12,029.5	0.000	162	24	Comb D- 4	8,326.5	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00
165	265	12,029.5	0.000	162	24	Comb D- 5	8,275.7	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00
165	265	12,029.5	0.000	162	24	Comb D- 6	8,270.1	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00
165	265	12,029.5	0.000	162	24	Comb D- 7	8,311.8	0001	8.1	79.49	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 0	8,273.2	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 1	8,264.6	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 2	8,241.7	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 3	8,299.3	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 4	8,256.1	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 5	8,300.9	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 6	8,252.2	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
166	266	12,308.5	0.000	163	24	Comb D- 7	8,252.7	0001	8.1	81.77	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 0	8,324.5	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 1	8,313.7	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 2	8,356.8	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 3	8,367.0	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 4	8,303.3	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 5	8,351.7	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 6	8,332.4	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
167	267	12,589.8	0.000	164	24	Comb D- 7	8,363.0	0001	8.1	81.78	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 0	8,301.4	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 1	8,263.7	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 2	8,272.0	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 3	8,282.6	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 4	8,287.0	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 5	8,236.4	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 6	8,261.2	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00
168	268	12,865.9	0.000	165	24	Comb D- 7	8,238.5	0001	8.1	79.54	2	0.00	8		0.00	0	0	0.00

Appendix 3 - Image Pointing Information
From ref 5, Karkoschka

The table presents the values of variable which define the Huygens' probe instantaneous orientation at the time of an image exposure. The values are relative to the DISR sensor head which protrudes along the probes +Z axis.

MT = Mission Time in s
Altit = Altitude in km
X = Coordinate east of landing site in km
Y = Coordinate north of landing site in km
Pitch = Pitch angle in deg, positive = DISR pointing down
Roll = Roll angle in deg, positive = DISR rotated clockwise in SLI viewing direction
Azim = Azimuth in deg, north = 0 deg, east = 90 deg
SMH = Indicator whether SLI, MRI, or HRI was received

MT	Altitude	X	Y	Pitch	Roll	Azimuth	S	M	H
143.58	142.77	-157.01	-3.27	-8.2	9.1	315.6	S		
146.60	142.64	-156.72	-3.26	-13.1	5.9	226.5	S	M	H
157.45	142.11	-155.68	-3.21	-8	0.5	269.3			H
169.45	141.45	-154.51	-3.16	-6.4	8.6	292.8	S		
180.26	140.87	-153.44	-3.12	-0.2	4.8	353.8		M	H
202.03	139.79	-151.31	-3.03	-0.3	-7.3	143.2	S		
204.77	139.66	-151.04	-3.02	2.0	0.5	71.5		M	H
216.68	139.09	-149.87	-2.97	-2.6	-0.3	138.5	S		H
229.99	138.41	-148.57	-2.92	2.2	3.9	181.3	S		H
255.99	137.17	-146.02	-2.82	-0.2	0.2	314.5			H
262.31	136.87	-145.40	-2.79	6.9	-7.1	180.7	S		
279.84	136.04	-143.67	-2.72	0.0	-0.1	174.3		M	H
285.24	135.78	-143.13	-2.70	2.8	-1.2	68.4	S		
306.26	134.82	-141.05	-2.61	-2.6	5.3	31.5	S	M	
309.70	134.66	-140.72	-2.60	0.3	-0.5	328.4		M	
320.59	134.16	-139.64	-2.55	-5.6	5.1	145.5	S	M	H
333.18	133.53	-138.41	-2.50	-3.3	-4.3	306.6	S		
343.83	133.05	-137.37	-2.46	-3.8	10.3	150.5	S	M	H
356.28	132.47	-136.15	-2.41	-1.5	-0.6	342.1	S		H
367.85	131.93	-135.03	-2.36	-5.4	12.3	197.9	S		
383.16	131.29	-133.59	-2.31	2.4	-2.0	23.8	S	M	
391.23	130.91	-132.84	-2.27	8.2	-5.3	298.5	S		H
401.39	130.44	-131.91	-2.24	2.3	-7.8	197	S		
430.98	129.2	-129.22	-2.12	-0.4	0.3	297.1		M	
784.78	115.34	-95.82	-0.75	-6.4	6.6	82.1	S	M	H
831.20	113.69	-92.38	-0.61	-9	-16	8.2	S		H
836.99	113.48	-91.97	-0.59	4.6	-0.2	96.3	S		H
846.37	113.15	-91.33	-0.57	10.6	7.5	242.6	S		
867.93	112.40	-89.92	-0.51	12	4.9	234.1		M	H
873.60	112.21	-89.57	-0.50	-4.9	-16	330	S		
882.86	111.91	-88.99	-0.47	-5.2	0.5	129.7		M	

MT	Altitude	X	Y	Pitch	Roll	Azimuth	S	M	H
893.64	111.54	-88.30	-0.44	2.6	-3.4	318.7		M	
907.53	111.00	-87.36	-0.41	-12	-3.3	214.5		M	H
917.53	110.60	-86.74	-0.38	-3.4	-8.5	43.5	S		H
928.74	110.06	-86.07	-0.35	4.3	-0.1	267.5			H
941.11	109.36	-85.36	-0.32	-5.5	-5.7	181.6	S		
955.72	108.44	-84.52	-0.29	-1	2.3	152.7		M	
1408.83	80.259	-65.717	0.486	-3	-4.2	42.2	S		H
1411.71	80.117	-65.676	0.488	1.5	3.3	180.6	S		
1433.36	79.082	-65.396	0.499	-4.5	4.3	130.3		M	
1437.01	78.910	-65.354	0.501	4.8	-3.5	302.7		M	H
1447.48	78.414	-65.248	0.505	-6	-1.6	77.1	S		H
1458.1	77.908	-65.159	0.509	6.1	0.3	208.8	S		
1469.49	77.402	-65.082	0.512	-0.4	-4.2	2.7		M	H
1480.66	76.906	-65.019	0.515	3.5	10.0	140.1	S		
1493.82	76.322	-64.951	0.518	0.3	-2.1	347.7		M	H
1517.59	75.279	-64.841	0.523	0.6	0.0	263.9		M	H
1529	74.786	-64.793	0.525	6.4	0.7	13.3	S		
1957.47	60.524	-54.477	0.884	8.7	-2.9	118.6	S	M	H
2095.63	57.241	-49.487	1.039	2.3	2.3	15.8	S		H
2122.82	56.637	-48.548	1.065	1.4	2.4	283.5	S	M	
2126.01	56.568	-48.44	1.068	0.0	-1.5	358.3		M	H
2148.51	56.081	-47.683	1.089	-0.6	1.9	170.6	S		
2152.85	55.988	-47.539	1.093	-0.1	2.3	266	S	M	
2162.64	55.780	-47.216	1.101	-0.9	0.4	109.3		M	
2173.52	55.549	-46.86	1.110	0.2	-0.8	341.4		M	
2184.68	55.314	-46.494	1.120	0.5	0.5	223.8		M	
2195.83	55.079	-46.132	1.129	-0.6	0.2	102.3		M	H
2210.07	54.786	-45.673	1.141	-4	-3.5	41.1	S		H
2225.98	54.461	-45.161	1.153	4.1	-1.3	340.8			H
2563.95	48.272	-35.465	1.325	-1.3	0.0	178.5	S	M	H
2974.12	42.120	-26.208	1.320	1.9	-2.9	229.6	S		
2977.15	42.079	-26.149	1.319	-5	-6.2	276.5	S	M	H
3011.1	41.622	-25.504	1.312	-0.3	-3.9	105.5	S	M	
3016.8	41.545	-25.397	1.311	-3.4	-3.8	197.6		M	
3025.34	41.430	-25.235	1.309	3.1	4.4	332.4	S	M	
3043.14	41.193	-24.903	1.305	-1.4	-10	252.7	S	M	H
3059.77	40.974	-24.596	1.300	1.5	0.1	158.6	S		H
3066.42	40.887	-24.478	1.299	-2.1	-3.6	268.1			H
3074.49	40.781	-24.336	1.296	0.6	-0.9	34.4	S		
3093.35	40.534	-24.003	1.291	-5.2	1.0	317.6		M	H
3655.21	33.977	-15.655	1.073	-0.9	1.1	258.8		M	
3658.5	33.943	-15.615	1.071	1.0	0.0	304.8		M	
3681.62	33.701	-15.336	1.059	-0.5	-3.6	271.5		M	
3684.94	33.667	-15.296	1.058	1.1	-1.5	319.2		M	
3696.57	33.545	-15.158	1.052	3.8	0.2	117.9		M	
3706.61	33.437	-15.04	1.046	0.3	-2.0	264.9		M	
3719.96	33.298	-14.885	1.039	-5.4	-2.8	91.1		M	

MT	Altitude	X	Y	Pitch	Roll	Azimuth	S	M	H
3729.25	33.202	-14.779	1.034	-1.1	-2.6	219.2		M	
3742.74	33.063	-14.629	1.027	5.4	2.4	48.2		M	H
3752.89	32.959	-14.515	1.022	-2.7	0.1	189.1	S		
3768.16	32.805	-14.34	1.013	1.8	0.9	55.3	S	M	
3792.06	32.564	-14.073	1.000	1.8	-4.3	12.3		M	H
4340.15	27.443	-9.099	0.658	1.8	3.2	175.5		M	
4344.15	27.408	-9.070	0.655	1.5	-1.7	219.8		M	
4366.22	27.217	-8.914	0.640	-2.6	1.0	101.8	S	M	
4370.25	27.183	-8.886	0.637	3.2	-4.0	142.4		M	H
4382.33	27.081	-8.801	0.628	-1	-1.6	261	S		H
4396.65	26.956	-8.701	0.618	-2.8	1.1	51.0	S		H
4402.65	26.904	-8.659	0.614	1.1	-0.4	115.5	S		H
4422.93	26.729	-8.520	0.599	-2.3	4.6	331.9	S		
4429.09	26.675	-8.477	0.595	1.6	-0.9	34.6		M	
4449.6	26.501	-8.338	0.580	0.6	1.8	254.6		M	H
4457.81	26.429	-8.285	0.574	0.4	-1.7	344.1			H
4493.18	26.130	-8.053	0.548	-1.3	2.7	25.7	S		
4858.38	23.191	-5.789	0.276	-2	2.0	286.1		M	H
4863.93	23.147	-5.761	0.272	-0.9	-5.3	346.2	S		H
4886.32	22.976	-5.645	0.254	-1.2	1.1	221	S		
4894.79	22.912	-5.600	0.248	2.5	2.2	308.4		M	H
4903.31	22.847	-5.556	0.241	-2.7	3.2	35.1	S		
4911.81	22.781	-5.512	0.235	-0.2	-2.4	120.4	S	M	
4934.45	22.607	-5.394	0.217	-1.6	0.5	344.6		M	H
4940.1	22.564	-5.364	0.212	2.3	-1.9	35.9	S		
4948.63	22.500	-5.318	0.206	2.0	-2.7	104.1		M	H
4976.89	22.287	-5.163	0.184	2.8	-4.6	284.4	S		
4985.39	22.222	-5.118	0.178	-2	0.2	333.7	S	M	
5025.22	21.922	-4.914	0.149	1.3	-3.2	276.7		M	H
5199.31	20.637	-4.150	0.033	-1.8	-1.8	190.5	S		H
5205.08	20.595	-4.126	0.029	-1.3	0.5	251.5	S		H
5225.38	20.451	-4.041	0.017	-2.1	0.3	97.0	S		
5237.01	20.370	-3.994	0.011	-2.2	1.5	201.3		M	
5242.85	20.329	-3.969	0.007	2.0	-4.5	253.9		M	
5251.68	20.265	-3.936	0.002	-0.1	3.2	332.9		M	H
5263.25	20.182	-3.887	-0.004	1.2	-0.9	73.6			H
5280.71	20.056	-3.813	-0.014	2.8	-4.1	231.1			H
5289.46	19.994	-3.777	-0.019	4.1	1.9	318.1	S		
5301.11	19.912	-3.731	-0.025	2.8	0.4	78.2	S	M	H
5318.6	19.786	-3.663	-0.034	-1.6	0.5	263	S		
5327.33	19.724	-3.631	-0.039	-0.9	-0.3	354		M	H
5728.7	16.980	-2.189	-0.186	-0.6	-3.4	340		M	
5734.46	16.942	-2.171	-0.187	-0.9	-1.2	34.1		M	
5756.6	16.797	-2.099	-0.191	3.8	0.0	241.3	S	M	
5764.77	16.743	-2.075	-0.193	2.3	-0.4	317.6		M	H
5772.96	16.689	-2.050	-0.195	1.8	0.6	31.8	S		
5783.76	16.618	-2.016	-0.197	-0.6	-1.0	133	S	M	

MT	Altitude	X	Y	Pitch	Roll	Azimuth	S	M	H
5803.19	16.491	-1.955	-0.2	0.2	0.6	324.4		M	
5808.77	16.454	-1.938	-0.201	-1.7	-1.7	18.5		M	H
5842.97	16.229	-1.831	-0.206	1.1	-0.8	355.3		M	H
5875.8	16.014	-1.726	-0.21	-0.5	-4.0	301.8		M	H
6069.61	14.782	-1.163	-0.217	1.7	-0.2	330.3	S		H
6074.78	14.750	-1.148	-0.217	-1.4	4.7	14.3	S		
6095.44	14.618	-1.091	-0.216	2.3	-1.4	210.3		M	
6103.19	14.570	-1.069	-0.216	3.4	1.0	283.4		M	H
6110.95	14.521	-1.048	-0.215	1.9	0.9	355.4	S		
6121.29	14.457	-1.020	-0.214	-0.5	1.4	96.9		M	H
6139.47	14.343	-0.975	-0.213	1.3	0.4	279.6	S		
6147.34	14.295	-0.956	-0.212	-0.8	-0.9	355.5		M	H
6155.17	14.246	-0.934	-0.212	-0.2	-0.9	70.9			H
6181.36	14.085	-0.860	-0.209	1.1	3.8	324.2	S		
6207.69	13.924	-0.787	-0.206	0.4	-2.2	202.1		M	H
6223.49	13.827	-0.744	-0.204	0.0	-0.7	343.3	S		H
6407.22	12.722	-0.317	-0.187	1.7	-2.2	186.9	S		
6415.39	12.673	-0.299	-0.186	2.0	1.8	263.5	S	M	H
6423.57	12.624	-0.282	-0.186	0.3	0.8	339.3	S		H
6445.4	12.492	-0.241	-0.184	-0.7	-0.4	177.3	S		H
6450.85	12.461	-0.231	-0.183	-0.5	-1.1	224.6	S		H
6461.82	12.397	-0.211	-0.183	1.5	-4.4	315.5	S		H
6475.53	12.318	-0.184	-0.181	-2	1.8	63.9	S		
6486.55	12.255	-0.163	-0.181	2.1	-0.5	144.1		M	
6497.56	12.190	-0.142	-0.18	0.6	-1.4	224.2		M	H
6525.18	12.029	-0.091	-0.178	3.4	-2.8	89.6			H
6533.5	11.980	-0.076	-0.177	-2.7	2.8	154.9	S		
6569.52	11.769	-0.012	-0.174	1.6	1.2	108.8		M	H
6740.54	10.785	0.250	-0.164	1.0	0.1	76.8	S		H
6746.26	10.752	0.258	-0.163	0.1	0.1	122.3	S		
6757.7	10.687	0.273	-0.163	0.8	0.9	218.1		M	H
6777.74	10.573	0.300	-0.162	-0.8	0.2	24.0	S		
6783.5	10.540	0.307	-0.162	-0.8	-0.1	69.3		M	
6794.92	10.475	0.322	-0.161	1.3	2.9	159.4		M	H
6803.86	10.425	0.332	-0.161	-0.2	1.2	226.3	S		
6832.43	10.263	0.367	-0.159	0.0	-0.9	80.5		M	H
6841.08	10.216	0.377	-0.159	1.9	2.1	148.5	S		
6855.49	10.136	0.393	-0.158	2.3	-1.0	263.1	S	M	
6869.99	10.055	0.409	-0.157	-0.1	-0.6	24.2		M	H
6893.26	9.924	0.435	-0.156	1.9	-2.3	203.9	S		
7065.41	8.970	0.589	-0.15	1.5	2.8	206.6		M	
7071.34	8.937	0.593	-0.15	2.3	-1.2	248.4		M	
7083.23	8.871	0.601	-0.149	-0.9	-0.3	336		M	H
7110.17	8.722	0.619	-0.149	3.3	1.6	172.7		M	
7122.18	8.658	0.628	-0.148	1.9	-0.8	268.6		M	
7131.18	8.610	0.633	-0.148	-0.2	-2.0	340.9		M	H
7149.16	8.511	0.644	-0.148	0.8	0.4	124	S		H

MT	Altitude	X	Y	Pitch	Roll	Azimuth	S	M	H
7161.18	8.446	0.651	-0.147	2.3	-2.6	219.2	S		H
7170.18	8.398	0.656	-0.147	2.2	-3.9	286.3			H
7188.24	8.302	0.666	-0.147	-0.7	-1.0	61.6	S		
7200.33	8.236	0.672	-0.147	0.4	0.5	153.8		M	
7388.28	7.229	0.738	-0.144	1.4	0.9	87.8		M	
7397.56	7.180	0.740	-0.144	3.5	0.5	156.7		M	H
7403.75	7.148	0.741	-0.144	0.7	-2.7	200.7	S		
7428.49	7.017	0.745	-0.144	0.3	-0.1	16.8		M	H
7437.76	6.967	0.747	-0.144	0.2	-0.9	83.0	S		
7443.96	6.935	0.748	-0.144	0.2	-0.2	132.2		M	
7456.33	6.870	0.749	-0.144	0.5	-1.1	231.4		M	
7484.38	6.723	0.751	-0.144	0.4	-0.2	66.3		M	
7490.67	6.690	0.752	-0.144	0.7	-0.4	109.9		M	H
7525.06	6.511	0.753	-0.144	0.1	0.1	335.6		M	H
7534.43	6.463	0.753	-0.144	0.7	-0.5	39.4	S		H
7719.49	5.510	0.729	-0.136	-0.7	0.9	25.3	S		H
7735.44	5.429	0.725	-0.134	0.2	1.9	138	S		
7741.82	5.396	0.723	-0.134	0.6	-0.8	181.4		M	H
7751.4	5.348	0.720	-0.133	0.9	1.0	245.6	S		
7760.98	5.300	0.717	-0.132	1.1	-0.6	309.3	S	M	H
7776.93	5.218	0.712	-0.13	1.0	0.9	55.3			H
7786.51	5.169	0.709	-0.129	0.0	-1.5	122.1	S		H
7802.47	5.089	0.704	-0.127	1.7	1.9	222.8	S		H
7821.79	4.993	0.697	-0.124	-1.5	-3.0	355.1		M	H
7831.49	4.945	0.693	-0.123	-0.8	0.5	64.5	S		H
7844.38	4.880	0.688	-0.121	2.5	0.2	159.8	S		
8229.49	2.993	0.388	-0.039	2.0	-1.7	308	S		
8242.14	2.932	0.363	-0.035	0.0	-0.7	36.0		M	
8278.29	2.757	0.286	-0.026	-0.1	1.5	250	S		H
8290.83	2.697	0.261	-0.023	1.2	1.1	333.4	S		H
8327.41	2.523	0.200	-0.013	0.3	-0.5	209.4	S		H
8339.98	2.462	0.183	-0.01	-0.2	1.7	295.8	S		H
8375.91	2.292	0.137	-0.001	-1.4	0.0	185.5	S		H
8388.46	2.232	0.122	0.003	0.0	-0.5	256.3		M	
8424.26	2.065	0.087	0.013	1.1	0.8	117.6	S		H
8436.78	2.005	0.076	0.017	2.7	-0.8	205.2	S		H
8474.16	1.828	0.042	0.028	2.2	-0.7	100.4	S		H
8486.66	1.770	0.033	0.031	1.1	-1.4	182.2		M	
8523.05	1.600	0.012	0.042	-2.2	-2.2	82.5	S		H
8535.24	1.543	0.006	0.046	-1.4	-2.5	170.8	S		H
8572.36	1.372	-0.010	0.057	-1.7	0.0	54.6	S		H
8584.89	1.313	-0.016	0.061	1.3	1.4	132.1	S		H
8621.05	1.143	-0.032	0.072	1.2	-0.8	32.3	S		H
8633.58	1.084	-0.039	0.075	0.2	0.3	121.2	S		H
8670.88	0.911	-0.050	0.080	-1	-0.4	355.1	S		H
8683.4	0.852	-0.053	0.079	0.5	0.2	76.3		M	
8719.03	0.686	-0.056	0.070	0.3	-1.1	303.9	S		H

MT	Altitude	X	Y	Pitch	Roll	Azimuth	S	M	H
8731.55	0.629	-0.054	0.065	2.6	-1.0	26.2	S		H
8769.42	0.455	-0.044	0.044	-0.2	-0.9	274.4	S		H
8782.15	0.397	-0.038	0.038	-0.2	-0.2	8.0	S		H
8810.57	0.269	-0.017	0.028	-1.1	-0.7	194.9			H
8813.58	0.255	-0.014	0.028	0.7	-0.3	213.4			H
8817.61	0.237	-0.011	0.026	1.0	0.9	237.9			H
8822.48	0.215	-0.009	0.025	1.6	-0.7	267.3			H
9008.5	48 cm	0.000	0.000	-3.1	0.8	193	S	M	H

Appendix 4 - East-West Tilt Function of Huygens, Low-Frequency Component
From ref 5 Karkoschka, PSS 2007.

East-West tilt defines a misalignment between the Huygens probe's spin axis and local Zenith in the East-West plane.

Positive angles (deg) indicate that Huygens was west of the parachute. This table describes the low frequency (~0.1 Hz) probe swing component, and does not include ~1 Hz oscillation with amplitude of about 1-10 deg. See section 5.5 of the Users' Guide.

This data is also available in the PDS archive in:
\EXTRAS\PROBE_ATTITUDE\HUYGENS_DESCENT_PARAMETERS\HUYGENS_DESCENT_PARAMETERS.TXT

MT+	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114
0	31.5	30.9	30.1	29.2	28	26.6	24.7	22.7	20.4	18.1	15.9	14.1	12.4	10.9	9.6	8.4	7.2	6	4.8	3.6
120	2.4	4	4.5	8.6	5.5	1.6	4.4	8.2	5.3	-1.4	-3.6	-3.5	5.1	1.9	3.3	-6	-3.2	-2.5	-2.7	-1.2
240	1	3.2	5.4	7.7	8.7	6.5	4.4	2.3	0.2	-1.7	-3.6	4.2	1.6	-4.8	-4.8	1.3	2.2	-5.7	0.6	3.7
360	-3.7	-14.8	-10.5	-0.8	-0.8	-9.2	-8.7	8	7.7	7.4	7.1	6.8	6.6	3.4	-0.5	-4.3	5.3	-0.1	-9.8	-5.7
480	2.2	-3.8	-2	6.3	0.8	7.5	9	4.4	0.1	-3.2	-0.4	-0.7	2.4	5.1	6	2.2	5.2	4.9	4.7	4.4
600	4.1	3.5	2.1	0.6	-0.8	-2.3	-3.7	-5.2	-6.6	-8	-9.5	-15.1	-11.2	-5.4	-5.7	-5.7	-3.2	-5	-10.3	-12.8
720	-8.5	-0.4	-2.2	1.9	-0.4	-10.8	-12.3	-10.1	-8	-5.8	-3.6	-2.2	-3.6	-5.1	-6.5	-7.9	-9.3	-10.8	-12.2	-4.6
840	-1.1	-11.8	-2.3	-5.2	-12.3	-10.5	-0.8	-1.5	-2.8	-4.1	-5.4	-6.7	-8	-9.2	-8.2	0	-4.3	3.3	4.2	5.2
960	6.1	-0.5	-9.4	-4.2	-5.7	-7	-5.5	-4	-2.6	-1.1	0.4	-1	4.3	1.1	1.5	-2.4	-1	-3.8	-4.5	-1.5
1080	-2.2	-4.4	-3.6	-2.3	-0.8	-5.8	-5.9	-5.5	-5.1	-4.8	-4.4	-4.1	-4.3	-4.6	-4.8	-4.9	-4	-3.2	-2.4	-1.5
1200	-0.7	-5.8	-3.2	-7.7	-5.1	-7	-7.7	-5.6	-7.4	-5.7	-8.9	-10.6	-10.6	-6.7	-4.2	-7.7	-7.7	-6.5	-6.5	-6.4
1320	-6.3	-6.2	-6.2	-4.4	-3.3	-2.9	-2.4	-1.9	-1.4	-0.9	-0.4	-0.3	-8	-7.4	-3.6	-1.7	-2.7	-3.2	-3.2	-5.1
1440	-6.7	-6.6	-8.3	-5.4	-4	-5	-3	-1.3	-1.2	-1.1	-1	-0.9	-0.8	-0.7	-0.6	-0.6	-1	-2	-3.2	4.1
1560	0.8	2.5	0.1	2.1	-0.7	-0.5	1.1	-2.1	3.4	4.1	8	8.8	10.4	10.2	11.2	8.3	5.2	6	6.8	7.5
1680	8.3	9.1	9.8	10.6	11.3	12.1	12.9	10.9	7.2	3.5	5.4	6.5	4.6	2.6	2.9	0.1	-0.9	1.2	-1	0.6
1800	-0.6	0	0.3	0.1	-1	1.3	2.8	2.8	2.7	2.6	2.4	2.3	2.2	2	1.9	1.8	1.6	1.5	1.4	1.2
1920	1.1	4.3	0.4	1.1	0	0.2	0.4	1.4	-1.2	0.4	0.6	-0.6	-1	-0.6	1.6	2.8	-0.7	-1.2	-1.2	-1.2
2040	-1.2	-1.1	-0.7	-0.3	0	0.4	0.8	1.1	1.5	1.9	0.1	1.8	-1.8	-1.1	-3.4	-1.6	1.7	-2.4	-2.3	-0.4
2160	-1.2	-2.3	2.6	-0.3	-1.7	-0.8	-0.8	-2.4	-4	-4.3	-4.1	-3.7	-3.4	-3	-2.7	-2.3	-1.9	-1.6	-1.5	-1.8
2280	-2	-1.9	-1.5	-2	-1.4	-0.6	0.7	-0.3	-2.4	-1.2	-1.5	0	-2.2	-1.2	-0.8	-1.2	-0.9	-0.7	-0.4	-0.1
2400	0.2	0.5	0.8	-2.4	-5	-3.5	-2.1	-0.6	-0.2	0	0.3	0.4	0.1	0.2	1.4	-2	-1.5	-0.9	-1.1	-1.6
2520	-0.8	-0.8	-0.9	0.6	1.4	0.6	-0.3	-0.5	-0.5	-0.4	-0.2	-0.1	0	0.2	0.3	0.4	-0.6	-1.7	-2.2	-2.1

MT+	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114
2640	-2	0.9	-2.5	-1.6	0.4	0.6	-0.8	-0.7	0.8	-1.6	0.9	-1.6	-1.4	0.3	-0.3	0.5	-1.7	-3.6	-3.5	-3.5
2760	-3.4	-3.4	-3.3	-3.3	-3.2	-3.2	-3.1	-2.2	-1	0.3	1.5	1.4	-1.6	-2.3	-2	-1.7	-0.3	-0.3	-0.3	0.8
2880	-1.6	-0.3	-0.9	-1.3	-0.1	2.3	-3.8	-0.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	4.8	5.5	4.1	2.8
3000	1.4	0	-1.8	0.5	-0.6	-0.8	-4.8	1.8	1.7	-5.4	-5.1	1.1	-2.8	0.4	0.2	0.2	4.8	3.9	3	2.1
3120	-2.4	-4.1	-1.1	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.7	0.1	-1.3	-3.6	-1.5	-1.3	-2.8	0.6	-0.9
3240	-0.2	1	0.3	1.6	0.5	-1.4	-0.7	1.4	3.5	5.3	-2.7	-4.1	-0.6	2.3	2.3	2.3	2.3	2.2	2.2	2.2
3360	2.2	2.5	0.2	-1.1	-0.7	-1	-1.7	-0.1	0.2	-0.9	-0.5	0.5	1.4	-1.6	1.2	-0.5	1.3	1.7	2.2	2.5
3480	-0.2	-0.8	0.9	2.2	1.7	1.1	0.6	0	-0.5	-1.1	-1.6	-1.3	0.6	0	-0.9	-0.2	-1.5	1.5	0.2	0.2
3600	-0.7	0.1	0.1	-0.3	0	0.8	1.1	0.5	0.3	0.1	-0.8	-0.1	0.7	1.4	-0.7	0.7	3.6	2.1	0	-3
3720	-6	-0.3	0.2	0.2	0.2	0.4	0.9	0.7	-1.6	2.4	-1.9	-0.6	-2.5	0.8	0.7	0	-0.6	-8.5	-7.7	-6.7
3840	-5.7	-4.7	-3.6	-2.6	-1.6	-0.6	0.4	1.4	2.4	0.6	-0.6	2.5	2.2	1.8	1.3	0.8	0.4	-0.1	-0.6	-0.2
3960	0.2	-0.8	0.1	-1.3	-0.7	-0.3	0.9	2.1	1.2	0.3	-0.6	-1.5	-2.4	-3.3	-4.2	-5.1	-6	-6.9	-5.5	-2.5
4080	-1.6	-1.5	0	0.2	-1.3	-1.6	0.4	0.9	0.8	-0.4	-0.9	-0.2	0.3	1.1	0	-3.3	-4.2	-5	-4.6	-4.3
4200	-4	-3.6	-3.3	-2.9	-2.6	-2.2	-1.9	-1.6	-1.5	-3.3	-3.2	-0.4	-0.4	-0.5	-0.8	-1.4	0.5	2.9	0.3	-1.5
4320	-1.3	-0.3	-0.5	-1.9	-0.8	1.1	-0.1	-1.4	0.8	3.8	2.3	1.2	0.4	0	1.4	2.4	3.4	4.5	0.3	-0.7
4440	-0.9	-2.2	0.6	-0.1	1.4	-0.5	0.1	0.1	-0.4	-0.8	1.3	0.9	0.6	2.1	-3.1	-2.2	-3	-2.9	-2.7	-2.6
4560	-2.5	-2.3	-2.2	-2.1	-1.9	-1.8	-1.7	-1.5	-1.4	-1.3	-1.1	0.3	-0.9	0.8	0.2	-0.2	-1.3	-0.8	0.4	1
4680	-0.4	-0.6	-0.2	1.4	-0.5	1.9	1.7	1.5	1.2	1	0.8	0.6	0.4	0.1	-0.1	-0.3	-0.5	-0.8	-1	-1.2
4800	-1.4	-1.8	1.5	-0.4	-0.8	-0.8	-0.5	0.1	-0.9	-1.6	-1.5	1.1	-0.8	0.3	-0.9	0	-1.2	1.9	1.2	0.2
4920	0.6	0.9	1.3	-0.3	0	1.4	0.6	-0.1	-0.9	-1.6	-0.7	1.2	-1.5	-2.2	0	0.8	0.2	-1.6	-0.2	1.2
5040	-0.4	-1.4	-0.5	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
5160	0	0	0	-0.8	-0.9	1	1	0.5	-0.9	-1	-0.6	-0.7	0.7	-0.5	-1.5	1.3	1.4	0.5	0.9	1.5
5280	2.2	-0.9	-1.8	1	2.2	1.8	1.3	0.8	0.3	0.7	1.2	1.6	2.1	-0.6	0.2	0.3	0.3	0.2	0.2	0.8
5400	0.5	-1	1	-1.4	-0.2	-0.3	-0.4	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	0	0	0.1	0.1	0.2	0.2	0.3
5520	0.3	1.1	0.8	-0.6	-1.1	3.8	-0.2	-0.4	0.2	0.4	0.3	-0.6	-1	-0.3	1.1	3.2	2.4	2.2	2.1	2
5640	1.8	1.7	1.6	1.4	1.3	1.2	1	0.9	0.8	0.6	0.5	0.3	0.2	-0.1	-0.6	-0.2	1.9	-1.4	-0.2	0.6
5760	-0.3	0.4	0.8	-0.1	0.2	1.2	0.8	0.2	-1.3	-1.4	-1.4	-1.3	-1.3	-1.2	-1.1	-0.9	-0.8	-0.5	-0.3	-0.1
5880	-0.5	-1.1	-0.4	-0.6	-0.7	0.1	0.3	-0.1	-0.7	-0.5	-1.3	-0.9	-0.6	-0.3	-0.2	-0.2	-0.3	-0.2	-0.2	-0.1
6000	-0.1	0	0	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.1	-0.4	-0.6	-0.5	0.2	-2.8	-0.1	-1
6120	-1.9	-0.6	0.8	0.8	1.1	0.8	-0.7	-0.3	0.1	0.4	0.8	1.1	1.5	1.8	2	1.8	0.8	-0.3	-0.4	-0.3
6240	-0.1	0.1	0.3	0.3	0.1	-0.1	-0.1	0.1	0.2	0.2	0.2	0	0	0.1	-0.5	-0.3	-0.1	0.2	0.4	0.6
6360	0.8	1.1	1.3	1.5	1.7	2	2.2	2.4	2.1	-1.8	-0.9	0.4	0.3	0.2	0.1	1.1	-0.8	-3	-1.6	-0.3
6480	0.9	2	1.6	1.1	1.3	1.5	1.7	1.9	0	-3.8	-2.9	-2	-1	-0.1	0.8	1.7	1.7	1.6	1.6	1.6
6600	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1	1	1

MT+	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114
6720	0.9	0.9	0.9	0.9	0.4	-0.3	-0.9	-0.8	-0.5	-0.1	-0.1	-0.7	-1	-1.1	-1	-0.9	-0.8	-0.7	-0.6	-0.3
6840	0.2	-0.3	-1	-1.3	-1	-0.6	0.1	0.9	1.6	2.2	2.1	1.9	1.7	1.5	1.4	1.2	1	0.8	0.6	0.4
6960	0.3	0.1	-0.1	-0.3	-0.5	-0.6	-0.8	-1	-1.2	-1.4	-1.5	-1.7	-1.9	-2.1	-2.3	-2.5	-2.6	-2.8	-2	-0.5
7080	0.1	0.4	0.4	0.4	0.4	0.3	-0.5	-1.4	-1.3	-1	-0.3	0.3	1	1.6	0.8	-1.5	-1.5	-1.3	-1.2	-0.6
7200	0	0	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.9	0.9	1	1
7320	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.9	2.3	2.7	2	1.3	0.6	-0.1	-0.3
7440	-0.1	0.4	0.6	0.7	0.6	0.5	0.3	0.2	0.5	0.6	0.5	0.4	0.2	0.1	0	-0.2	-0.3	-0.3	-0.2	-0.2
7560	-0.2	-0.1	-0.1	0	0	0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.6	0.6
7680	0.6	0.7	0.7	0.8	0.8	0.8	0.9	0.6	0.1	-0.5	0.5	0	-1.3	-1.2	-0.7	0.2	1.1	0.7	0	-1
7800	-2	-2.3	-2.2	-2	-1.5	-0.4	0.5	1.3	1.5	1.3	1	0.8	0.6	0.4	0.2	0	-0.2	-0.4	-0.6	-0.5
7920	0	-0.1	-0.4	0	0.1	-0.8	0.4	0.7	0.6	0.5	0.4	0.3	0.2	0.2	0.1	0	-0.1	-0.2	-0.3	-0.4
8040	-0.2	1.3	1.2	-0.1	-0.1	0.3	0	-0.9	-0.5	-1.7	-0.8	-0.3	0	0.3	0.6	0.6	0.5	0.3	0.1	-0.1
8160	-0.3	-0.4	-0.6	-0.8	-1	-1.2	-1.4	-1.5	-1.7	-1.9	-2.1	-2.2	-1.6	-1.4	-1.1	0.3	0.5	-0.2	0	-0.3
8280	-0.1	0.8	0.7	-0.6	0.9	1.1	0.9	0.7	0.5	0.4	0.3	0.2	0.1	-0.1	-0.2	-0.3	-0.4	-0.1	0.3	0.2
8400	0	-0.2	0.2	0.2	-0.7	-0.5	0.3	0.5	0	0.5	0.6	-1	-1.2	0.3	1.2	1.2	0.5	-0.3	-1.1	-1.9
8520	-2.6	-2	0.2	1.2	0.8	0.5	0.1	-0.2	-0.6	-0.9	-1	-0.3	0.7	0.8	0.1	0.5	-0.2	-1.2	-0.5	0.9
8640	0.6	0.6	1	1.4	1.4	0.3	0.3	0.5	0.4	0.2	0.1	-0.1	-0.3	-0.5	-0.7	-0.9	-0.7	-0.3	0	0.3
8760	0.4	0.2	0.8	0.1	-0.5	0.3	1.3	0.6	0.5	0.1	-1.7	-1.2	0.6	0.9	0.6	0.4	0.2	0.1	0	-1.4

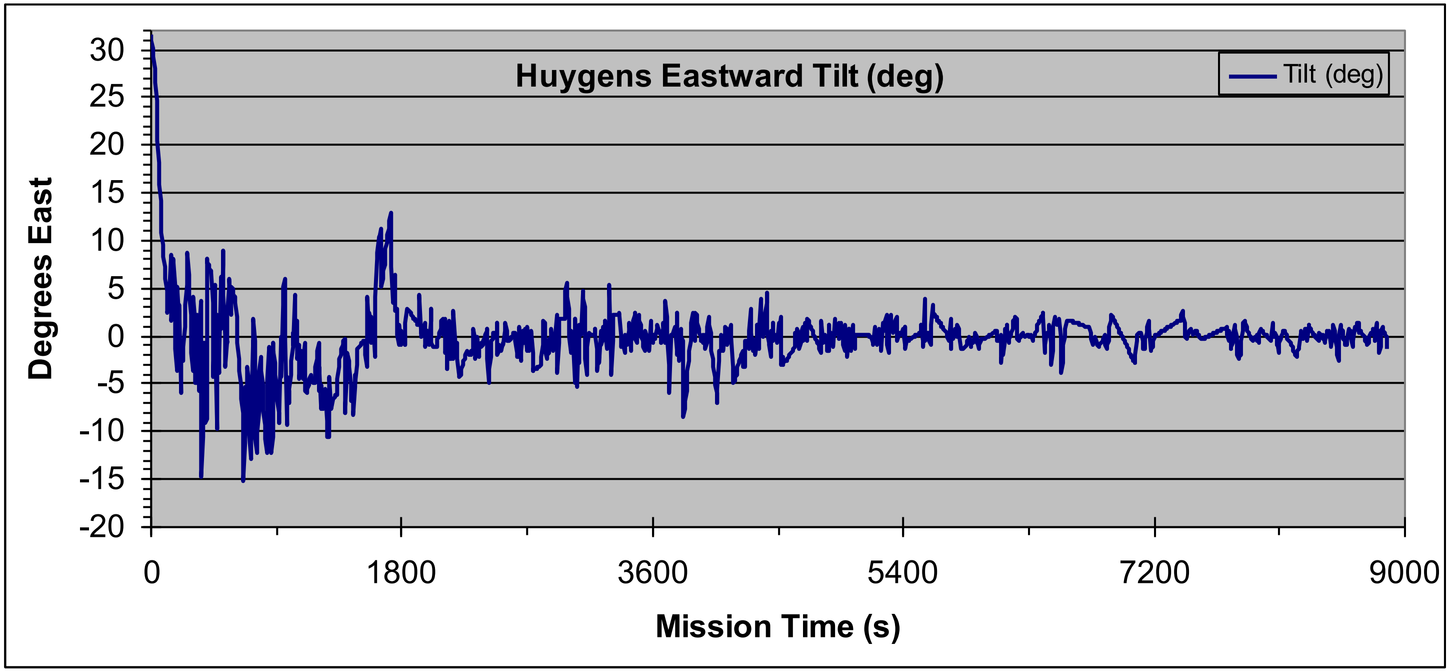


Figure - Low frequency (~0.1 hz) probe motion under parachute vs. time.

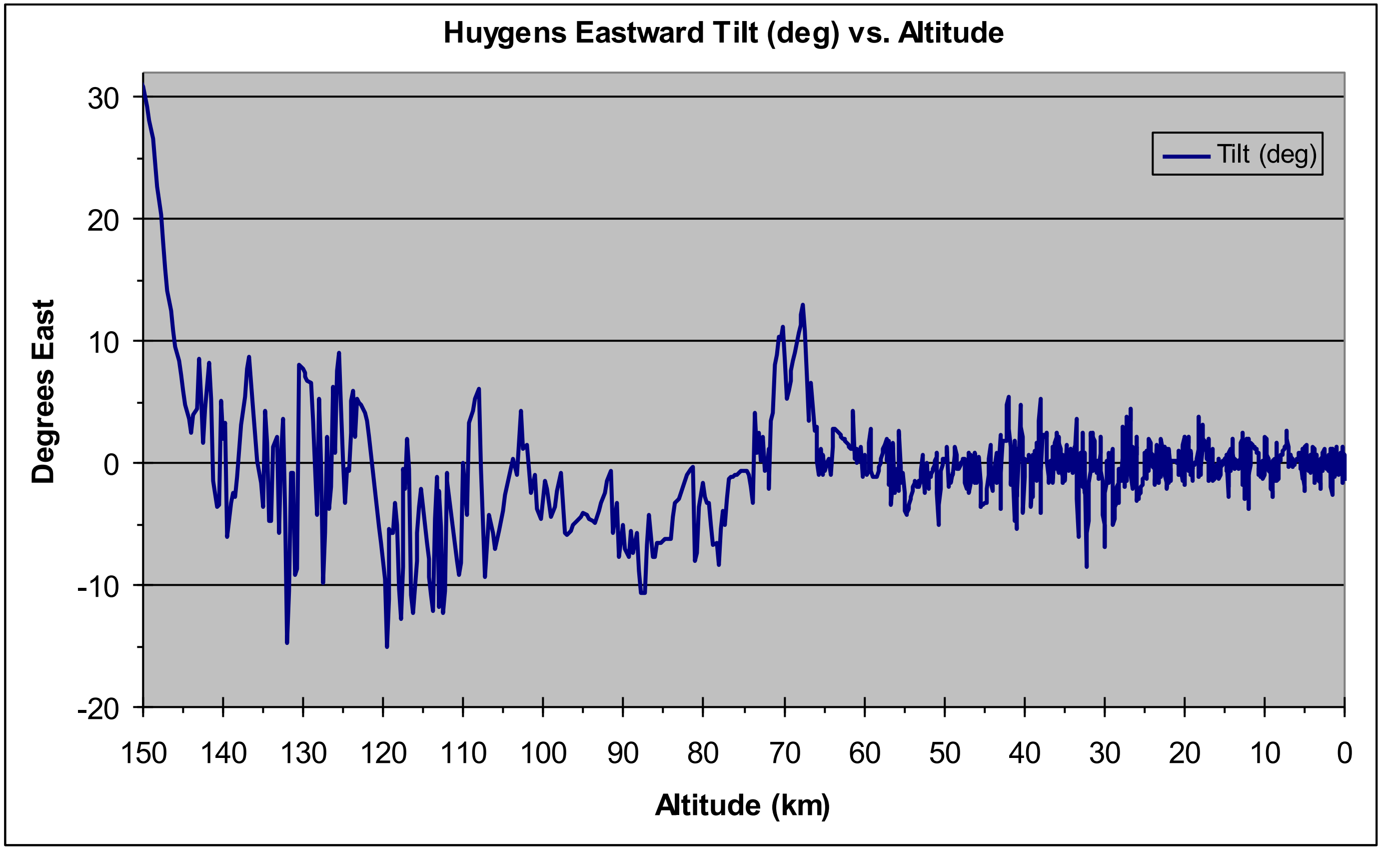


Figure - Low frequency probe swing amplitude vs. altitude.

Appendix 5 - Azimuth Functions of Huygens

Care must be taken when determining the pointing azimuth during a Huygens observation. The original concept was that the probe would spin counter-clockwise (from above), and sun crossings would determine the spin rate and angular position of the probe during the descent. However due to problems with spin direction, probe dynamics and haze the in-situ determination of the probes azimuth was often incorrect. In fact the sun sensor has no way of knowing the direction of spin, so azimuths determined after the spin reversal are in the opposite sense of what was intended.

Some azimuth corrections were made to the dataset currently in the archive. However, these were our best knowledge as of mid 2006, and the definitive analysis was not performed until 2007. This is still the best knowledge at the time of this writing (June 2012), although a true 6 degree of freedom dynamics analysis of the probe is still not available, and we are not aware of any plans to conduct a full 6 DoF dynamics analysis. Probe attitude knowledge near the epoch of low level images is quite good (~0.5°), and likely better than ~5° elsewhere. Regions of high aerodynamic forces (i.e. above 65 km) are likely not as well described as at lower altitudes (see section 5.5 of the DISR Archive Users' Guide).

The original convention for DISR observation azimuths was degrees counter-clockwise from the sun when viewed from above, and this continues to be the convention for azimuths described in the DISR headers and archive files. However elsewhere other conventions relating to DISR observations can be found, so it is important to understand the basis of all azimuth declarations.

Let us use the example of DISR IR dataset 190 (IR_0190_022512_4610). It has a sample time (i.e. exposure time) of 247 * 8.064ms = 1.992 seconds, but an overall collection time (i.e. integration time) of 994 * 8.064ms = 8.02 seconds. So the exposure begins at T0+2 hr, 25 min, 12.4610 seconds (T0+8712.461s) and ends at T0+8720.481 seconds. From the table below, the azimuth at the beginning of the observation is 332.725 revolutions from the reversal (east of north), and ends at 332.8718 revolutions (or from 261 degrees east of north to 313.85 degrees east of north, and average observation azimuth of 587.424 east of north). The sun's position during the observation (from appendix 14) is 115.03 degrees east of north. So using our original convention the observation begins 214.03 degrees CCW of the sun, and ends at 161.182 degrees CCW of the sun (an average observation azimuth of 187.606 degrees, or -172.394 degrees relative to the sun).

Azimuth information for IR exposure IR_0190_022512_4610

	T0+sec.	Rotations	Degs E of N	Sun AZ	° CCW of sun	° CCW of sun
Begin	**8712.461**	**332.7250**	**261.00**	**115.03**	**214.03**	**-145.97**
End	**8720.481**	**332.8718**	**313.85**	**115.03**	**161.18**	**-198.82**
Average	**8716.471**	**332.7984**	**287.42**	**115.03**	**187.61**	**-172.39**

From ref 5, Karkoschka
Entries are listed in full rotations for DISR (Huygens z-axis) east of north,
0.000 = north, 0.250 = east, 0.500 = south, 0.750 = west,
this smooth rotational profile does not include irregularities of a few degrees on short time scales.

This information is also available in the PDS archive in:
/EXTRAS/PROBE_ATTITUDE/DATA_AT_SOLAR_CROSSING/AZIMUTH_MODEL_29AUG05.TXT

MT+ seconds	0	10	20	30	40	50	60	70	80	90	100	110
0	31.530	30.363	29.196	28.030	26.874	25.753	24.668	23.622	22.613	21.638	20.694	19.776
120	18.884	18.017	17.173	16.352	15.552	14.771	14.008	13.265	12.542	11.840	11.161	10.503
240	9.864	9.244	8.640	8.052	7.481	6.930	6.404	5.904	5.431	4.987	4.570	4.181
360	3.818	3.479	3.162	2.865	2.585	2.322	2.078	1.852	1.647	1.464	1.303	1.164
480	1.046	0.948	0.870	0.809	0.766	0.740	0.730	0.735	0.756	0.794	0.848	0.918
600	1.005	1.108	1.227	1.360	1.509	1.672	1.850	2.043	2.251	2.472	2.706	2.954
720	3.214	3.488	3.775	4.076	4.390	4.718	5.060	5.415	5.784	6.166	6.562	6.973
840	7.397	7.834	8.284	8.747	9.222	9.710	10.211	10.723	11.255	11.823	12.435	13.063
960	13.714	14.420	15.181	15.996	16.872	17.787	18.733	19.704	20.697	21.714	22.757	23.830
1080	24.935	26.076	27.256	28.476	29.733	31.026	32.354	33.718	35.117	36.550	38.016	39.520
1200	41.060	42.635	44.237	45.857	47.483	49.102	50.709	52.304	53.892	55.472	57.045	58.615
1320	60.182	61.746	63.298	64.830	66.329	67.787	69.204	70.584	71.937	73.274	74.602	75.925
1440	77.240	78.541	79.822	81.078	82.309	83.516	84.701	85.867	87.016	88.150	89.278	90.392
1560	91.468	92.499	93.502	94.481	95.450	96.436	97.424	98.401	99.366	100.331	101.27	102.173
1680	103.076	103.999	104.902	105.818	106.712	107.563	108.416	109.262	110.076	110.871	111.669	112.485
1800	113.284	114.076	114.859	115.652	116.437	117.203	117.965	118.74	119.536	120.337	121.101	121.853
1920	122.605	123.352	124.087	124.811	125.538	126.236	126.957	127.665	128.394	129.121	129.81	130.502
2040	131.214	131.909	132.62	133.321	133.985	134.658	135.335	135.983	136.631	137.284	137.931	138.566
2160	139.167	139.763	140.361	140.961	141.548	142.114	142.648	143.161	143.689	144.21	144.727	145.248
2280	145.777	146.296	146.8	147.285	147.757	148.241	148.728	149.2	149.656	150.101	150.533	150.958
2400	151.396	151.838	152.283	152.729	153.174	153.612	154.033	154.44	154.856	155.28	155.702	156.123

MT+ seconds	0	10	20	30	40	50	60	70	80	90	100	110
2520	156.545	156.973	157.412	157.86	158.314	158.783	159.24	159.682	160.12	160.556	160.985	161.428
2640	161.865	162.292	162.713	163.125	163.53	163.936	164.366	164.829	165.29	165.735	166.171	166.608
2760	167.057	167.516	167.975	168.457	168.942	169.42	169.876	170.338	170.802	171.248	171.681	172.113
2880	172.546	172.978	173.411	173.856	174.319	174.786	175.229	175.653	176.068	176.473	176.882	177.319
3000	177.777	178.243	178.69	179.132	179.571	180.009	180.452	180.902	181.321	181.743	182.156	182.565
3120	182.970	183.377	183.787	184.161	184.519	184.909	185.288	185.665	186.045	186.435	186.822	187.211
3240	187.597	187.971	188.316	188.662	189.026	189.443	189.865	190.25	190.621	190.991	191.366	191.752
3360	192.161	192.59	193.019	193.451	193.878	194.279	194.658	195.027	195.396	195.758	196.125	196.505
3480	196.908	197.323	197.743	198.157	198.548	198.909	199.251	199.606	199.979	200.336	200.693	201.068
3600	201.475	201.895	202.293	202.701	203.115	203.517	203.905	204.306	204.692	205.079	205.466	205.87
3720	206.255	206.638	207.03	207.411	207.821	208.217	208.588	208.954	209.301	209.621	209.931	210.293
3840	210.654	211.008	211.365	211.697	211.996	212.25	212.523	212.853	213.263	213.685	214.073	214.445
3960	214.863	215.291	215.714	216.159	216.641	217.128	217.596	218.038	218.459	218.861	219.245	219.623
4080	220.003	220.392	220.768	221.138	221.498	221.845	222.17	222.47	222.732	223.006	223.323	223.658
4200	224.007	224.358	224.722	225.08	225.421	225.762	226.089	226.404	226.731	227.064	227.393	227.665
4320	227.920	228.193	228.483	228.79	229.095	229.389	229.661	229.942	230.243	230.534	230.829	231.123
4440	231.417	231.72	232.023	232.335	232.653	232.972	233.29	233.612	233.938	234.269	234.607	234.95
4560	235.299	235.642	235.973	236.282	236.586	236.89	237.193	237.496	237.802	238.122	238.458	238.809
4680	239.150	239.479	239.792	240.113	240.441	240.768	241.093	241.418	241.744	242.078	242.42	242.737
4800	243.050	243.363	243.654	243.939	244.243	244.546	244.843	245.147	245.444	245.722	246.003	246.284
4920	246.564	246.841	247.097	247.316	247.496	247.668	247.842	248.002	248.18	248.385	248.627	248.895
5040	249.138	249.379	249.636	249.898	250.143	250.383	250.631	250.888	251.155	251.433	251.718	252.016
5160	252.332	252.65	252.965	253.261	253.55	253.841	254.118	254.383	254.634	254.884	255.126	255.369
5280	255.623	255.899	256.185	256.482	256.771	257.062	257.359	257.651	257.936	258.205	258.471	258.742
5400	259.015	259.289	259.563	259.836	260.113	260.392	260.664	260.933	261.205	261.48	261.76	262.032
5520	262.291	262.551	262.811	263.073	263.336	263.614	263.906	264.192	264.475	264.753	265.018	265.267
5640	265.523	265.79	266.069	266.359	266.638	266.91	267.188	267.462	267.722	267.978	268.241	268.501
5760	268.759	269.014	269.27	269.54	269.815	270.085	270.362	270.638	270.908	271.175	271.437	271.691
5880	271.947	272.206	272.466	272.732	272.997	273.26	273.527	273.802	274.077	274.351	274.627	274.904
6000	275.184	275.456	275.711	275.957	276.199	276.44	276.684	276.927	277.174	277.442	277.704	277.963

MT+ seconds	0	10	20	30	40	50	60	70	80	90	100	110
6120	278.233	278.515	278.791	279.059	279.327	279.597	279.865	280.126	280.375	280.619	280.869	281.113
6240	281.355	281.596	281.84	282.094	282.357	282.613	282.867	283.122	283.378	283.634	283.889	284.132
6360	284.369	284.607	284.845	285.089	285.337	285.591	285.851	286.109	286.361	286.604	286.835	287.06
6480	287.269	287.47	287.675	287.899	288.13	288.354	288.584	288.826	289.068	289.314	289.556	289.795
6600	290.032	290.265	290.501	290.745	290.983	291.212	291.435	291.651	291.864	292.082	292.305	292.528
6720	292.754	292.98	293.202	293.425	293.661	293.895	294.116	294.336	294.55	294.751	294.955	295.171
6840	295.389	295.608	295.837	296.068	296.279	296.494	296.72	296.952	297.19	297.434	297.682	297.934
6960	298.195	298.45	298.691	298.924	299.152	299.377	299.603	299.828	300.044	300.251	300.462	300.664
7080	300.867	301.068	301.265	301.477	301.697	301.921	302.143	302.363	302.584	302.792	302.997	303.209
7200	303.421	303.617	303.817	304.019	304.219	304.418	304.613	304.806	305.002	305.199	305.399	305.602
7320	305.810	306.02	306.233	306.446	306.659	306.87	307.076	307.28	307.484	307.68	307.878	308.076
7440	308.279	308.505	308.717	308.908	309.099	309.293	309.472	309.652	309.837	310.026	310.219	310.422
7560	310.640	310.867	311.083	311.293	311.508	311.73	311.952	312.17	312.388	312.612	312.837	313.056
7680	313.270	313.478	313.68	313.88	314.081	314.277	314.47	314.657	314.842	315.023	315.214	315.403
7800	315.576	315.759	315.952	316.149	316.356	316.551	316.739	316.923	317.097	317.265	317.437	317.615
7920	317.797	317.99	318.199	318.413	318.622	318.828	319.03	319.225	319.421	319.623	319.827	320.021
8040	320.205	320.387	320.571	320.755	320.941	321.129	321.319	321.514	321.715	321.915	322.109	322.301
8160	322.492	322.68	322.869	323.067	323.273	323.476	323.677	323.866	324.063	324.223	324.381	324.551
8280	324.726	324.912	325.087	325.265	325.446	325.631	325.822	326.019	326.226	326.417	326.581	326.735
8400	326.886	327.059	327.245	327.439	327.632	327.823	328.012	328.201	328.385	328.57	328.766	328.964
8520	329.167	329.372	329.564	329.746	329.929	330.111	330.282	330.461	330.656	330.861	331.069	331.269
8640	331.452	331.621	331.791	331.971	332.151	332.326	332.5	332.68	332.863	333.046	333.217	333.394
8760	333.581	333.774	333.981	334.167	334.349	334.525	334.695	334.862	335.035	335.212	335.384	335.536

DISR azimuths shown in the archive label files and data headers are defined in the oppose sense (in keeping with the original anticipated spin direction of the probe) as degrees west of north (counter-clockwise as viewed from above) relative to the sun vector's projection on Titan's surface at the beginning of the measurement.

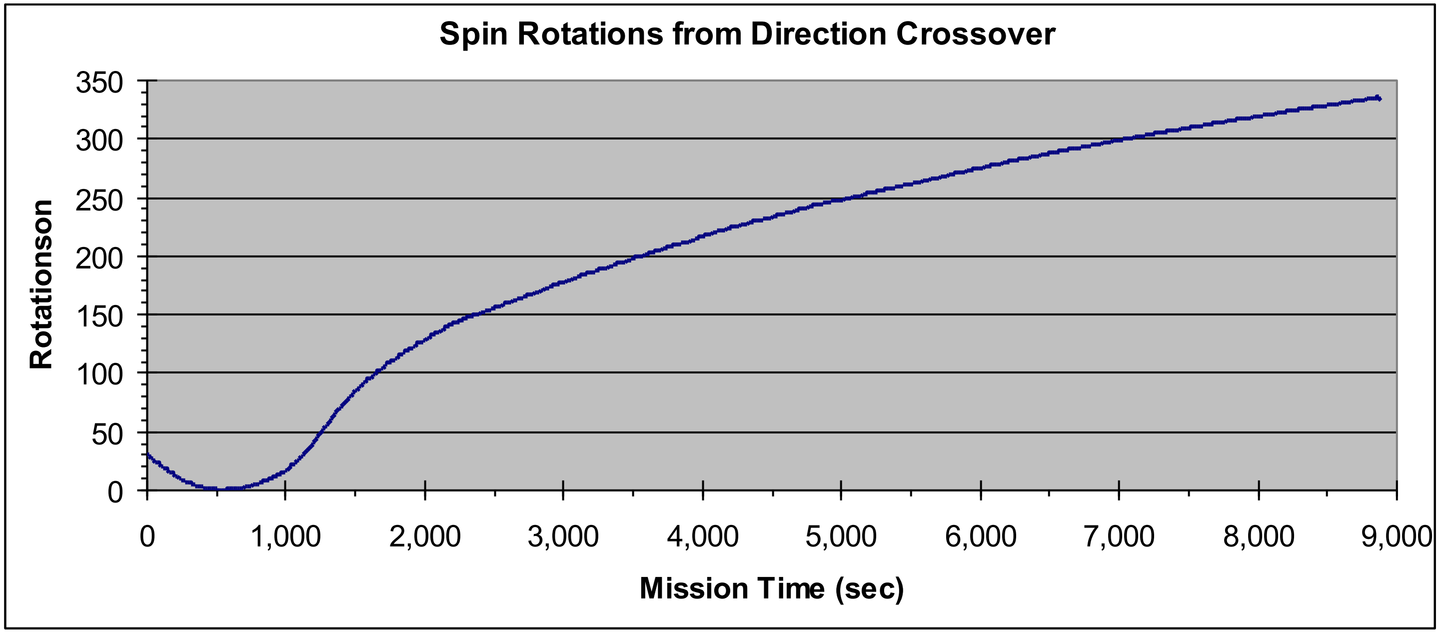


Figure - Total number of probe spin rotations from reversal at ~125 km altitude (~545 seconds).

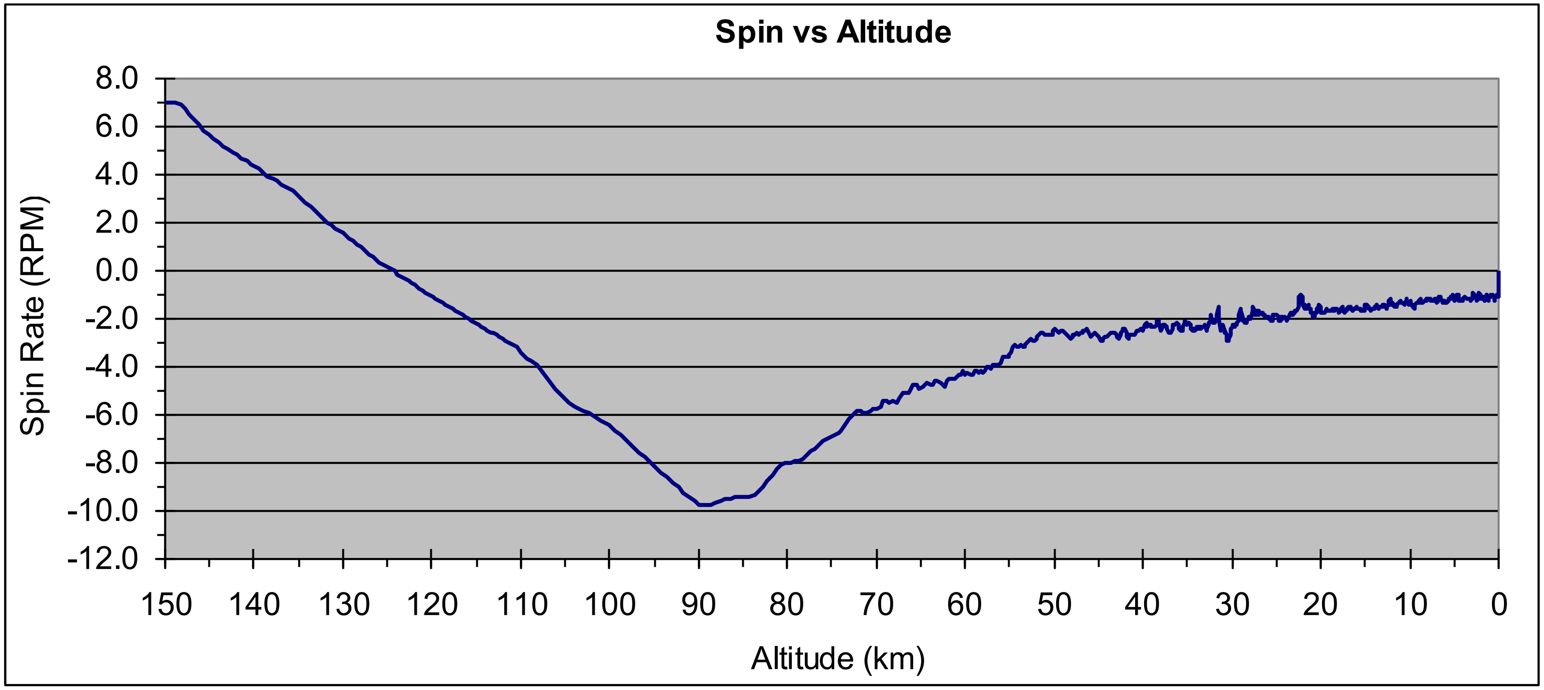


Figure - Huygens probe spin rate vs. altitude.

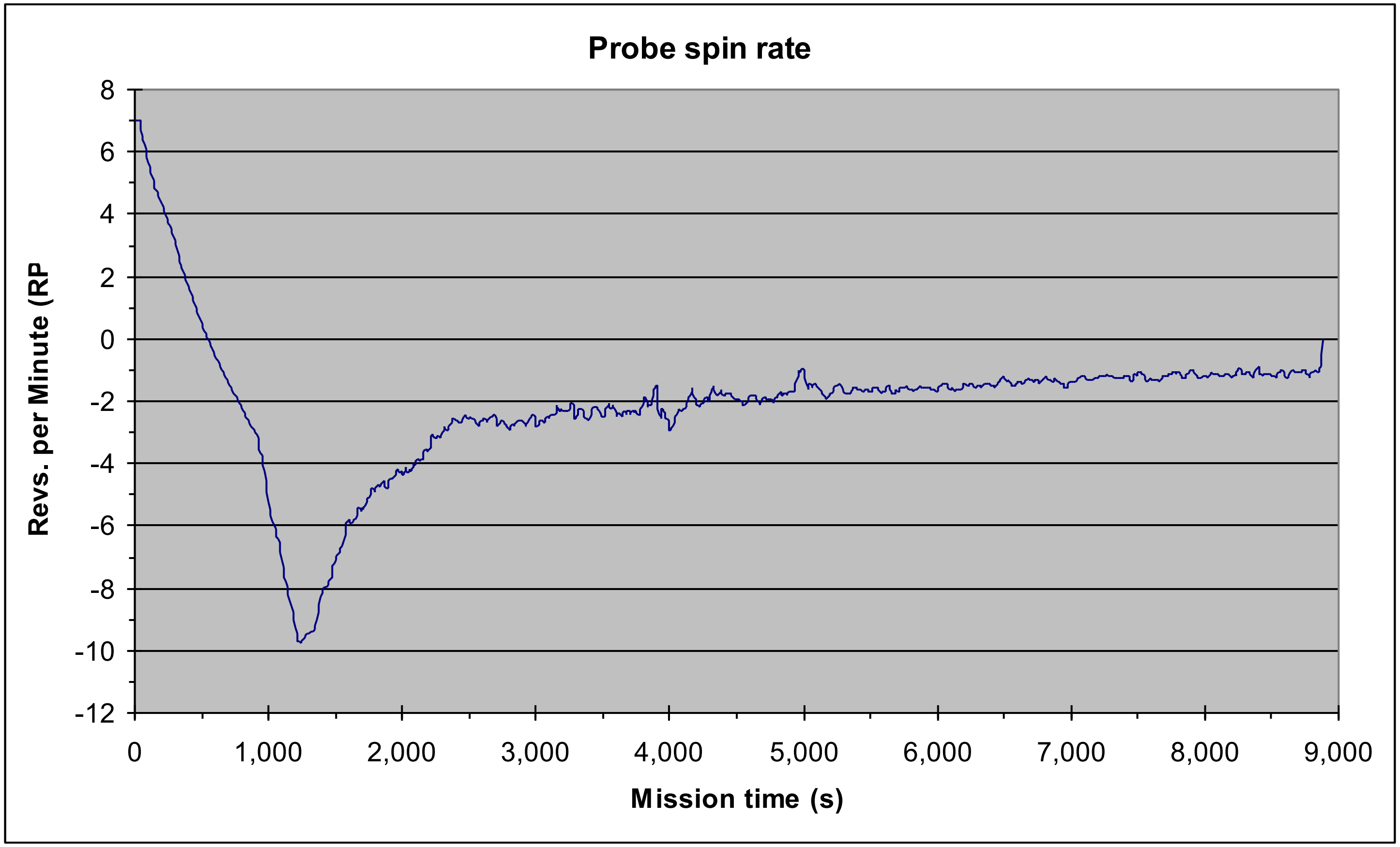


Figure - Huygens probe spin rate vs. mission time.

References....

5 - "DISR imaging and the geometry of the descent of the Huygens probe within Titan's atmosphere", Erich Karkoschka, et al., Planetary and Space Science 55 (2007) 1896-1935

Appendix 6 - A summary of the DISR Descent Mode Cycles.

The DISR software schedules data collection in pre-defined batches called "Cycles". Each cycle is designed for a particular purpose. For example the "Image Cycle" is designed to collect a set of images at each of 12 azimuths relative to the sun, along with associated spectra and solar aureole exposures to measure one atmospheric level. The software also manages the buffer state of the instrument by scheduling enough measurement to assure no probe polling opportunities are lost. Above 20 km altitude the software keeps the buffer as full as possible to take advantage of any potential windfall polling. At 20 km the buffer is emptied by the Drain cycle and the Near Surface cycles keep just enough data in the buffer to keep up with the data link, but loose as little low-level data as possible upon impact. Below is a summary of the Descent cycles:

Image - Collects a set of images at each of 12 azimuths relative to the sun, along with associated spectra and solar aureole exposures to measure one atmospheric level.

Non-Image - Collects 360 degrees of spectra (UV thru IR) and solar aureole measurements representing one atmospheric level.

Calibration - Collects data from each instrument with the calibration lamps on and off, to track thermal variations.

Drain - Empties the telemetry buffer to secure all high altitude data.

HNS - High Near Surface cycles similar to Image cycles, captures two clocked rotations of images, spectra and solar aureole measurements to provide one altitude panorama.

Spec. - Spectrophotometric cycles take downward looking spectral exposures to create a 360 degree map of Titan's surface.

MNS - Medium Near Surface cycles take single snapshot images and spectra at a rate that keeps the telemetry buffer near empty.

LNS - Low Near Surface cycles take rapid half SLI images of the surface.

VLNS - Very Low Near Surface cycles take only spectra near Titan's surface.

Surf. - Surface cycles take observations from Titan's surface.

The plots below show the altitudes were specific cycles were taken and a summary of the 164 cycles collected during the Titan descent.

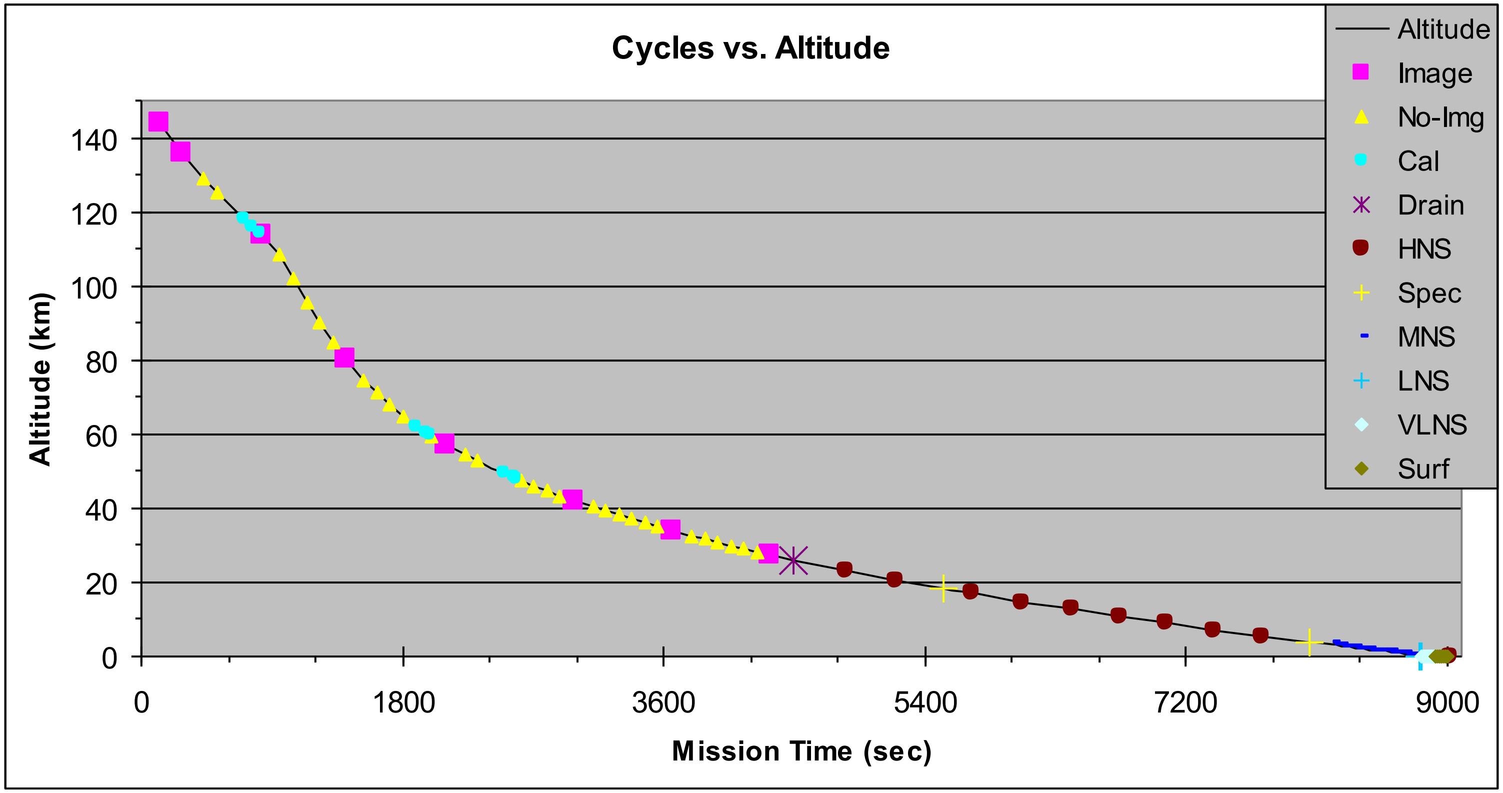


Figure - DISR Descent Cycles (& Altitude) vs. Mission Time

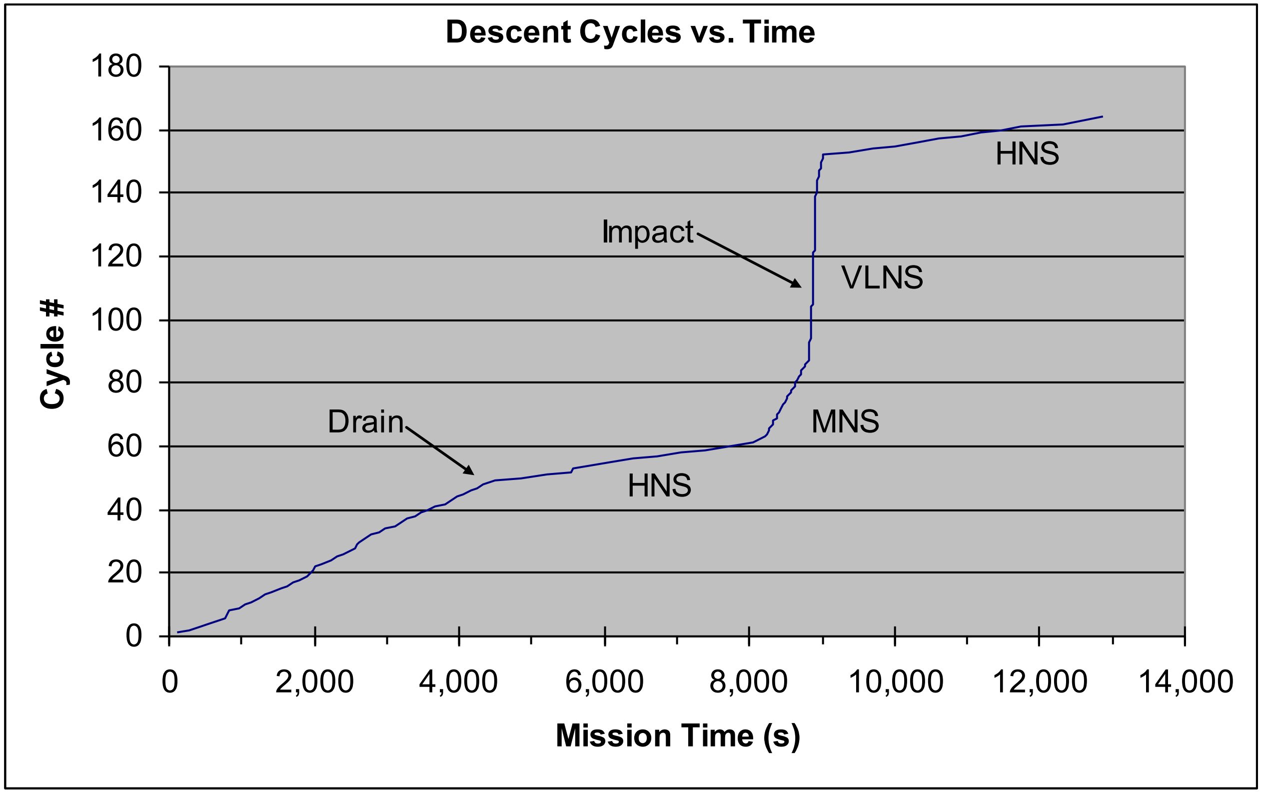


Figure - Descent Cycle progression during Titan descent.

This table presents the DISR Descent Mode Cycle Types experienced during the Titan descent by mission time (M_Time) with corresponding DDB altitude. The values for altitude in the 3rd column (Altitude) are as reconstructed by the Descent Trajectory Working Group (DTWG) as of July 2011 and are more accurate. The values or altitude in the other columns (5-17) are as reported in the Descent Data Broadcast (DDB) during the descent and therefore as used by the in-flight software. The surface cycles (SurfA thru SurfC) are not reported in the table but were all at zero altitude.

Cycle #	Type	Altitude (km)	M_Time (s)	Img	NoImg	Cal_A	CAl_B	Cal_C	Flat	Drain	HNS	Dark	Spect	MNS	LNS	VLNS
1	Img	143.876	122.6	152.75	0	0	0	0	0	0	0	0	0	0	0	0
2	Img	135.934	282.0	141.43	0	0	0	0	0	0	0	0	0	0	0	0
3	NoImg	129.106	433.2	0	132.51	0	0	0	0	0	0	0	0	0	0	0
4	NoImg	125.304	523.2	0	128.34	0	0	0	0	0	0	0	0	0	0	0
5	Cal_A	118.369	700.6	0	0	120.77	0	0	0	0	0	0	0	0	0	0
6	Cal_B	116.178	760.6	0	0	0	118.37	0	0	0	0	0	0	0	0	0
7	Cal_C	114.471	808.0	0	0	0	0	116.52	0	0	0	0	0	0	0	0
8	Img	113.784	828.5	115.76	0	0	0	0	0	0	0	0	0	0	0	0
9	NoImg	108.300	957.9	0	108.52	0	0	0	0	0	0	0	0	0	0	0
10	NoImg	101.776	1047.9	0	101.56	0	0	0	0	0	0	0	0	0	0	0
11	NoImg	95.583	1137.9	0	95.17	0	0	0	0	0	0	0	0	0	0	0
12	NoImg	89.963	1227.9	0	89.43	0	0	0	0	0	0	0	0	0	0	0
13	NoImg	84.922	1317.9	0	84.25	0	0	0	0	0	0	0	0	0	0	0
14	Img	80.304	1407.9	79.57	0	0	0	0	0	0	0	0	0	0	0	0
15	NoImg	74.693	1531.2	0	73.89	0	0	0	0	0	0	0	0	0	0	0
16	NoImg	71.001	1621.2	0	70.24	0	0	0	0	0	0	0	0	0	0	0
17	NoImg	67.748	1711.2	0	66.96	0	0	0	0	0	0	0	0	0	0	0
18	NoImg	64.835	1801.2	0	64.05	0	0	0	0	0	0	0	0	0	0	0
19	Cal_A	62.251	1891.2	0	0	61.43	0	0	0	0	0	0	0	0	0	0
20	Cal_B	60.683	1951.2	0	0	0	59.79	0	0	0	0	0	0	0	0	0
21	Cal_C	59.985	1979.0	0	0	0	0	59.1	0	0	0	0	0	0	0	0
22	NoImg	59.355	2004.8	0	58.45	0	0	0	0	0	0	0	0	0	0	0
23	Img	57.259	2094.8	56.31	0	0	0	0	0	0	0	0	0	0	0	0
24	NoImg	54.418	2228.1	0	53.36	0	0	0	0	0	0	0	0	0	0	0
25	NoImg	52.648	2318.2	0	51.53	0	0	0	0	0	0	0	0	0	0	0
26	Flat	50.974	2408.2	0	0	0	0	0	49.81	0	0	0	0	0	0	0
27	Cal_A	49.389	2498.2	0	0	48.17	0	0	0	0	0	0	0	0	0	0
28	Cal_B	48.368	2558.2	0	0	0	47.13	0	0	0	0	0	0	0	0	0

Cycle #	Type	Altitude (km)	M_Time (s)	Img	NoImg	Cal_A	CAl_B	Cal_C	Flat	Drain	HNS	Dark	Spect	MNS	LNS	VLNS
29	Cal_C	48.008	2579.9	0	0	0	0	46.78	0	0	0	0	0	0	0	0
30	NoImg	47.465	2613.1	0	46.22	0	0	0	0	0	0	0	0	0	0	0
31	NoImg	46.040	2703.1	0	44.75	0	0	0	0	0	0	0	0	0	0	0
32	NoImg	44.686	2793.1	0	43.35	0	0	0	0	0	0	0	0	0	0	0
33	NoImg	43.382	2883.1	0	42.01	0	0	0	0	0	0	0	0	0	0	0
34	Img	42.133	2973.1	40.72	0	0	0	0	0	0	0	0	0	0	0	0
35	NoImg	40.277	3113.2	0	38.81	0	0	0	0	0	0	0	0	0	0	0
36	NoImg	39.142	3203.2	0	37.64	0	0	0	0	0	0	0	0	0	0	0
37	NoImg	38.043	3293.2	0	36.5	0	0	0	0	0	0	0	0	0	0	0
38	NoImg	36.980	3383.2	0	35.41	0	0	0	0	0	0	0	0	0	0	0
39	NoImg	35.953	3473.2	0	34.35	0	0	0	0	0	0	0	0	0	0	0
40	NoImg	34.958	3563.2	0	33.31	0	0	0	0	0	0	0	0	0	0	0
41	Img	33.998	3653.2	32.32	0	0	0	0	0	0	0	0	0	0	0	0
42	NoImg	32.542	3794.2	0	30.8	0	0	0	0	0	0	0	0	0	0	0
43	NoImg	31.644	3884.2	0	29.88	0	0	0	0	0	0	0	0	0	0	0
44	NoImg	30.773	3974.2	0	28.98	0	0	0	0	0	0	0	0	0	0	0
45	NoImg	29.922	4064.2	0	28.1	0	0	0	0	0	0	0	0	0	0	0
46	NoImg	29.092	4154.3	0	27.23	0	0	0	0	0	0	0	0	0	0	0
47	NoImg	28.283	4244.3	0	26.39	0	0	0	0	0	0	0	0	0	0	0
48	Img	27.481	4335.6	25.57	0	0	0	0	0	0	0	0	0	0	0	0
49	Drain	26.112	4495.4	0	0	0	0	0	0	14	0	0	0	0	0	0
50	HNS	23.207	4856.4	0	0	0	0	0	0	0	12.6	0	0	0	0	0
51	HNS	20.669	5194.9	0	0	0	0	0	0	0	11.28	0	0	0	0	0
52	Spect	18.284	5534.9	0	0	0	0	0	0	0	0	0	9.99	0	0	0
53	Dark	17.980	5579.3	0	0	0	0	0	0	0	0	9.86	0	0	0	0
54	HNS	16.997	5726.2	0	0	0	0	0	0	0	11.64	0	0	0	0	0
55	HNS	14.796	6067.4	0	0	0	0	0	0	0	16.25	0	0	0	0	0
56	HNS	12.731	6405.7	0	0	0	0	0	0	0	14.01	0	0	0	0	0
57	HNS	10.807	6736.6	0	0	0	0	0	0	0	11.92	0	0	0	0	0
58	HNS	8.982	7063.1	0	0	0	0	0	0	0	10.01	0	0	0	0	0
59	HNS	7.249	7384.4	0	0	0	0	0	0	0	8.01	0	0	0	0	0
60	HNS	5.519	7717.7	0	0	0	0	0	0	0	6.21	0	0	0	0	0
61	Spect	3.882	8046.4	0	0	0	0	0	0	0	0	0	4.31	0	0	0
62	Dark	3.642	8095.3	0	0	0	0	0	0	0	0	4.11	0	0	0	0

Cycle #	Type	Altitude (km)	M_Time (s)	Img	NoImg	Cal_A	CAl_B	Cal_C	Flat	Drain	HNS	Dark	Spect	MNS	LNS	VLNS
63	MNS	3.026	8222.7	0	0	0	0	0	0	0	0	0	0	3.39	0	0
64	MNS	2.982	8231.7	0	0	0	0	0	0	0	0	0	0	3.37	0	0
65	MNS	2.790	8271.3	0	0	0	0	0	0	0	0	0	0	3.14	0	0
66	MNS	2.746	8280.5	0	0	0	0	0	0	0	0	0	0	3.08	0	0
67	MNS	2.556	8320.4	0	0	0	0	0	0	0	0	0	0	2.87	0	0
68	MNS	2.512	8329.6	0	0	0	0	0	0	0	0	0	0	2.83	0	0
69	MNS	2.325	8368.9	0	0	0	0	0	0	0	0	0	0	2.62	0	0
70	MNS	2.282	8378.1	0	0	0	0	0	0	0	0	0	0	2.56	0	0
71	MNS	2.098	8417.3	0	0	0	0	0	0	0	0	0	0	2.37	0	0
72	MNS	2.054	8426.5	0	0	0	0	0	0	0	0	0	0	2.31	0	0
73	MNS	1.859	8467.4	0	0	0	0	0	0	0	0	0	0	2.1	0	0
74	MNS	1.818	8476.3	0	0	0	0	0	0	0	0	0	0	2.05	0	0
75	MNS	1.631	8516.3	0	0	0	0	0	0	0	0	0	0	1.83	0	0
76	MNS	1.589	8525.2	0	0	0	0	0	0	0	0	0	0	1.79	0	0
77	MNS	1.403	8565.5	0	0	0	0	0	0	0	0	0	0	1.59	0	0
78	MNS	1.361	8574.6	0	0	0	0	0	0	0	0	0	0	1.53	0	0
79	MNS	1.175	8614.2	0	0	0	0	0	0	0	0	0	0	1.33	0	0
80	MNS	1.132	8623.2	0	0	0	0	0	0	0	0	0	0	1.28	0	0
81	MNS	0.942	8663.9	0	0	0	0	0	0	0	0	0	0	1.07	0	0
82	MNS	0.900	8673.1	0	0	0	0	0	0	0	0	0	0	1.02	0	0
83	MNS	0.720	8711.9	0	0	0	0	0	0	0	0	0	0	0.830	0	0
84	MNS	0.676	8721.2	0	0	0	0	0	0	0	0	0	0	0.770	0	0
85	MNS	0.488	8762.3	0	0	0	0	0	0	0	0	0	0	0.560	0	0
86	MNS	0.445	8771.6	0	0	0	0	0	0	0	0	0	0	0.520	0	0
87	LNS	0.269	8810.5	0	0	0	0	0	0	0	0	0	0	0	0.310	0
88	LNS	0.255	8813.5	0	0	0	0	0	0	0	0	0	0	0	0.300	0
89	LNS	0.242	8816.6	0	0	0	0	0	0	0	0	0	0	0	0.280	0
90	LNS	0.227	8819.8	0	0	0	0	0	0	0	0	0	0	0	0.270	0
91	VLNS	0.205	8824.7	0	0	0	0	0	0	0	0	0	0	0	0	0.240
92	VLNS	0.198	8826.4	0	0	0	0	0	0	0	0	0	0	0	0	0.230
93	VLNS	0.172	8831.9	0	0	0	0	0	0	0	0	0	0	0	0	0.210
94	VLNS	0.127	8841.5	0	0	0	0	0	0	0	0	0	0	0	0	0.160
95	VLNS	0.120	8843.3	0	0	0	0	0	0	0	0	0	0	0	0	0.150
96	VLNS	0.112	8845.0	0	0	0	0	0	0	0	0	0	0	0	0	0.140

Cycle #	Type	Altitude (km)	M_Time (s)	Img	NoImg	Cal_A	CAl_B	Cal_C	Flat	Drain	HNS	Dark	Spect	MNS	LNS	VLNS
97	VLNS	0.104	8846.7	0	0	0	0	0	0	0	0	0	0	0	0	0.130
98	VLNS	0.097	8848.4	0	0	0	0	0	0	0	0	0	0	0	0	0.120
99	VLNS	0.089	8850.1	0	0	0	0	0	0	0	0	0	0	0	0	0.110
100	VLNS	0.081	8851.8	0	0	0	0	0	0	0	0	0	0	0	0	0.110
101	VLNS	0.074	8853.5	0	0	0	0	0	0	0	0	0	0	0	0	0.100
102	VLNS	0.066	8855.2	0	0	0	0	0	0	0	0	0	0	0	0	0.090
103	VLNS	0.058	8856.9	0	0	0	0	0	0	0	0	0	0	0	0	0.080
104	VLNS	0.050	8858.7	0	0	0	0	0	0	0	0	0	0	0	0	0.060
105	VLNS	0.043	8860.4	0	0	0	0	0	0	0	0	0	0	0	0	0.050
106	VLNS	0.035	8862.1	0	0	0	0	0	0	0	0	0	0	0	0	0.040
107	VLNS	0.027	8863.8	0	0	0	0	0	0	0	0	0	0	0	0	0.040
108	VLNS	0.019	8865.5	0	0	0	0	0	0	0	0	0	0	0	0	0.030
109	VLNS	0.012	8867.2	0	0	0	0	0	0	0	0	0	0	0	0	0.020
110	VLNS	0.004	8868.9	0	0	0	0	0	0	0	0	0	0	0	0	0.010
111	VLNS	0.000	8870.6	0	0	0	0	0	0	0	0	0	0	0	0	0.000
112	VLNS	0	8872.4	0	0	0	0	0	0	0	0	0	0	0	0	0.000
113	VLNS	0	8873.5	0	0	0	0	0	0	0	0	0	0	0	0	0.000
114	VLNS	0	8876.2	0	0	0	0	0	0	0	0	0	0	0	0	0.000
115	VLNS	0	8877.3	0	0	0	0	0	0	0	0	0	0	0	0	0.000
116	VLNS	0	8879.2	0	0	0	0	0	0	0	0	0	0	0	0	0.000
117	VLNS	0	8880.3	0	0	0	0	0	0	0	0	0	0	0	0	0.000
118	VLNS	0	8882.2	0	0	0	0	0	0	0	0	0	0	0	0	0.000
119	VLNS	0	8883.3	0	0	0	0	0	0	0	0	0	0	0	0	0.000
120	VLNS	0	8885.3	0	0	0	0	0	0	0	0	0	0	0	0	0.000
121	VLNS	0	8886.4	0	0	0	0	0	0	0	0	0	0	0	0	0.000
122	VLNS	0	8888.3	0	0	0	0	0	0	0	0	0	0	0	0	0.000
123	VLNS	0	8890.0	0	0	0	0	0	0	0	0	0	0	0	0	0.000
124	VLNS	0	8891.2	0	0	0	0	0	0	0	0	0	0	0	0	0.000
125	VLNS	0	8893.0	0	0	0	0	0	0	0	0	0	0	0	0	0.000
126	VLNS	0	8894.2	0	0	0	0	0	0	0	0	0	0	0	0	0.000
127	VLNS	0	8895.3	0	0	0	0	0	0	0	0	0	0	0	0	0.000
128	VLNS	0	8897.7	0	0	0	0	0	0	0	0	0	0	0	0	0.000
129	VLNS	0	8898.8	0	0	0	0	0	0	0	0	0	0	0	0	0.000
130	VLNS	0	8900.5	0	0	0	0	0	0	0	0	0	0	0	0	0.000

Cycle #	Type	Altitude (km)	M_Time (s)	Img	NoImg	Cal_A	CAl_B	Cal_C	Flat	Drain	HNS	Dark	Spect	MNS	LNS	VLNS
131	VLNS	0	8902.3	0	0	0	0	0	0	0	0	0	0	0	0	0.000
132	VLNS	0	8903.4	0	0	0	0	0	0	0	0	0	0	0	0	0.000
133	VLNS	0	8905.9	0	0	0	0	0	0	0	0	0	0	0	0	0.000
134	VLNS	0	8907.1	0	0	0	0	0	0	0	0	0	0	0	0	0.000
135	VLNS	0	8908.2	0	0	0	0	0	0	0	0	0	0	0	0	0.000
136	VLNS	0	8909.7	0	0	0	0	0	0	0	0	0	0	0	0	0.000
137	VLNS	0	8911.5	0	0	0	0	0	0	0	0	0	0	0	0	0.000
138	VLNS	0	8912.7	0	0	0	0	0	0	0	0	0	0	0	0	0.000
139	VLNS	0	8914.5	0	0	0	0	0	0	0	0	0	0	0	0	0.000
140	VLNS	0	8915.7	0	0	0	0	0	0	0	0	0	0	0	0	0.000
141	SurfA	0	8917.9	0	0	0	0	0	0	0	0	0	0	0	0	0
142	SurfB	0	8923.6	0	0	0	0	0	0	0	0	0	0	0	0	0
143	SurfB	0	8931.6	0	0	0	0	0	0	0	0	0	0	0	0	0
144	SurfB	0	8941.5	0	0	0	0	0	0	0	0	0	0	0	0	0
145	SurfB	0	8949.8	0	0	0	0	0	0	0	0	0	0	0	0	0
146	SurfB	0	8958.7	0	0	0	0	0	0	0	0	0	0	0	0	0
147	SurfB	0	8966.9	0	0	0	0	0	0	0	0	0	0	0	0	0
148	SurfB	0	8975.3	0	0	0	0	0	0	0	0	0	0	0	0	0
149	SurfB	0	8983.6	0	0	0	0	0	0	0	0	0	0	0	0	0
150	SurfB	0	8991.9	0	0	0	0	0	0	0	0	0	0	0	0	0
151	SurfC	0	9000.2	0	0	0	0	0	0	0	0	0	0	0	0	0
152	HNS	0	9010.7	0	0	0	0	0	0	0	0.000	0	0	0	0	0
153	HNS	0	9370.3	0	0	0	0	0	0	0	0.000	0	0	0	0	0
154	HNS	0	9690.7	0	0	0	0	0	0	0	0.000	0	0	0	0	0
155	HNS	0	10001.4	0	0	0	0	0	0	0	0.000	0	0	0	0	0
156	HNS	0	10311.4	0	0	0	0	0	0	0	0.000	0	0	0	0	0
157	HNS	0	10609.5	0	0	0	0	0	0	0	0.000	0	0	0	0	0
158	HNS	0	10904.5	0	0	0	0	0	0	0	0.000	0	0	0	0	0
159	HNS	0	11182.0	0	0	0	0	0	0	0	0.000	0	0	0	0	0
160	HNS	0	11462.6	0	0	0	0	0	0	0	0.000	0	0	0	0	0
161	HNS	0	11744.2	0	0	0	0	0	0	0	0.000	0	0	0	0	0
162	HNS	0	12307.2	0	0	0	0	0	0	0	0.000	0	0	0	0	0
163	HNS	0	12588.4	0	0	0	0	0	0	0	0.000	0	0	0	0	0
164	HNS	0	12864.9	0	0	0	0	0	0	0	0.000	0	0	0	0	0

The following table lists the types and number of observations made for each Descent Cycle.

Measurements taken during typical descent cycles:

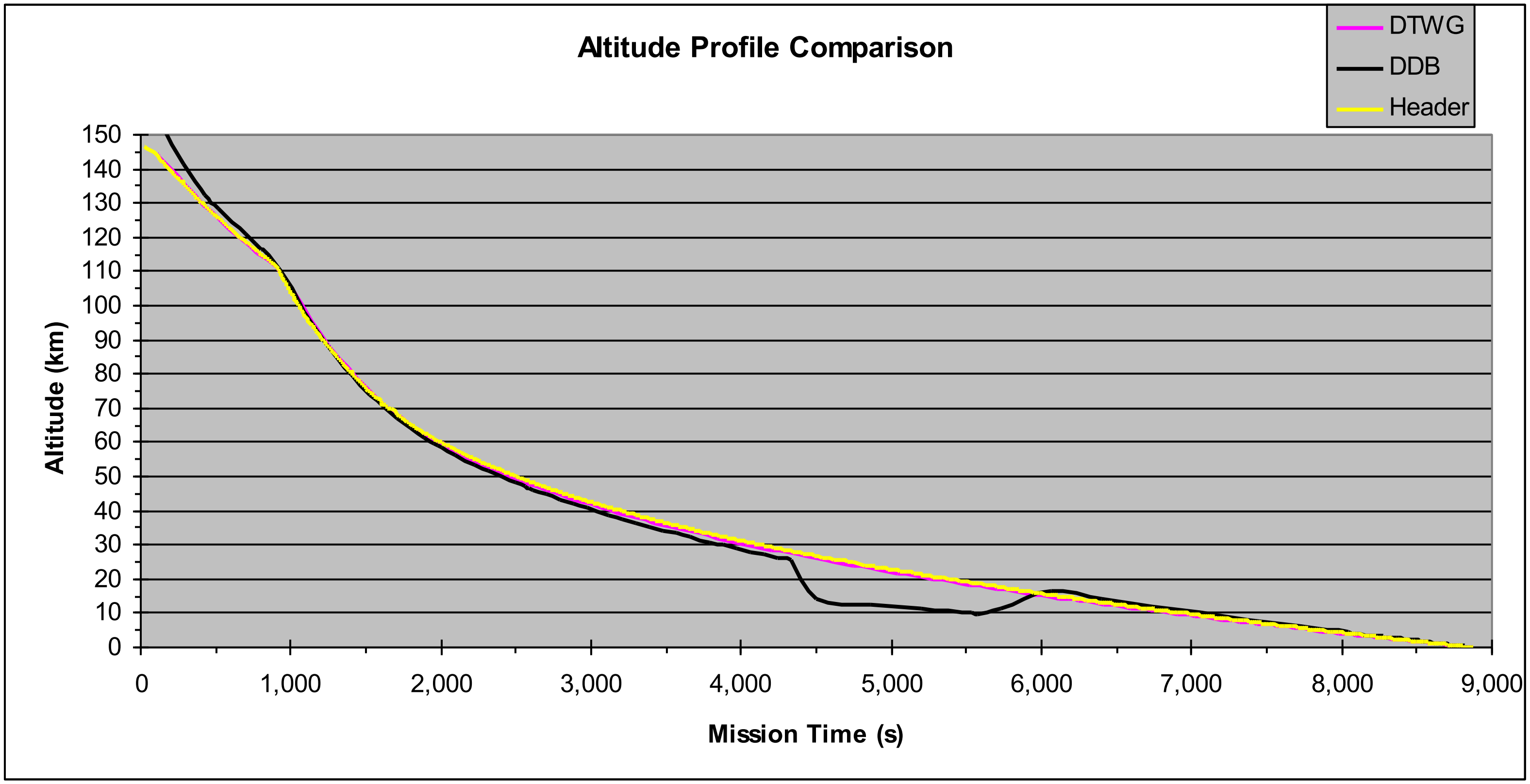
	Above 20 km Altitude					Below 20 km Altitude							
	Image	**No Image**	**Cal A**	**Cal B**	**Cal C**	**Surf. A & B**	**Surface C**	**VLNS**	**LNS**	**MNS**	**HNS**	**Dark**	**Spectr**
IR_COMB	1	1	1	1	1	1	1	1	0	1	1	0	0
DLIS	0	0	0	0	0	0	0	0	0	0	0	0	51-56
ULIS	0	0	0	0	0	0	0	0	0	0	0	0	0
IR_long	0	0	0	1	0	0	0	0	0	0	0	0	0
DLVS	12	6	1	2	1	1	1	1	0	1	12	0	31-35
ULVS	5	5	1	2	1	1	1	0	0	1	5	0	0
DLVS_Ex	12	6	1	2	1	1	1	1	0	1	12	0	31-35
ULVS_Ex	5	5	1	2	1	1	1	0	0	1	5	0	0
DLV	2	2	1	1	1	1	1	1	0	1	2	0	0
ULV	5	5	1	1	1	1	1	1	0	1	5	0	0
DLI1, HRI	12	0	1	2	0	0	1	0	0	1	12	0	0
DLI2, MRI	12	0	1	2	0	0	1	0	0	1	12	0	0
SLI	12	0	1	2	0	0	1	0	0	1	12	0	0
DLI1Raw	6	0	1	1	0	0	0	0	1	0-1	6-12	0	0
DLI2Raw	0-1	0	0	0	0	0	0-1	0	0	0-1	0-6	0	0
SLIRaw	7	0	0	1	0	0	0	0	0	0-1	0-6	0	0
DLI1(U)	0	0	0	0	0	0	0	0	1	0	0	0	0
DLI1(L)	0	0	0	0	0	0	0	0	1	0	0	0	0
STRIP	0	6	0	0	0	0	0	0	0	0	0	0	0
SA	2	2	1	2	1	0	0	0	0	1	2	0	0
DARK	1	1	1	2	1	0	0	0	1	1	1	1	0

The following table presents the selection criteria for Descent Cycle execution. The cycles are listed in decreasing order of priority; the cycle closest to the top of the table is executed first provided the criteria is met.

Cycle Type	**Specification criteria**
Calibration 1	1st cycle after 9 minutes
Calibration 2	1st cycle after 30 minutes
Calibration 3	1st cycle after 41 minutes
Calibration 4	1st cycle after 79 minutes
Medium Near Surface	Above 3 kilometers and spin less than 0.3 rpm
Image standard	1st cycle
Flat Field	1st cycle below 50 kilometers
Buffer Depletion	1st cycle le below 20 kilometers
Dark current only	1st cycle below 10 km and spin >1 rpm
Spectrophotometric	2nd cycle below 10 kilometers and spin > 1rpm
Dark current only	1st cycle below 5 kilometers and spin > 1 rpm
Spectrophotometric	2nd cycle below 5 kilometers and spin > 1 rpm
High Near Surface	below 20 Kilometers and above 3 kilometers
Medium Near Surface	below 3 kilometers and above 500 meters
Low Near Surface	below 500 meters and above 250 meters
Very Low Near Surface	below 250 meters and above the surface
Surface	28 seconds after 100 meters altitude
Image standard	Less than 4 minutes of telemetry data in the buffer
No-Image standard	

Appendix 7 - Huygens Probe Altitude Profile

This appendix contains the altitude vs. mission time profile. Table 1 contains the reconstructed data and should be used to reference the instrument's altitude rather than the entries in the DISR archive label files which were based on an early evaluation of the altitude profile. The following plot shows graphically the difference between the software reported (i.e. the Descent Data Broadcast) altitude, the early reconstruction (used in the DISR headers for the archive), and the DTWG 2011 reconstruction. A radar altimeter error instigated the divergence from ~4300 to 6000 seconds.



The reconstructed data is from the Descent Trajectory Working Group's (DTWG) data archive from June of 2011 (HP-SSA-DTWG-6-TRAJECTORY-V2.0). The table is filtered to 1 minute intervals, but an accuracy of 1 second can be obtained from the DTWG archive directly. A further comparison of DTWG vs. DDB altitudes can be seen in the Descent Cycles table in appendix 6.

Table 1: DTWG reconstructed altitude profile (June 2010) at 1 minute intervals.

T0+ (sec)	Alt. (km)		T0+ (sec)	Alt. (km)		T0+ (sec)	Alt. (km)		T0+ (sec)	Alt. (km)		T0+ (sec)	Alt. (km)
118	144.122		1980	59.960		3960	30.909		5940	15.602		7920	4.506
119	144.068		2040	58.511		4020	30.340		6000	15.219		7980	4.209
120	144.015		2100	57.143		4080	29.776		6060	14.843		8040	3.913
180	140.883		2160	55.836		4140	29.222		6120	14.465		8100	3.619
240	137.942		2220	54.583		4200	28.678		6180	14.093		8160	3.328
300	135.103		2280	53.387		4260	28.141		6240	13.727		8220	3.038
360	132.291		2340	52.235		4320	27.615		6300	13.365		8280	2.749
420	129.660		2400	51.122		4380	27.100		6360	13.004		8340	2.462
480	127.120		2460	50.052		4440	26.583		6420	12.645		8400	2.178
540	124.635		2520	49.016		4500	26.074		6480	12.293		8460	1.894
600	122.267		2580	48.006		4560	25.574		6540	11.943		8520	1.614
660	119.911		2640	47.033		4620	25.083		6600	11.591		8580	1.336
720	117.665		2700	46.088		4680	24.600		6660	11.244		8640	1.053
780	115.502		2760	45.178		4740	24.119		6720	10.901		8700	0.7754
840	113.374		2820	44.287		4800	23.643		6780	10.560		8760	0.4981
900	111.297		2880	43.426		4860	23.178		6840	10.221		8820	0.2263
960	108.162		2940	42.589		4920	22.718		6900	9.887		8869	0.0035
1020	103.808		3000	41.772		4980	22.263		6960	9.550		8869.77	0
1080	99.478		3060	40.971		5040	21.812		7020	9.217		8870	0
1140	95.446		3120	40.190		5100	21.365		7080	8.889		12865	0
1200	91.671		3180	39.431		5160	20.925		7140	8.561			
1260	88.093		3240	38.688		5220	20.489		7200	8.238			
1320	84.809		3300	37.961		5280	20.061		7260	7.915			
1380	81.695		3360	37.251		5340	19.633		7320	7.593			
1440	78.769		3420	36.559		5400	19.215		7380	7.273			
1500	76.051		3480	35.875		5460	18.802		7440	6.956			
1560	73.472		3540	35.211		5520	18.385		7500	6.642			
1620	71.047		3600	34.562		5580	17.976		7560	6.330			
1680	68.832		3660	33.926		5640	17.571		7620	6.019			
1740	66.773		3720	33.298		5700	17.170		7680	5.710			
1800	64.871		3780	32.686		5760	16.775		7740	5.405			
1860	63.110		3840	32.081		5820	16.380		7800	5.101			
1920	61.483		3900	31.490		5880	15.988		7860	4.803			

Appendix 8 - Data for Derived Data Products example.

This appendix presents a tabular version of the data described in section 6 of the DISR Data Archive Users' Guide. The data exists in the DISR archive under: \DATA\DERIVED_DATA_PRODUCTS. The data represents the upward looking (downward streaming) spectral radiance near Titan's surface.

Table A8-1: Visible Spectrometer Data (ULVS) - An average of the last three measurements taken before impact (Sequence numbers 731,.747 & 763), from 2.3 km to 0.48 km altitude.

Wavelength	Visible		Wavelength	Visible		Wavelength	Visible
(nm)	W/(m2*u*sr)		(nm)	W/(m2*u*sr)		(nm)	W/(m2*u*sr)
976.7	0.034		817.5	1.765		649.2	1.671
974.4	0.049		815.0	1.540		646.6	1.745
972.0	0.064		812.6	1.209		644.1	1.768
969.7	0.079		810.1	0.833		641.5	1.749
967.4	0.094		807.7	0.548		638.9	1.773
965.1	0.109		805.2	0.344		636.3	1.803
962.8	0.132		802.8	0.192		633.7	1.807
960.5	0.200		800.3	0.108		631.1	1.785
958.1	0.364		797.9	0.073		628.5	1.682
955.8	0.578		795.4	0.085		625.9	1.412
953.5	0.735		792.9	0.143		623.3	0.910
951.1	0.805		790.5	0.218		620.7	0.406
948.8	0.851		788.0	0.242		618.1	0.227
946.5	0.941		785.5	0.202		615.5	0.345
944.1	1.123		783.1	0.179		612.9	0.674
941.8	1.389		780.6	0.274		610.3	1.082
939.5	1.608		778.1	0.487		607.7	1.388
937.1	1.722		775.6	0.720		605.1	1.542
934.8	1.745		773.2	0.918		602.5	1.553
932.4	1.671		770.7	1.101		599.9	1.468
930.1	1.554		768.2	1.202		597.2	1.402
927.7	1.395		765.7	1.228		594.6	1.394
925.4	1.175		763.2	1.321		592.0	1.428
923.0	0.952		760.7	1.520		589.4	1.423
920.7	0.716		758.2	1.734		586.7	1.433
918.3	0.482		755.8	1.902		584.1	1.449
916.0	0.285		753.3	1.977		581.5	1.384
913.6	0.154		750.8	1.987		578.9	1.237
911.2	0.110		748.3	1.975		576.2	1.114
908.9	0.100		745.8	1.946		573.6	1.125
906.5	0.071		743.3	1.808		570.9	1.153
904.1	0.040		740.8	1.462		568.3	1.169
901.8	0.026		738.2	0.923		565.7	1.177
899.4	0.022		735.7	0.420		563.0	1.185
897.0	0.021		733.2	0.130		560.4	1.143
894.6	0.022		730.7	0.028		557.7	1.105
892.3	0.021		728.2	0.006		555.1	1.098

Wavelength	Visible		Wavelength	Visible		Wavelength	Visible
889.9	0.019		725.7	0.009		552.4	1.088
887.5	0.016		723.2	0.021		549.8	1.028
885.1	0.016		720.6	0.057		547.1	0.890
882.7	0.018		718.1	0.241		544.5	0.675
880.3	0.021		715.6	0.751		541.8	0.563
877.9	0.033		713.1	1.275		539.1	0.648
875.5	0.045		710.5	1.436		536.5	0.769
873.1	0.048		708.0	1.275		533.8	0.826
870.7	0.039		705.5	0.988		531.1	0.822
868.3	0.025		702.9	0.749		528.5	0.810
865.9	0.019		700.4	0.781		525.8	0.779
863.5	0.019		697.9	1.111		523.1	0.733
861.1	0.024		695.3	1.514		520.4	0.691
858.7	0.039		692.8	1.792		517.8	0.654
856.3	0.103		690.2	1.887		515.1	0.635
853.9	0.275		687.7	1.837		512.4	0.617
851.5	0.543		685.1	1.731		509.7	0.592
849.1	0.738		682.6	1.670		507.0	0.572
846.7	0.706		680.0	1.757		504.3	0.551
844.2	0.506		677.5	1.906		501.6	0.534
841.8	0.322		674.9	1.905		498.9	0.524
839.4	0.338		672.4	1.695		496.2	0.512
837.0	0.667		669.8	1.375		493.6	0.486
834.5	1.269		667.2	1.118		490.9	0.455
832.1	1.827		664.7	1.068		488.2	0.400
829.7	2.091		662.1	1.176		485.4	0.393
827.2	2.133		659.5	1.281		482.7	0.396
824.8	2.090		657.0	1.339		480.0	0.408
822.4	2.006		654.4	1.455		477.3	0.434
819.9	1.904		651.8	1.595			

Table A8.2 - IR Data (ULIS) from DDP Archive (ULIS_AV_DDP.TAB) - An average of the last two measurements (Sequence numbers 59 & 60) before Titan impact, at 5.6 & 7.3 km altitude).

Wavelength	IR		Wavelength	IR		Wavelength	IR
(nm)	W/(m2*u*sr)		(nm)	W/(m2*u*sr)		(nm)	W/(m2*u*sr)
822.6536	2.10665		1147.443	0.0057		1451.707	0.00325
829.9325	1.76475		1154.2756	0.0049		1458.0936	0.0039
837.2017	1.25295		1161.0986	0.0056		1464.4705	0.00515
844.4612	0.8264		1167.9119	0.005		1470.8374	0.0082
851.7109	0.54985		1174.7155	0.00535		1477.1948	0.0287
858.951	0.2926		1181.5094	0.00525		1483.5426	0.08055
866.1815	0.12695		1188.2935	0.00535		1489.8805	0.1456
873.4021	0.0905		1195.068	0.0062		1496.2089	0.19165
880.6131	0.07665		1201.8329	0.0166		1502.5275	0.23265
887.8144	0.0555		1208.5879	0.05085		1508.8363	0.296
895.0059	0.0936		1215.3334	0.0978		1515.1355	0.39345

Wavelength	IR		Wavelength	IR		Wavelength	IR
902.1879	0.2185		1222.0691	0.12225		1521.4249	0.49565
909.36	0.4822		1228.7949	0.1379		1527.7048	0.56305
916.5225	0.91495		1235.5114	0.2314		1533.9749	0.6304
923.6753	1.40245		1242.2178	0.44325		1540.2352	0.65665
930.8184	1.73255		1248.9148	0.69815		1546.486	0.66115
937.9518	1.78445		1255.6019	0.8939		1552.7269	0.65695
945.0755	1.56605		1262.2794	1.01985		1558.9583	0.6491
952.1895	1.1518		1268.9473	1.13995		1565.1799	0.66975
959.2938	0.68695		1275.6052	1.2585		1571.3917	0.71585
966.3883	0.31485		1282.2537	1.3396		1577.5939	0.77305
973.4733	0.08615		1288.8925	1.3186		1583.7864	0.8107
980.5484	0.02155		1295.5214	1.10855		1589.9692	0.821
987.6139	0.0152		1302.1406	0.7136		1596.1422	0.80355
994.6697	0.0121		1308.7504	0.40335		1602.3057	0.76285
1001.7158	0.01115		1315.3501	0.09565		1608.4595	0.69345
1008.7522	0.0126		1321.9403	0.02085		1614.6033	0.57925
1015.7789	0.0202		1328.5208	0.00765		1620.7377	0.4506
1022.7958	0.0614		1335.0917	0.00585		1626.8623	0.3539
1029.8032	0.2046		1341.6526	0.00505		1632.9772	0.3537
1036.8007	0.5077		1348.2041	0.00485		1639.0823	0.44145
1043.7886	0.9081		1354.7458	0.0044		1645.1777	0.556
1050.7667	1.27305		1361.2777	0.0046		1651.2637	0.7836
1057.7352	1.5129		1367.7999	0.00405		1657.3396	0.996
1064.6941	1.65675		1374.3127	0.004		1663.4061	1.1053
1071.6431	1.75645		1380.8156	0.00355		1669.4629	1.122
1078.5825	1.77025		1387.3086	0.00375		1675.5098	1.07655
1085.5123	1.55495		1393.7922	0.00315		1681.5471	1.0432
1092.4323	1.1021		1400.266	0.0034		1687.5747	1.0394
1099.3425	0.61575		1406.73	0.0029		1693.5925	1.0847
1106.243	0.27965		1413.1844	0.0031		1699.6007	1.078
1113.134	0.12545		1419.6293	0.00285		1705.5992	1.05915
1120.0151	0.0531		1426.0641	0.0032		1711.588	1.1242
1126.8866	0.01445		1432.4895	0.00295		1717.567	3.84465
1133.7485	0.00755		1438.9052	0.00315			
1140.6005	0.00615		1445.3109	0.00295			

Table A8-3: Violet Data (ULV_DDP.TAB) - Maximum and Minimum of the last 10 upward looking violet measurements (1.39 to 0.014 km altitude) above Titan's surface.

Wavelength	UV	
(nm)	W/(m2*u*sr)	
415	0.0582	min
415	0.0754	max

Appendix 9 - DLIS Near-Surface Example

A table of Downward Looking Infra-Red Spectrometer (DLIS) data numbers (DN) used in the near-surface example in Guide Section 5.11

DLIS data from 1173 m to 486 m altitude.
Exp./8.064 = The number of 8.064 millisecond exposure steps used (That number multiplied by 8.064 give the total exposure time in ms).
M_Time = The number of seconds after T0 when the exposure was begun.
Altitude = The number of meters about Titans surface where the measurement began.
DN = The digital signal measured.

	DLIS Shutter Closed, DN					DLIS Shutter Open, DN				DLIS Signal (Closed-Open), DN			
Exp./8.064 ->	247	247	247	247		247	247	247	247	247	247	247	247
M_Time (s) ->	8615	8664	8712	8763		8615	8664	8712	8763	8615	8664	8712	8763
Altitude (m) ->	1173	940	717	486		1173	940	717	486	1173	940	717	486
Wavl. (nm)					Average								
778.9802	55188	55194	55204	55220	55202	55186	55198	55198	55214	2	-4	6	6
786.2591	54056	54074	54076	54084	54073	54050	54062	54068	54078	6	12	8	6
793.538	54016	54004	54010	54018	54012	53880	53878	53892	53894	136	126	118	124
800.8169	54070	54066	54074	54066	54069	53870	53860	53876	53870	200	206	198	196
808.0958	54408	54394	54388	54392	54396	54016	54004	54016	54016	392	390	372	376
815.3747	38454	38542	38634	38784	38604	37658	37812	37880	38082	796	730	754	702
822.6536	53768	53758	53758	53766	53763	53622	53616	53630	53634	146	142	128	132
829.9325	53350	53352	53360	53266	53332	50000	49880	49854	49756	3350	3472	3506	3510
837.2017	51386	51344	51302	51284	51329	48970	48838	48778	48708	2416	2506	2524	2576
844.4612	52008	51998	52018	51922	51987	50466	50382	50360	50216	1542	1616	1658	1706
851.7109	53346	53342	53340	53238	53317	52362	52312	52288	52122	984	1030	1052	1116
858.951	53288	53282	53288	53186	53261	52844	52820	52830	52648	444	462	458	538
866.1815	53326	53314	53318	53218	53294	53172	53172	53172	53000	154	142	146	218
873.4021	53294	53294	53300	53194	53271	53156	53150	53166	52970	138	144	134	224
880.6131	53322	53318	53322	53218	53295	53196	53192	53194	53012	126	126	128	206
887.8144	53332	53334	53340	53238	53311	53186	53176	53178	52980	146	158	162	258
895.0059	53294	53292	53296	53200	53271	53014	52994	52996	52786	280	298	300	414
902.1879	53320	53322	53328	53226	53299	52334	52276	52254	52010	986	1046	1074	1216
909.36	53276	53272	53278	53184	53253	49814	49640	49536	49286	3462	3632	3742	3898

916.5225	53302	53296	53306	53216	53280	44140	43694	43446	43222	9162	9602	9860	9994
923.6753	53084	53076	53082	53006	53062	35900	35122	34756	34578	17184	17954	18326	18428
930.8184	53200	53202	53206	53116	53181	29448	28418	27952	27842	23752	24784	25254	25274
937.9518	53300	53288	53290	53200	53270	29512	28478	27982	27890	23788	24810	25308	25310
945.0755	53302	53284	53296	53212	53274	35020	34196	33780	33590	18282	19088	19516	19622
952.1895	53284	53278	53284	53202	53262	42758	42254	41948	41694	10526	11024	11336	11508
959.2938	53300	53296	53298	53224	53280	48428	48166	48010	47720	4872	5130	5288	5504
966.3883	53302	53288	53294	53220	53276	51760	51676	51624	51330	1542	1612	1670	1890
973.4733	53324	53318	53324	53246	53303	53012	52998	53002	52710	312	320	322	536
980.5484	53304	53296	53302	53222	53281	53150	53144	53150	52842	154	152	152	380
987.6139	50634	50660	50668	50608	50643	50496	50528	50538	50254	138	132	130	354
994.6697	45532	45582	45602	45650	45592	45388	45472	45492	45314	144	110	110	336
1001.7158	53326	53324	53324	53258	53308	53190	53182	53196	52860	136	142	128	398
1008.7522	53158	53152	53164	53092	53142	53016	53016	53022	52698	142	136	142	394
1015.7789	53320	53316	53326	53252	53304	53130	53122	53136	52788	190	194	190	464
1022.7958	53206	53192	53198	53136	53183	52798	52778	52770	52428	408	414	428	708
1029.8032	53324	53322	53322	53256	53306	51590	51480	51414	51062	1734	1842	1908	2194
1036.8007	53274	53266	53280	53204	53256	47774	47438	47240	46876	5500	5828	6040	6328
1043.7886	48814	48846	48896	48858	48854	37338	36684	36336	36006	11476	12162	12560	12852
1050.7667	53184	53174	53178	53116	53163	34492	33488	32954	32688	18692	19686	20224	20428
1057.7352	51472	51470	51472	51430	51461	27762	26582	25970	25784	23710	24888	25502	25646
1064.6941	53274	53270	53266	53206	53254	24742	23374	22732	22606	28532	29896	30534	30600
1071.6431	53298	53286	53286	53222	53273	21576	20132	19428	19332	31722	33154	33858	33890
1078.5825	53288	53280	53282	53216	53267	22008	20584	19866	19778	31280	32696	33416	33438
1085.5123	53292	53284	53292	53230	53275	27908	26720	26134	25936	25384	26564	27158	27294
1092.4323	53160	53152	53156	53100	53142	39408	38732	38342	38062	13752	14420	14814	15038
1099.3425	53314	53308	53314	53252	53297	48656	48404	48254	47908	4658	4904	5060	5344
1106.243	53294	53292	53294	53232	53278	52182	52102	52054	51680	1112	1190	1240	1552
1113.134	53136	53144	53142	53088	53128	52686	52654	52648	52294	450	490	494	794
1120.0151	53306	53302	53306	53248	53291	53106	53096	53100	52760	200	206	206	488
1126.8866	53218	53212	53216	53164	53203	53086	53084	53094	52764	132	128	122	400
1133.7485	53134	53110	53128	53064	53109	53026	53020	53034	52716	108	90	94	348
1140.6005	53014	53010	53018	52966	53002	52912	52916	52926	52612	102	94	92	354
1147.443	53304	53300	53304	53242	53288	53216	53216	53228	52918	88	84	76	324
1154.2756	53326	53318	53320	53270	53309	53242	53234	53244	52948	84	84	76	322

1161.0986	53286	53282	53282	53226	53269	53214	53210	53220	52930	72	72	62	296
1167.9119	53328	53330	53334	53276	53317	53256	53248	53262	52978	72	82	72	298
1174.7155	53296	53294	53292	53238	53280	53222	53220	53230	52956	74	74	62	282
1181.5094	53170	53168	53176	53116	53158	53090	53092	53098	52832	80	76	78	284
1188.2935	47508	47556	47594	47574	47558	47460	47484	47526	47318	48	72	68	256
1195.068	53326	53320	53328	53270	53311	53242	53238	53252	52990	84	82	76	280
1201.8329	53274	53262	53270	53212	53255	53176	53168	53172	52908	98	94	98	304
1208.5879	53234	53240	53240	53184	53225	53032	53012	53012	52738	202	228	228	446
1215.3334	43228	43268	43350	43352	43300	42928	42950	42982	42790	300	318	368	562
1222.0691	53316	53312	53318	53256	53301	52962	52918	52908	52620	354	394	410	636
1228.7949	53316	53304	53314	53256	53298	52820	52778	52760	52468	496	526	554	788
1235.5114	53224	53232	53238	53176	53218	51740	51628	51552	51254	1484	1604	1686	1922
1242.2178	53262	53254	53266	53210	53248	49316	49044	48866	48560	3946	4210	4400	4650
1248.9148	53284	53280	53292	53228	53271	45660	45170	44870	44568	7624	8110	8422	8660
1255.6019	53298	53292	53290	53238	53280	42868	42208	41832	41560	10430	11084	11458	11678
1262.2794	53294	53294	53298	53244	53283	40260	39486	39048	38810	13034	13808	14250	14434
1268.9473	53250	53250	53248	53192	53235	36450	35534	35044	34882	16800	17716	18204	18310
1275.6052	53236	53232	53238	53184	53223	32222	31150	30592	30518	21014	22082	22646	22666
1282.2537	53202	53188	53194	53144	53182	30868	29762	29176	29154	22334	23426	24018	23990
1288.8925	53306	53306	53314	53250	53294	32388	31338	30772	30700	20918	21968	22542	22550
1295.5214	53166	53150	53156	53104	53144	39196	38446	38022	37856	13970	14704	15134	15248
1302.1406	53320	53314	53316	53260	53303	47336	46998	46806	46578	5984	6316	6510	6682
1308.7504	53314	53306	53312	53254	53297	51916	51830	51774	51538	1398	1476	1538	1716
1315.3501	52842	52840	52856	52800	52835	52598	52590	52602	52370	244	250	254	430
1321.9403	53308	53304	53300	53248	53290	53200	53194	53198	52976	108	110	102	272
1328.5208	53256	53252	53258	53192	53240	53160	53152	53164	52948	96	100	94	244
1335.0917	53324	53302	53310	53248	53296	53234	53226	53242	53022	90	76	68	226
1341.6526	53310	53302	53312	53252	53294	53230	53228	53242	53026	80	74	70	226
1348.2041	53244	53230	53244	53188	53227	53180	53176	53188	52982	64	54	56	206
1354.7458	53258	53252	53262	53202	53244	53196	53192	53200	52998	62	60	62	204
1361.2777	53280	53272	53280	53220	53263	53228	53226	53238	53042	52	46	42	178
1367.7999	53324	53316	53326	53262	53307	53264	53258	53270	53076	60	58	56	186
1374.3127	53308	53300	53302	53246	53289	53256	53258	53268	53082	52	42	34	164
1380.8156	51552	51624	51642	51584	51601	51510	51580	51598	51402	42	44	44	182
1387.3086	53310	53304	53310	53250	53294	53266	53266	53276	53100	44	38	34	150

1393.7922	53310	53312	53310	53258	53298	53266	53260	53274	53098	44	52	36	160
1400.266	53218	53210	53220	53166	53204	53174	53178	53186	53016	44	32	34	150
1406.73	53326	53326	53326	53264	53311	53280	53276	53286	53108	46	50	40	156
1413.1844	52232	52286	52294	52240	52263	52192	52250	52262	52096	40	36	32	144
1419.6293	53270	53274	53280	53218	53261	53234	53232	53246	53066	36	42	34	152
1426.0641	53300	53294	53298	53248	53285	53266	53260	53272	53092	34	34	26	156
1432.4895	53182	53186	53190	53130	53172	53144	53142	53164	52974	38	44	26	156
1438.9052	53312	53302	53304	53250	53292	53268	53268	53278	53106	44	34	26	144
1445.3109	52994	52998	53000	52944	52984	52950	52952	52974	52790	44	46	26	154
1451.707	53292	53280	53286	53234	53273	53250	53252	53256	53080	42	28	30	154
1458.0936	53328	53324	53334	53272	53315	53286	53286	53298	53114	42	38	36	158
1464.4705	53298	53290	53290	53244	53281	53260	53254	53270	53086	38	36	20	158
1470.8374	53296	53290	53298	53232	53279	53242	53244	53258	53074	54	46	40	158
1477.1948	53312	53304	53306	53246	53292	53230	53236	53236	53050	82	68	70	196
1483.5426	53092	53098	53104	53048	53086	52892	52874	52876	52692	200	224	228	356
1489.8805	53290	53272	53286	53224	53268	52926	52884	52876	52696	364	388	410	528
1496.2089	53296	53304	53298	53238	53284	52830	52786	52766	52582	466	518	532	656
1502.5275	53038	53044	53044	52996	53031	52458	52412	52384	52210	580	632	660	786
1508.8363	53316	53324	53330	53262	53308	52334	52234	52192	52020	982	1090	1138	1242
1515.1355	53246	53234	53246	53192	53230	51706	51568	51508	51350	1540	1666	1738	1842
1521.4249	53330	53314	53330	53260	53309	51096	50896	50810	50676	2234	2418	2520	2584
1527.7048	53276	53272	53272	53214	53259	50488	50238	50146	50030	2788	3034	3126	3184
1533.9749	53256	53260	53262	53206	53246	50104	49850	49742	49640	3152	3410	3520	3566
1540.2352	53282	53270	53268	53216	53259	50082	49818	49706	49612	3200	3452	3562	3604
1546.486	53316	53320	53322	53258	53304	50084	49810	49712	49610	3232	3510	3610	3648
1552.7269	53300	53292	53302	53238	53283	50296	50042	49942	49846	3004	3250	3360	3392
1558.9583	53302	53302	53306	53240	53288	50464	50236	50144	50046	2838	3066	3162	3194
1565.1799	45170	45130	45178	45208	45172	42520	42310	42242	42246	2650	2820	2936	2962
1571.3917	53324	53324	53328	53256	53308	49772	49498	49400	49324	3552	3826	3928	3932
1577.5939	53302	53302	53302	53240	53287	49398	49110	49008	48940	3904	4192	4294	4300
1583.7864	53302	53308	53312	53250	53293	49308	49004	48906	48848	3994	4304	4406	4402
1589.9692	53304	53298	53302	53236	53285	49550	49272	49170	49092	3754	4026	4132	4144
1596.1422	50740	50744	50750	50726	50740	47590	47368	47270	47228	3150	3376	3480	3498
1602.3057	53320	53302	53308	53250	53295	50914	50742	50670	50570	2406	2560	2638	2680
1608.4595	53308	53304	53316	53252	53295	51808	51694	51652	51542	1500	1610	1664	1710

1614.6033	53308	53306	53302	53240	53289	52398	52338	52316	52216	910	968	986	1024
1620.7377	53156	53148	53160	53092	53139	52358	52322	52320	52228	798	826	840	864
1626.8623	53302	53298	53298	53232	53283	52398	52368	52358	52272	904	930	940	960
1632.9772	53310	53308	53316	53246	53295	52178	52140	52140	52068	1132	1168	1176	1178
1639.0823	53298	53298	53300	53234	53283	52016	51976	51968	51908	1282	1322	1332	1326
1645.1777	53306	53306	53314	53246	53293	51866	51814	51818	51752	1440	1492	1496	1494
1651.2637	53260	53256	53264	53194	53244	51798	51752	51746	51690	1462	1504	1518	1504
1657.3396	50548	50586	50326	50564	50506	49220	49216	48942	49034	1328	1370	1384	1530
1663.4061	53226	53222	53226	53164	53210	52150	52110	52108	52044	1076	1112	1118	1120
1669.4629	46612	46648	46692	46692	46661	45878	45902	45936	45946	734	746	756	746
1675.5098	53298	53290	53302	53238	53282	52762	52748	52744	52670	536	542	558	568
1681.5471	53326	53324	53330	53262	53311	52886	52868	52866	52794	440	456	464	468
1687.5747	52298	52310	52318	52262	52297	51912	51906	51902	51846	386	404	416	416
1693.5925	53314	53318	53318	53250	53300	52922	52900	52902	52830	392	418	416	420
1699.6007	53294	53290	53298	53236	53280	52952	52942	52938	52866	342	348	360	370
1705.5992	53128	53118	53132	53074	53113	52844	52838	52842	52774	284	280	290	300
1711.588	52240	52248	52250	52200	52235	52054	52054	52068	52004	186	194	182	196
1717.567	53304	53310	53314	53262	53298	53190	53188	53196	53120	114	122	118	142
1723.546	53352	53336	53346	53296	53333	53236	53238	53248	53184	116	98	98	112
1729.525	20482	21012	21504	21726	21181	18458	18916	19122	19784	2024	2096	2382	1942
1735.504	55968	55916	55880	55870	55909	54838	54828	54830	54788	1130	1088	1050	1082
1741.483	54100	54088	54078	54078	54086	53748	53746	53760	53748	352	342	318	330
1747.462	51260	51272	51270	51236	51260	51012	51028	51026	51004	248	244	244	232
1753.441	53238	53244	53250	53250	53246	53164	53168	53192	53184	74	76	58	66
1759.42	53324	53326	53328	53334	53328	53318	53328	53326	53336	6	-2	2	-2
1765.399	53324	53336	53342	53342	53336	53320	53326	53328	53338	4	10	14	4

Appendix 10 - Downward Looking Infra-Red Spectrometer Example Data

This table presents the DLIS data from 203 m to Titan's surface as discussed in section 5.11.2 of the Users' Guide. The raw data is in the PDS archive under \DATA\IR. These data are in raw data numbers (DN). The darks are obtained using the average of the darks from 1200 to 400 m altitude (files 186 thru 192). Section 5.11.1 of the Guide, and Section 4.1 of the IR calibration document (ref14), describe how to convert DN/second into spectral radiance.

Exp./8.064 = The number of 8.064 ms exposure steps used (That number multiplied by 8.064 give the total exposure time in ms).
M_Time = The number of seconds after T0 when the exposure was begun.
Altitude = The number of meters about Titans surface where the measurement began.
DN = The digital signal measured.

		DLIS Shutter Open Signal, DN								
	IR#	194	196	199	202	204	206	208	210	213
	Exp./8.064 - >	124	124	124	124	124	124	124	124	124
	M_Time (s) ->	8825	8832	8845	8850	8853	8857	8860	8864	8869
	Altitude (m) ->	203	171	112	89	73	58	42	27	3
	Average									
Wavelength	Dark									
(nm)	400-1200 m									
778.9802	55202	54316	54324	54320	54320	54324	54328	54340	54336	54340
786.2591	54073	53716	53708	53716	53704	53716	53716	53728	53712	53724
793.538	54012	53696	53708	53696	53696	53696	53708	53720	53716	53728
800.8169	54069	53744	53740	53752	53732	53756	53744	53768	53748	53776
808.0958	54396	53896	53900	53920	53916	53908	53916	53944	53928	53948
815.3747	38604	45860	45864	45596	45596	45632	45644	45656	45612	45576
822.6536	53763	53580	53572	53568	53584	53576	53588	53588	53592	53600
829.9325	53332	51520	51560	51664	51668	51672	51640	53320	51340	53300
837.2017	51329	50868	50900	50988	50984	50980	50952	52248	50604	52236
844.4612	51987	51724	51748	51804	51780	51780	51740	52652	51332	52620
851.7109	53317	52696	52704	52716	52720	52700	52656	53280	52212	53276
858.951	53261	52984	52992	52992	52956	52940	52908	53272	52432	53252
866.1815	53294	53144	53144	53136	53120	53092	53052	53276	52548	53256

873.4021	53271	53152	53156	53140	53112	53100	53052	53280	52536	53252
880.6131	53295	53160	53160	53144	53136	53108	53068	53280	52548	53268
887.8144	53311	53160	53152	53152	53116	53100	53060	53300	52464	53280
895.0059	53271	53036	53040	53024	53008	52968	52916	53276	52184	53260
902.1879	53299	52636	52652	52652	52628	52580	52500	53296	51580	53280
909.36	53253	51204	51268	51356	51356	51300	51192	53268	50060	53260
916.5225	53280	48088	48212	48540	48560	48536	48396	53284	47084	53280
923.6753	53062	43724	43964	44564	44652	44652	44488	53176	43020	53180
930.8184	53181	40292	40624	41484	41616	41636	41436	53244	39832	53236
937.9518	53270	40308	40656	41500	41640	41648	41448	53284	39796	53276
945.0755	53274	43208	43484	44136	44216	44232	44028	53288	42384	53280
952.1895	53262	47276	47428	47788	47824	47792	47628	53276	46060	53268
959.2938	53280	50392	50460	50612	50588	50548	50388	53292	48852	53288
966.3883	53276	52276	52288	52312	52264	52196	52048	53280	50568	53280
973.4733	53303	53000	52996	52964	52900	52844	52708	53308	51220	53296
980.5484	53281	53060	53052	53012	52976	52896	52776	53284	51308	53280
987.6139	50643	51748	51740	51720	51660	51612	51476	51972	50012	51956
994.6697	45592	49248	49132	49092	49064	49020	48884	49348	47420	49344
1001.7158	53308	53080	53076	53052	52984	52916	52784	53312	51192	53304
1008.7522	53142	52996	52984	52948	52896	52824	52680	53224	51040	53220
1015.7789	53304	53044	53036	52996	52928	52864	52708	53300	51028	53296
1022.7958	53183	52836	52828	52800	52736	52648	52488	53240	50784	53240
1029.8032	53306	52112	52144	52160	52104	52024	51852	53312	50104	53304
1036.8007	53256	49908	49980	50180	50176	50108	49928	53280	48188	53280
1043.7886	48854	44260	44436	44908	44960	44928	44724	51076	42996	51068
1050.7667	53163	42652	42936	43700	43824	43808	43592	53240	41836	53228
1057.7352	51461	38980	39344	40324	40512	40516	40284	52392	38512	52372
1064.6941	53254	37528	37992	39104	39308	39364	39104	53288	37312	53276
1071.6431	53273	35896	36396	37624	37892	37884	37640	53304	35820	53312
1078.5825	53267	36080	36604	37780	38048	38052	37824	53296	35968	53288
1085.5123	53275	39232	39660	40640	40800	40824	40560	53308	38724	53300
1092.4323	53142	45448	45668	46168	46236	46200	45996	53232	44236	53224

1099.3425	53297	50476	50544	50684	50660	50608	50436	53308	48708	53296
1106.243	53278	52432	52452	52444	52396	52312	52172	53300	50508	53292
1113.134	53128	52776	52788	52768	52720	52664	52540	53240	51068	53228
1120.0151	53291	53028	53020	53016	52984	52944	52856	53292	51720	53292
1126.8866	53203	53040	53044	53052	53020	53012	52964	53264	52156	53256
1133.7485	53109	53016	53016	53012	53000	52996	52960	53212	52224	53212
1140.6005	53002	52968	52972	52972	52940	52932	52876	53160	52008	53148
1147.443	53288	53108	53120	53112	53104	53076	53032	53296	52256	53292
1154.2756	53309	53132	53144	53144	53120	53124	53100	53320	52680	53308
1161.0986	53269	53124	53124	53124	53120	53112	53108	53288	52844	53276
1167.9119	53317	53156	53160	53156	53140	53136	53108	53320	52604	53316
1174.7155	53280	53128	53140	53136	53116	53092	53048	53292	52280	53284
1181.5094	53158	53092	53088	53080	53052	53044	52980	53232	52108	53232
1188.2935	47558	50152	50164	50156	50156	50124	50060	50320	49188	50308
1195.068	53311	53160	53156	53140	53100	53072	52988	53320	51932	53304
1201.8329	53255	53100	53096	53060	53036	52976	52876	53280	51688	53276
1208.5879	53225	53000	53012	52972	52924	52864	52744	53276	51464	53268
1215.3334	43300	47668	47672	47644	47636	47548	47472	48024	46260	48044
1222.0691	53301	52936	52932	52908	52852	52796	52672	53304	51380	53304
1228.7949	53298	52848	52844	52832	52780	52724	52600	53308	51316	53304
1235.5114	53218	52208	52240	52260	52220	52152	52028	53268	50756	53252
1242.2178	53248	50776	50840	50992	50988	50920	50800	53280	49508	53272
1248.9148	53271	48684	48816	49148	49164	49152	49000	53296	47696	53296
1255.6019	53280	47136	47312	47784	47828	47816	47660	53288	46376	53292
1262.2794	53283	45744	46000	46564	46628	46636	46480	53300	45172	53296
1268.9473	53235	43752	44084	44788	44912	44916	44768	53280	43484	53272
1275.6052	53223	41532	41920	42840	42984	43024	42856	53276	41548	53272
1282.2537	53182	40836	41252	42192	42360	42416	42252	53256	40976	53252
1288.8925	53294	41652	42036	42944	43060	43120	42940	53316	41692	53312
1295.5214	53144	45280	45556	46152	46224	46224	46080	53228	44908	53224
1302.1406	53303	49772	49884	50128	50116	50104	50004	53308	48880	53308
1308.7504	53297	52376	52396	52432	52408	52368	52284	53308	51324	53292

1315.3501	52835	52832	52844	52840	52812	52784	52724	53068	51956	53080
1321.9403	53290	53144	53140	53140	53124	53112	53072	53292	52536	53292
1328.5208	53240	53140	53136	53136	53120	53116	53080	53280	52644	53272
1335.0917	53296	53164	53168	53168	53160	53156	53144	53300	52752	53292
1341.6526	53294	53188	53180	53184	53164	53176	53156	53312	52828	53296
1348.2041	53227	53144	53144	53140	53136	53140	53136	53268	52896	53264
1354.7458	53244	53164	53168	53176	53160	53168	53160	53276	53012	53276
1361.2777	53263	53172	53176	53180	53180	53180	53176	53284	53032	53284
1367.7999	53307	53208	53204	53208	53196	53208	53204	53312	53028	53300
1374.3127	53289	53196	53200	53192	53188	53192	53192	53296	53044	53296
1380.8156	51601	52348	52352	52348	52344	52356	52356	52444	52232	52448
1387.3086	53294	53208	53208	53200	53200	53204	53204	53300	53124	53296
1393.7922	53298	53212	53216	53220	53212	53216	53212	53304	53140	53304
1400.266	53204	53164	53164	53160	53156	53156	53164	53252	53092	53248
1406.73	53311	53228	53224	53224	53212	53220	53216	53312	53108	53300
1413.1844	52263	52688	52692	52696	52692	52676	52676	52780	52440	52780
1419.6293	53261	53200	53196	53204	53188	53180	53152	53288	52792	53288
1426.0641	53285	53204	53196	53188	53188	53164	53144	53296	52692	53288
1432.4895	53172	53156	53156	53148	53124	53116	53080	53244	52568	53244
1438.9052	53292	53200	53208	53188	53180	53156	53116	53288	52608	53292
1445.3109	52984	53064	53064	53056	53032	53020	52988	53152	52464	53152
1451.707	53273	53200	53188	53176	53164	53144	53104	53296	52600	53284
1458.0936	53315	53216	53228	53216	53188	53164	53128	53316	52624	53312
1464.4705	53281	53192	53188	53176	53160	53144	53100	53296	52620	53292
1470.8374	53279	53200	53200	53200	53168	53164	53116	53300	52660	53296
1477.1948	53292	53168	53180	53168	53148	53132	53092	53308	52668	53292
1483.5426	53086	53004	53004	53000	52984	52964	52932	53204	52496	53196
1489.8805	53268	52980	52988	52996	52980	52964	52924	53284	52496	53292
1496.2089	53284	52932	52944	52960	52940	52928	52884	53296	52460	53300
1502.5275	53031	52736	52752	52768	52752	52740	52700	53168	52284	53164
1508.8363	53308	52636	52660	52712	52684	52700	52648	53312	52240	53312
1515.1355	53230	52276	52312	52404	52384	52392	52368	53268	51952	53264

1521.4249	53309	51932	51992	52124	52100	52128	52080	53304	51672	53304
1527.7048	53259	51592	51656	51820	51800	51840	51800	53276	51380	53284
1533.9749	53246	51400	51488	51664	51628	51688	51640	53280	51236	53280
1540.2352	53259	51380	51464	51628	51620	51676	51636	53284	51224	53284
1546.486	53304	51388	51472	51660	51624	51696	51644	53300	51252	53304
1552.7269	53283	51496	51576	51760	51728	51780	51732	53292	51372	53292
1558.9583	53288	51612	51680	51848	51816	51876	51828	53296	51476	53308
1565.1799	45172	47384	47456	47608	47596	47640	47612	49024	47284	49024
1571.3917	53308	51244	51324	51532	51508	51576	51532	53304	51176	53312
1577.5939	53287	51048	51140	51352	51332	51404	51356	53292	51004	53296
1583.7864	53293	50988	51092	51316	51300	51372	51324	53300	50976	53300
1589.9692	53285	51108	51208	51416	51400	51460	51420	53292	51072	53296
1596.1422	50740	50148	50208	50404	50384	50440	50408	52016	50060	52028
1602.3057	53295	51880	51944	52064	52056	52080	52064	53300	51768	53308
1608.4595	53295	52396	52432	52516	52500	52516	52492	53304	52268	53304
1614.6033	53289	52736	52760	52804	52792	52804	52784	53296	52620	53292
1620.7377	53139	52768	52784	52812	52796	52808	52792	53224	52672	53220
1626.8623	53283	52788	52792	52824	52824	52832	52828	53288	52740	53288
1632.9772	53295	52688	52704	52740	52732	52752	52748	53312	52656	53292
1639.0823	53283	52596	52612	52660	52660	52660	52664	53288	52588	53288
1645.1777	53293	52540	52552	52592	52592	52612	52600	53308	52528	53296
1651.2637	53244	52496	52508	52552	52556	52568	52556	53264	52488	53268
1657.3396	50506	51208	51100	51272	51292	51304	51300	51948	51212	51848
1663.4061	53210	52668	52680	52712	52724	52728	52724	53256	52640	53248
1669.4629	46661	49480	49508	49520	49516	49528	49508	49904	49452	49904
1675.5098	53282	52988	52984	53000	53008	53000	53008	53296	52924	53288
1681.5471	53311	53068	53064	53084	53068	53072	53076	53304	52988	53316
1687.5747	52297	52564	52568	52584	52592	52584	52584	52820	52508	52800
1693.5925	53300	53072	53084	53092	53080	53092	53084	53304	53004	53296
1699.6007	53280	53080	53084	53096	53104	53096	53092	53296	53012	53276
1705.5992	53113	53048	53056	53056	53040	53060	53044	53216	52976	53224
1711.588	52235	52652	52664	52656	52660	52656	52656	52784	52580	52780

1717.567	53298	53232	53232	53228	53224	53220	53212	53308	53144	53300
1723.546	53333	53280	53280	53288	53280	53276	53276	53332	53200	53328
1729.525	21181	34932	35056	34936	34888	34800	35012	34984	34860	35100
1735.504	55909	55012	55012	55024	55024	55032	55024	55044	55040	55036
1741.483	54086	53932	53932	53948	53928	53940	53936	53956	53948	53956
1747.462	51260	52428	52420	52372	52360	52432	52412	52404	52424	52436
1753.441	53246	53384	53396	53388	53396	53388	53396	53408	53408	53420
1759.42	53328	53332	53328	53332	53336	53328	53336	53344	53332	53344
1765.399	53336	53344	53344	53340	53336	53340	53348	53352	53344	53348

Appendix 11 - Table of Violet dark measurements taken while DISR was mated to Huygens.

Violet dark measurements from installation of DISR onto the Huygens probe until Titan encounter. There are two data collections modes represented: 1) Simulated Descent Mode and, 2) Single Measurement Mode collection style, used in the Health Check and In-Flight Calibration sequences.

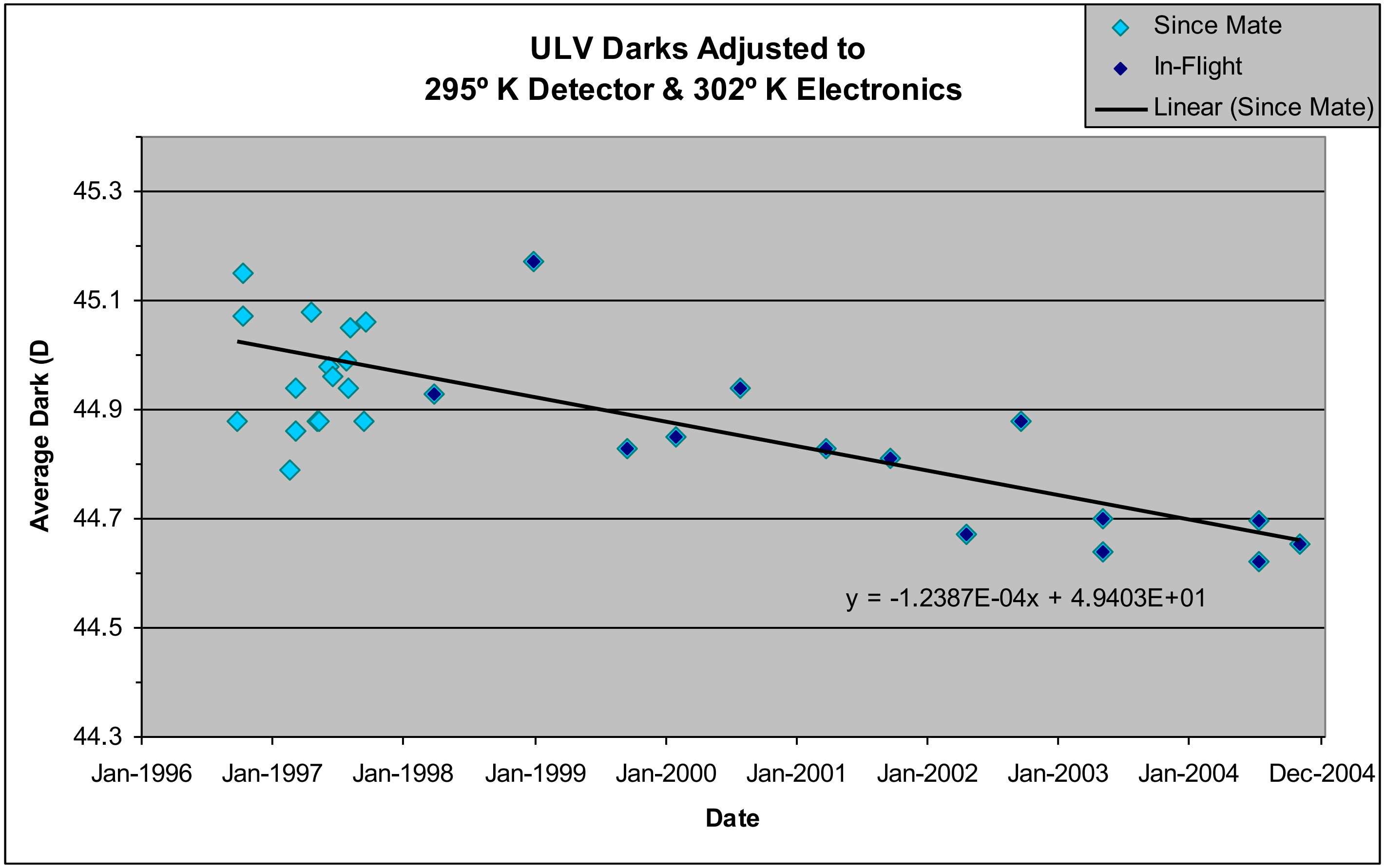
							ULV			DLV (1)			DLV (2)		
Type: (1) Des. (2) SMM	Date	Detector Temp, Tv (ºK)	EA Temp, Te (ºK)	Delta Td to 295K	Delta Te to 302K	Descent vs. SMM	Darks ave. DN	Adjusted Dark	Offset to premate average	Darks ave. DN	Adjusted Dark	Offset to premate average	Darks ave. DN	Adjusted Dark	Offset to premate average
PreM(1)	25-Sep-96	295	303	0	-0.02	0	44.90	44.88	-0.07	42.40	42.40	-0.13			
PreM(2)	10-Oct-96	295	301	0	0.02	-0.3	45.35	45.07	0.12				55.33	55.45	0.52
PreM(2)	11-Oct-96	295	301	0	0.02	-0.3	45.43	45.15	0.20				55.00	55.20	0.27
PreM(2)	20-Feb-97	295	302.5	0	-0.01	-0.3	45.10	44.79	-0.16				53.71	53.55	-1.38
PreM(1)	7-Mar-97	295	300.5	0	0.03	0	44.91	44.94	-0.01	42.65	42.65	0.13			
PreM(2)	7-Mar-97	295	301	0	0.02	-0.3	45.14	44.86	-0.09				54.60	54.51	-0.42
PreM(2)	22-Apr-97	295	302.4	0	-0.01	-0.3	45.39	45.08	0.13				55.61	55.74	0.81
PreM(2)	7-May-97	295	302.5	0	-0.01	-0.3	45.19	44.88	-0.07				55.10	55.03	0.10
PreM(2)	12-May-97	295	302.5	0	-0.01	-0.3	45.19	44.88	-0.07				55.10	55.03	0.10
PreL(1)	10-Jun-97	295	300	0	0.04	0	44.94	44.98	0.03	42.61	42.61	0.09			
PreL(1)	18-Jun-97	295	300	0	0.04	0	44.92	44.96	0.01	42.89	42.89	0.37			
PreL(1)	24-Jul-97	295	298	0	0.08	0	44.91	44.99	0.04	42.15	42.15	-0.38			
PreL(1)	2-Aug-97	295	302	0	0	0	44.94	44.94	-0.01	42.76	42.76	0.23			
PreL(2)	5-Aug-97	295	303.6	0	-0.03	-0.3	45.38	45.05	0.10				54.62	54.72	-0.21
PreL(1)	12-Sep-97	295	311	0	-0.18	0	45.06	44.88	-0.07	42.69	42.69	0.16			
PreL(1)	19-Sep-97	295	310	0	-0.16	0	45.22	45.06	0.11	42.75	42.75	0.23			
F1(2)	23-Oct-97	274.5	291.9	0.39	0.21	0	45.00	45.60	0.65				53.37	54.02	-0.91
F2(1)	27-Mar-98	274.5	290.8	0.39	0.23	0	44.31	44.93	-0.02	42.88	42.88	0.36			
F3(2)	28-Dec-98	270.6	287.8	0.46	0.29	0	44.52	45.27	0.32				53.10	53.42	-1.51
F4(1)	15-Sep-99	271.3	289.1	0.45	0.26	0	44.12	44.83	-0.12	43.06	43.06	0.54			
F5(2)	2-Feb-00	270.3	287	0.46	0.3	0	44.19	44.95	0.00				52.80	52.80	-2.13
F6(1)	28-Jul-00	270.7	288.4	0.46	0.28	0	44.20	44.94	-0.01	42.81	42.81	0.29			
F7(2)	22-Mar-01	272.5	289.6	0.43	0.25	0	44.25	44.93	-0.02				53.05	53.03	-1.90
F8(1)	20-Sep-01	270.2	294	0.46	0.16	0	44.19	44.81	-0.14	42.84	42.84	0.32			
F9(2)	17-Apr-02	271.2	296.6	0.45	0.11	0	44.21	44.77	-0.18				53.29	53.11	-1.82

F10(1)	16-Sep-02	267.7	295.2	0.5	0.24	0	44.14	44.88	-0.07	43.09	43.09	0.57			
$F11_{[H]}(2)$	2-May-03	267	290	0.51	0.24	0	44.05	44.80	-0.15				53.33	53.18	-1.75
$F11_{[D]}(1)$	2-May-03	270.4	300	0.46	0.04	0	44.14	44.64	-0.31	42.43	44.70	2.18			
									Stdev			Stdev			Stdev
F14 (2)	14-Jul-04	267.5	291.6	0.5	0.22	0	44.00	44.72	0.00	41.69	42.41	5.41			
F14 (1)	14-Jul-04	272.5	302.8	0.43	-0.01	0	44.28	44.70	0.93				51.76	52.18	4.46
F16 (1)	3-Nov-04	269.5	299.37	0.47	0.07	0	44.12	44.65	0.37	40.79	41.32	6.52			

The DLV data is strongly bi-modal correlating with the acquisition mode (Single Measurement Mode vs. Descent Mode). One could make the case that the ULV is bi-modal also, although the F1 test outlays.

Radiation induced trends, although likely present, are less of a factor than the noise variation. Even adjusted for detector and electronics temperature variations, there is not good consistency between checkouts. The in-flight tests are more stable (except F10), which may point to electromagnetic interference influencing the ground test data.

A linear regression of the ULV descent data from launch to the encounter indicates that the ULV dark bias is 44.65 DN when corrected for a standard detector temperature of 298 K and an electronics assembly temperature of 302 K.


ULV Darks Adjusted to
295º K Detector & 302º K Electronics
Since Mate
In-Flight
Linear (Since Mate)
45.3
45.1
44.9
44.7
44.5
44.3
Average Dark (D
y = -1.2387E-04x + 4.9403E+01
Jan-1996
Jan-1997
Jan-1998
Jan-1999
Jan-2000
Jan-2001
Jan-2002
Jan-2003
Jan-2004
Dec-2004
Date

Appendix 12 - Column Headers for InfraRed Spectrometer Derived Data Products

The IR Spectrometer data in the Derived Data Products directory of the PDS (hpdisr_0001\DATA\DERIVED_DATA_PRODUCTS) is somewhat difficult to use because the table columns (in the .TAB file) have no headers. To alleviate this problem we here supply the column headers for those six files (DLIS_AV_DDP.TAB, DLIS_AZ_DDP.TAB, DLIS_I_DDP.TAB, ULIS_AV_DDP.TAB, ULIS_AZ_DDP.TAB & ULIS_I_DDP.TAB). Note: The wavelengths are in nm

DLIS_AV_DDP.TAB = DLIS intensity (W/(m2-u-sr)) averaged over one descent cycle,
DLIS_AZ_DDP.TAB = DLIS intensity presented in the 8 azimuthal bins (Guide sect. 5.11.1),
DLIS_I_DDP.TAB = DLIS intensities from short term exposures with azimuth information,
ULIS_AV_DDP.TAB = ULIS intensity (W/(m2-u-sr)) averaged over one descent cycle,
ULIS_AZ_DDP.TAB = ULIS intensity presented in the 4 azimuthal bins (Guide sect. 5.11.1),
ULIS_I_DDP.TAB = ULIS intensities from short term exposures with azimuth information.

Here is a brief description of the column abbreviations:
cycle - Descent cycle corresponding to the measurement (see Appendix 6).
m time - Mission time at the start of the measurement in seconds after parachute deploy (T0)
altitude - Altitude above Titan's surface in km
AZ - The azimuth at start of observation relative to sun in degrees CCW, viewed from above.
ir temp - Temperature of the IR chip at the start of the measurement in deg K (offset, see section 6 of engineering appendix).
o temp - Temperature of the optical bench at the start of the observation in deg K.

DLIS						ULIS					
DLIS_AV_DDP.TAB			DLIS_AZ_DDP.TAB & DLIS_I_DDP.TAB			ULIS_AV_DDP.TAB			ULIS_AZ_DDP.TAB & ULIS_I_DDP.TAB		
Column	Column Heading	Pixel	Column	Column Heading	Pixel	Column	Column Heading	Pixel	Column	Column Heading	Pixel
1	cycle		1	cycle		1	cycle		1	cycle	
2	m time		2	m time		2	m time		2	m time	
3	altitude		3	altitude		3	altitude		3	altitude	
4	AZ		4	AZ		4	AZ		4	AZ	
5	822.654	0	5	ir temp		5	822.6536	0	5	ir temp	
6	829.932	1	6	o temp		6	829.9325	1	6	o temp	
7	837.202	2	7	822.654	0	7	837.2017	2	7	822.6536	0

8	844.461	3	8	829.932	1	8	844.4612	3	8	829.9325	1
9	851.711	4	9	837.202	2	9	851.7109	4	9	837.2017	2
10	858.951	5	10	844.461	3	10	858.9510	5	10	844.4612	3
11	866.181	6	11	851.711	4	11	866.1815	6	11	851.7109	4
12	873.402	7	12	858.951	5	12	873.4021	7	12	858.9510	5
13	880.613	8	13	866.181	6	13	880.6131	8	13	866.1815	6
14	887.814	9	14	873.402	7	14	887.8144	9	14	873.4021	7
15	895.006	10	15	880.613	8	15	895.0059	10	15	880.6131	8
16	902.188	11	16	887.814	9	16	902.1879	11	16	887.8144	9
17	909.360	12	17	895.006	10	17	909.3600	12	17	895.0059	10
18	916.523	13	18	902.188	11	18	916.5225	13	18	902.1879	11
19	923.675	14	19	909.360	12	19	923.6753	14	19	909.3600	12
20	930.818	15	20	916.523	13	20	930.8184	15	20	916.5225	13
21	937.952	16	21	923.675	14	21	937.9518	16	21	923.6753	14
22	945.076	17	22	930.818	15	22	945.0755	17	22	930.8184	15
23	952.189	18	23	937.952	16	23	952.1895	18	23	937.9518	16
24	959.294	19	24	945.076	17	24	959.2938	19	24	945.0755	17
25	966.388	20	25	952.189	18	25	966.3883	20	25	952.1895	18
26	973.473	21	26	959.294	19	26	973.4733	21	26	959.2938	19
27	980.548	22	27	966.388	20	27	980.5484	22	27	966.3883	20
28	987.614	23	28	973.473	21	28	987.6139	23	28	973.4733	21
29	994.670	24	29	980.548	22	29	994.6697	24	29	980.5484	22
30	1001.716	25	30	987.614	23	30	1001.7158	25	30	987.6139	23
31	1008.752	26	31	994.670	24	31	1008.7522	26	31	994.6697	24
32	1015.779	27	32	1001.716	25	32	1015.7789	27	32	1001.7158	25
33	1022.796	28	33	1008.752	26	33	1022.7958	28	33	1008.7522	26
34	1029.803	29	34	1015.779	27	34	1029.8032	29	34	1015.7789	27
35	1036.801	30	35	1022.796	28	35	1036.8007	30	35	1022.7958	28
36	1043.789	31	36	1029.803	29	36	1043.7886	31	36	1029.8032	29
37	1050.767	32	37	1036.801	30	37	1050.7667	32	37	1036.8007	30
38	1057.735	33	38	1043.789	31	38	1057.7352	33	38	1043.7886	31
39	1064.694	34	39	1050.767	32	39	1064.6941	34	39	1050.7667	32
40	1071.643	35	40	1057.735	33	40	1071.6431	35	40	1057.7352	33
41	1078.583	36	41	1064.694	34	41	1078.5825	36	41	1064.6941	34
42	1085.512	37	42	1071.643	35	42	1085.5123	37	42	1071.6431	35

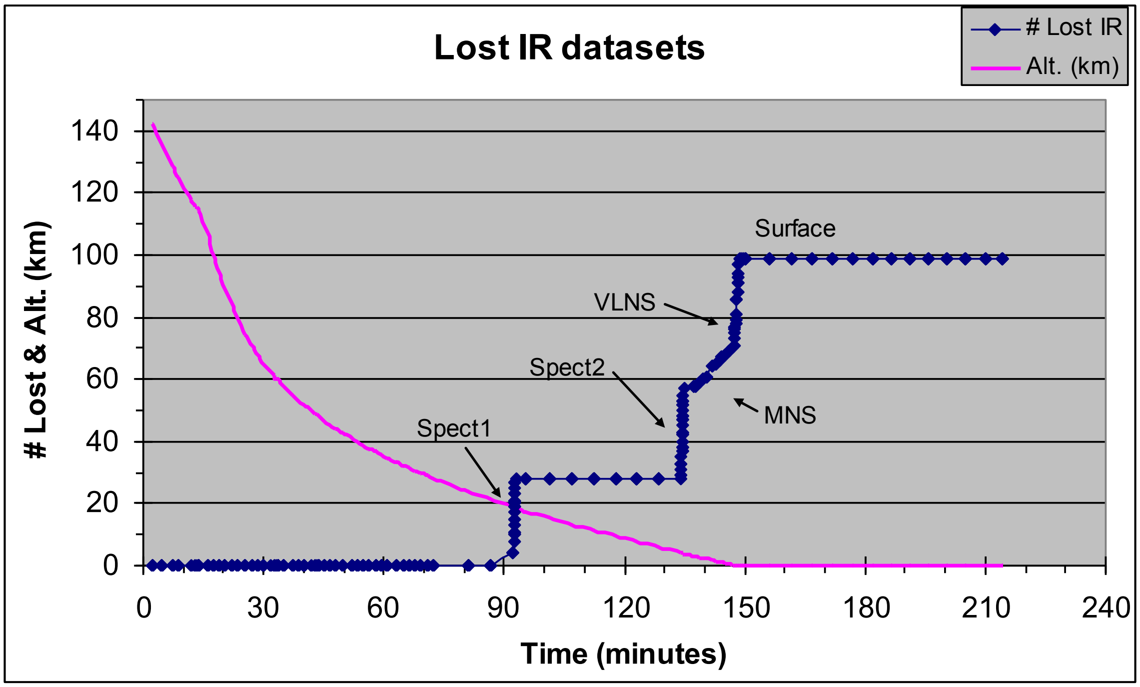
43	1092.432	38	43	1078.583	36	43	1092.4323	38	43	1078.5825	36
44	1099.343	39	44	1085.512	37	44	1099.3425	39	44	1085.5123	37
45	1106.243	40	45	1092.432	38	45	1106.2430	40	45	1092.4323	38
46	1113.134	41	46	1099.343	39	46	1113.1340	41	46	1099.3425	39
47	1120.015	42	47	1106.243	40	47	1120.0151	42	47	1106.2430	40
48	1126.887	43	48	1113.134	41	48	1126.8866	43	48	1113.1340	41
49	1133.749	44	49	1120.015	42	49	1133.7485	44	49	1120.0151	42
50	1140.600	45	50	1126.887	43	50	1140.6005	45	50	1126.8866	43
51	1147.443	46	51	1133.749	44	51	1147.4430	46	51	1133.7485	44
52	1154.276	47	52	1140.600	45	52	1154.2756	47	52	1140.6005	45
53	1161.099	48	53	1147.443	46	53	1161.0986	48	53	1147.4430	46
54	1167.912	49	54	1154.276	47	54	1167.9119	49	54	1154.2756	47
55	1174.715	50	55	1161.099	48	55	1174.7155	50	55	1161.0986	48
56	1181.509	51	56	1167.912	49	56	1181.5094	51	56	1167.9119	49
57	1188.293	52	57	1174.715	50	57	1188.2935	52	57	1174.7155	50
58	1195.068	53	58	1181.509	51	58	1195.0680	53	58	1181.5094	51
59	1201.833	54	59	1188.293	52	59	1201.8329	54	59	1188.2935	52
60	1208.588	55	60	1195.068	53	60	1208.5879	55	60	1195.0680	53
61	1215.333	56	61	1201.833	54	61	1215.3334	56	61	1201.8329	54
62	1222.069	57	62	1208.588	55	62	1222.0691	57	62	1208.5879	55
63	1228.795	58	63	1215.333	56	63	1228.7949	58	63	1215.3334	56
64	1235.511	59	64	1222.069	57	64	1235.5114	59	64	1222.0691	57
65	1242.218	60	65	1228.795	58	65	1242.2178	60	65	1228.7949	58
66	1248.915	61	66	1235.511	59	66	1248.9148	61	66	1235.5114	59
67	1255.602	62	67	1242.218	60	67	1255.6019	62	67	1242.2178	60
68	1262.279	63	68	1248.915	61	68	1262.2794	63	68	1248.9148	61
69	1268.947	64	69	1255.602	62	69	1268.9473	64	69	1255.6019	62
70	1275.605	65	70	1262.279	63	70	1275.6052	65	70	1262.2794	63
71	1282.254	66	71	1268.947	64	71	1282.2537	66	71	1268.9473	64
72	1288.892	67	72	1275.605	65	72	1288.8925	67	72	1275.6052	65
73	1295.521	68	73	1282.254	66	73	1295.5214	68	73	1282.2537	66
74	1302.141	69	74	1288.892	67	74	1302.1406	69	74	1288.8925	67
75	1308.750	70	75	1295.521	68	75	1308.7504	70	75	1295.5214	68
76	1315.350	71	76	1302.141	69	76	1315.3501	71	76	1302.1406	69
77	1321.940	72	77	1308.750	70	77	1321.9403	72	77	1308.7504	70

78	1328.521	73	78	1315.350	71	78	1328.5208	73	78	1315.3501	71
79	1335.092	74	79	1321.940	72	79	1335.0917	74	79	1321.9403	72
80	1341.653	75	80	1328.521	73	80	1341.6526	75	80	1328.5208	73
81	1348.204	76	81	1335.092	74	81	1348.2041	76	81	1335.0917	74
82	1354.746	77	82	1341.653	75	82	1354.7458	77	82	1341.6526	75
83	1361.278	78	83	1348.204	76	83	1361.2777	78	83	1348.2041	76
84	1367.800	79	84	1354.746	77	84	1367.7999	79	84	1354.7458	77
85	1374.313	80	85	1361.278	78	85	1374.3127	80	85	1361.2777	78
86	1380.816	81	86	1367.800	79	86	1380.8156	81	86	1367.7999	79
87	1387.309	82	87	1374.313	80	87	1387.3086	82	87	1374.3127	80
88	1393.792	83	88	1380.816	81	88	1393.7922	83	88	1380.8156	81
89	1400.266	84	89	1387.309	82	89	1400.2660	84	89	1387.3086	82
90	1406.730	85	90	1393.792	83	90	1406.7300	85	90	1393.7922	83
91	1413.184	86	91	1400.266	84	91	1413.1844	86	91	1400.2660	84
92	1419.629	87	92	1406.730	85	92	1419.6293	87	92	1406.7300	85
93	1426.064	88	93	1413.184	86	93	1426.0641	88	93	1413.1844	86
94	1432.490	89	94	1419.629	87	94	1432.4895	89	94	1419.6293	87
95	1438.905	90	95	1426.064	88	95	1438.9052	90	95	1426.0641	88
96	1445.311	91	96	1432.490	89	96	1445.3109	91	96	1432.4895	89
97	1451.707	92	97	1438.905	90	97	1451.7070	92	97	1438.9052	90
98	1458.094	93	98	1445.311	91	98	1458.0936	93	98	1445.3109	91
99	1464.470	94	99	1451.707	92	99	1464.4705	94	99	1451.7070	92
100	1470.837	95	100	1458.094	93	100	1470.8374	95	100	1458.0936	93
101	1477.195	96	101	1464.470	94	101	1477.1948	96	101	1464.4705	94
102	1483.543	97	102	1470.837	95	102	1483.5426	97	102	1470.8374	95
103	1489.880	98	103	1477.195	96	103	1489.8805	98	103	1477.1948	96
104	1496.209	99	104	1483.543	97	104	1496.2089	99	104	1483.5426	97
105	1502.527	100	105	1489.880	98	105	1502.5275	100	105	1489.8805	98
106	1508.836	101	106	1496.209	99	106	1508.8363	101	106	1496.2089	99
107	1515.135	102	107	1502.527	100	107	1515.1355	102	107	1502.5275	100
108	1521.425	103	108	1508.836	101	108	1521.4249	103	108	1508.8363	101
109	1527.705	104	109	1515.135	102	109	1527.7048	104	109	1515.1355	102
110	1533.975	105	110	1521.425	103	110	1533.9749	105	110	1521.4249	103
111	1540.235	106	111	1527.705	104	111	1540.2352	106	111	1527.7048	104
112	1546.486	107	112	1533.975	105	112	1546.4860	107	112	1533.9749	105

113	1552.727	108	113	1540.235	106	113	1552.7269	108	113	1540.2352	106
114	1558.958	109	114	1546.486	107	114	1558.9583	109	114	1546.4860	107
115	1565.180	110	115	1552.727	108	115	1565.1799	110	115	1552.7269	108
116	1571.392	111	116	1558.958	109	116	1571.3917	111	116	1558.9583	109
117	1577.594	112	117	1565.180	110	117	1577.5939	112	117	1565.1799	110
118	1583.786	113	118	1571.392	111	118	1583.7864	113	118	1571.3917	111
119	1589.969	114	119	1577.594	112	119	1589.9692	114	119	1577.5939	112
120	1596.142	115	120	1583.786	113	120	1596.1422	115	120	1583.7864	113
121	1602.306	116	121	1589.969	114	121	1602.3057	116	121	1589.9692	114
122	1608.459	117	122	1596.142	115	122	1608.4595	117	122	1596.1422	115
123	1614.603	118	123	1602.306	116	123	1614.6033	118	123	1602.3057	116
124	1620.738	119	124	1608.459	117	124	1620.7377	119	124	1608.4595	117
125	1626.862	120	125	1614.603	118	125	1626.8623	120	125	1614.6033	118
126	1632.977	121	126	1620.738	119	126	1632.9772	121	126	1620.7377	119
127	1639.082	122	127	1626.862	120	127	1639.0823	122	127	1626.8623	120
128	1645.178	123	128	1632.977	121	128	1645.1777	123	128	1632.9772	121
129	1651.264	124	129	1639.082	122	129	1651.2637	124	129	1639.0823	122
130	1657.340	125	130	1645.178	123	130	1657.3396	125	130	1645.1777	123
131	1663.406	126	131	1651.264	124	131	1663.4061	126	131	1651.2637	124
132	1669.463	127	132	1657.340	125	132	1669.4629	127	132	1657.3396	125
133	1675.510	128	133	1663.406	126	133	1675.5098	128	133	1663.4061	126
134	1681.547	129	134	1669.463	127	134	1681.5471	129	134	1669.4629	127
135	1687.575	130	135	1675.510	128	135	1687.5747	130	135	1675.5098	128
136	1693.593	131	136	1681.547	129	136	1693.5925	131	136	1681.5471	129
137	1699.601	132	137	1687.575	130	137	1699.6007	132	137	1687.5747	130
138	1705.599	133	138	1693.593	131	138	1705.5992	133	138	1693.5925	131
139	1711.588	134	139	1699.601	132	139	1711.5880	134	139	1699.6007	132
140	1717.567	135	140	1705.599	133	140	1717.5670	135	140	1705.5992	133
			141	1711.588	134				141	1711.5880	134
			142	1717.567	135				142	1717.5670	135

Appendix 13 - The Lost IR datasets

The following plot shows where during the descent IR datasets were lost due to the failure of telemetry channel A. Each blue triangle represents a retrieved IR dataset. The accumulated number of datasets lost appears on the ordinate. About 30 datasets were lost from each of the Spectrophotometric maps (18 & 4 km). The rest were lost during the Medium Near Surface (MNS) cycles (3 to 0.5 km) and Very Low Near Surface (VLNS) cycles (200 to 0 m).



Appendix 14 - Sun Position in Sky

This table contains information about the position of the sun in the sky during the Huygens descent. The altitude is from the 2011 DTWG release. The other parameters are from the DTWG trajectory reconstruction tool, version 4.4 from 28 February 2005. The solar azimuth (AZ) is degrees east of north. This is the geometric sun position relative to the local horizontal (with no spherical geometry), and is uncorrected for refraction.

M_Time (sec)	Altitude (km)	Sun AZ (deg)	Sun EL (deg)	SZA (deg)
0	150.435	112.66	50.01	39.99
180	140.883	112.77	50.36	39.64
240	137.942	112.81	50.48	39.52
300	135.103	112.85	50.60	39.40
360	132.291	112.89	50.71	39.29
420	129.660	112.92	50.84	39.16
480	127.120	112.97	50.96	39.04
540	124.635	113.01	51.09	38.91
600	122.267	113.05	51.22	38.78
660	119.911	113.09	51.35	38.65
720	117.665	113.14	51.48	38.52
780	115.502	113.18	51.62	38.38
840	113.374	113.23	51.75	38.25
900	111.297	113.28	51.90	38.10
960	108.162	113.33	52.04	37.96
1020	103.808	113.37	52.16	37.84
1080	99.478	113.41	52.27	37.73
1140	95.446	113.44	52.37	37.63
1200	91.671	113.49	52.49	37.51
1260	88.093	113.53	52.60	37.40
1320	84.809	113.56	52.69	37.31
1380	81.695	113.59	52.77	37.23
1440	78.769	113.62	52.84	37.16
1500	76.051	113.64	52.91	37.09
1560	73.472	113.66	52.97	37.03
1620	71.047	113.68	53.01	36.99
1680	68.832	113.70	53.05	36.95
1740	66.773	113.71	53.08	36.92
1800	64.871	113.71	53.10	36.90
1860	63.110	113.72	53.12	36.88
1920	61.483	113.73	53.14	36.86
1980	59.960	113.75	53.18	36.82
2040	58.511	113.77	53.24	36.76
2100	57.143	113.79	53.29	36.71
2160	55.836	113.81	53.35	36.65
2220	54.583	113.83	53.41	36.59
2280	53.387	113.86	53.47	36.53

M_Time (sec)	Altitude (km)	Sun AZ (deg)	Sun EL (deg)	SZA (deg)
4620	25.083	114.47	54.92	35.08
4680	24.600	114.48	54.95	35.05
4740	24.119	114.49	54.97	35.03
4800	23.643	114.50	54.99	35.01
4860	23.178	114.51	55.02	34.98
4920	22.718	114.52	55.04	34.96
4980	22.263	114.53	55.06	34.94
5040	21.812	114.54	55.08	34.92
5100	21.365	114.55	55.11	34.89
5160	20.925	114.56	55.13	34.87
5220	20.489	114.57	55.15	34.85
5280	20.061	114.58	55.17	34.83
5340	19.633	114.59	55.19	34.81
5400	19.215	114.60	55.21	34.79
5460	18.802	114.61	55.23	34.77
5520	18.385	114.61	55.25	34.75
5580	17.976	114.62	55.27	34.73
5640	17.571	114.63	55.29	34.71
5700	17.170	114.64	55.31	34.69
5760	16.775	114.65	55.33	34.67
5820	16.380	114.66	55.35	34.65
5880	15.988	114.67	55.37	34.63
5940	15.602	114.68	55.39	34.61
6000	15.219	114.69	55.41	34.59
6060	14.843	114.69	55.43	34.57
6120	14.465	114.70	55.45	34.55
6180	14.093	114.71	55.46	34.54
6240	13.727	114.72	55.48	34.52
6300	13.365	114.73	55.50	34.50
6360	13.004	114.74	55.52	34.48
6420	12.645	114.75	55.54	34.46
6480	12.293	114.75	55.56	34.44
6540	11.943	114.76	55.57	34.43
6600	11.591	114.77	55.59	34.41
6660	11.244	114.78	55.61	34.39
6720	10.901	114.79	55.63	34.37
6780	10.560	114.80	55.64	34.36

M_Time	Altitude	Sun AZ	Sun EL	SZA
2340	52.235	113.88	53.53	36.47
2400	51.122	113.90	53.58	36.42
2460	50.052	113.92	53.64	36.36
2520	49.016	113.95	53.69	36.31
2580	48.006	113.97	53.74	36.26
2640	47.033	113.99	53.79	36.21
2700	46.088	114.01	53.84	36.16
2760	45.178	114.03	53.89	36.11
2820	44.287	114.05	53.94	36.06
2880	43.426	114.06	53.98	36.02
2940	42.589	114.08	54.03	35.97
3000	41.772	114.10	54.07	35.93
3060	40.971	114.12	54.11	35.89
3120	40.190	114.13	54.15	35.85
3180	39.431	114.15	54.19	35.81
3240	38.688	114.17	54.23	35.77
3300	37.961	114.18	54.27	35.73
3360	37.251	114.20	54.31	35.69
3420	36.559	114.21	54.34	35.66
3480	35.875	114.23	54.38	35.62
3540	35.211	114.24	54.41	35.59
3600	34.562	114.26	54.44	35.56
3660	33.926	114.27	54.48	35.52
3720	33.298	114.29	54.51	35.49
3780	32.686	114.30	54.54	35.46
3840	32.081	114.31	54.57	35.43
3900	31.490	114.33	54.60	35.40
3960	30.909	114.34	54.63	35.37
4020	30.340	114.35	54.66	35.34
4080	29.776	114.36	54.69	35.31
4140	29.222	114.38	54.72	35.28
4200	28.678	114.39	54.74	35.26
4260	28.141	114.40	54.77	35.23
4320	27.615	114.41	54.80	35.20
4380	27.100	114.42	54.82	35.18
4440	26.583	114.43	54.85	35.15
4500	26.074	114.44	54.87	35.13
4560	25.574	114.46	54.90	35.10

M_Time	Altitude	Sun AZ	Sun EL	SZA
6840	10.221	114.80	55.66	34.34
6900	9.887	114.81	55.68	34.32
6960	9.550	114.82	55.69	34.31
7020	9.217	114.83	55.71	34.29
7080	8.889	114.83	55.73	34.27
7140	8.561	114.84	55.74	34.26
7200	8.238	114.85	55.76	34.24
7260	7.915	114.86	55.77	34.23
7320	7.593	114.87	55.79	34.21
7380	7.273	114.87	55.81	34.19
7440	6.956	114.88	55.82	34.18
7500	6.642	114.89	55.84	34.16
7560	6.330	114.90	55.85	34.15
7620	6.019	114.90	55.87	34.13
7680	5.710	114.91	55.88	34.12
7740	5.405	114.92	55.90	34.10
7800	5.101	114.92	55.91	34.09
7860	4.803	114.93	55.93	34.07
7920	4.506	114.94	55.94	34.06
7980	4.209	114.95	55.96	34.04
8040	3.913	114.95	55.97	34.03
8100	3.619	114.96	55.99	34.01
8160	3.328	114.97	56.00	34.00
8220	3.038	114.97	56.02	33.98
8280	2.749	114.98	56.03	33.97
8340	2.462	114.99	56.04	33.96
8400	2.178	114.99	56.06	33.94
8460	1.894	115.00	56.07	33.93
8520	1.614	115.01	56.08	33.92
8580	1.336	115.01	56.09	33.91
8640	1.053	115.02	56.11	33.89
8700	0.775	115.03	56.12	33.88
8760	0.498	115.03	56.14	33.86
8820	0.226	115.04	56.15	33.85
8868	0.008	115.04	56.16	33.84
8869	0.000	115.04	56.16	33.84
8870	0.000	115.04	56.16	33.84
13203	0.000	115.50	58.00	32.00

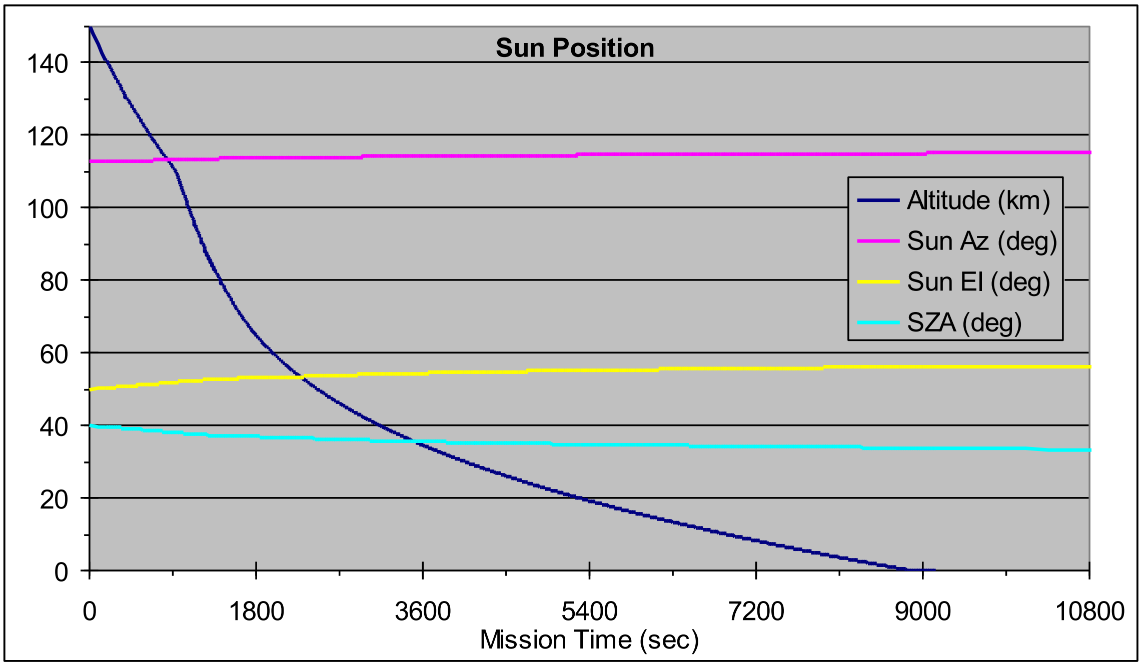
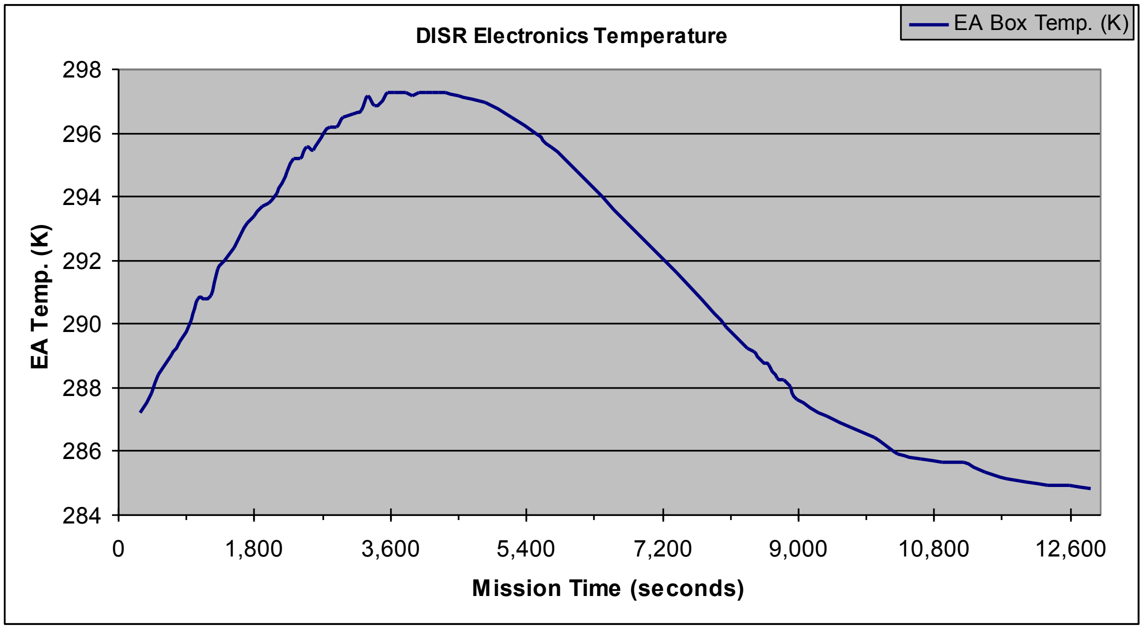


Figure - Sun position and probe altitude vs. mission time (seconds past T0)

Appendix 15 - DISR Electronics Temperature during Titan Descent.

The following graph and table present the measured temperatures of the DISR electronics assembly during the Titan descent. The thermistor is located on the motherboard and therefore reports an intermediate temperature between the electronics cards and the housing. Quantization error in the DISR temperature measurements is about 0.1K.



Sec.	EA Box Temp. (K)	Sec.	EA Box Temp. (K)	Sec.	EA Box Temp. (K)	Sec.	EA Box Temp. (K)
282.01	287.24	2318.15	295.19	4154.25	297.27	8614.17	288.72
433.15	287.83	2408.16	295.19	4244.25	297.27	8711.94	288.32
523.16	288.43	2498.16	295.58	4335.64	297.27	8810.54	288.23
700.62	289.03	2579.85	295.48	4495.35	297.17	8891.19	288.03
808.00	289.42	2703.12	295.98	4856.42	296.97	8975.34	287.63
957.89	290.12	2793.13	296.18	5194.92	296.48	9370.29	287.13
1047.89	290.81	2883.13	296.18	5534.92	295.98	9690.67	286.74
1137.90	290.81	2973.14	296.48	5726.17	295.58	10001.41	286.44
1227.90	290.91	3113.17	296.58	6067.42	294.79	10311.41	285.94
1317.90	291.71	3203.18	296.68	6405.67	293.99	10609.54	285.74
1407.91	292.01	3293.18	297.17	6736.55	293.20	10904.54	285.64
1531.17	292.40	3383.18	296.87	7063.05	292.40	11182.04	285.65
1621.17	292.80	3473.19	296.97	7384.42	291.61	11462.55	285.35
1711.17	293.20	3563.19	297.27	7717.67	290.81	11744.16	285.15
1801.18	293.40	3653.20	297.27	8046.41	289.91	12307.16	284.95
1891.18	293.69	3794.23	297.27	8222.67	289.52	12588.42	284.95
1979.00	293.79	3884.24	297.17	8320.42	289.22	12864.92	284.85
2094.82	294.09	3974.24	297.27	8417.29	289.12		
2228.15	294.79	4064.24	297.27	8516.29	288.82		

Appendix 16 - Violet Measurement Summary Table (with updated parameters)

Seq # = The sequence number of the dataset (also encoded in archive filename).
Cyc # = The Descent cycle in which the data was taken.
M_Time = The number of seconds after T0 when the measurement began.
Type = The Violet dataset type (upward vs. downward looking violet measurement).
DN = The digital data number between 0 and 4095 representing the signal strength.
Alt_2011 = The altitude based on the DTWG's June 2011 evaluation.
AZ_2007 = Azimuth of the observation in °CW from Sun, based on Karkoschka, PSS 2007
Sun Az = The azimuth of the sun projected on Titan's surface at the time of observation.
E-W Tilt = The misalignment of the probe's spin axis in the E/W plane (see Appx. 4)
Lamps = The DISR calibration and surface lamp state. CCCS, 0 is off, 1 is on.
Tv = Violet Detector Temperature
Tea = DISR electronics Temperature

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
1	1	144.25	DLV	379	142.729	182.85	112.75	5.3	0000	269.6	287.2
2	1	148.80	DLV	393	142.490	49.00	112.76	2.4	0000	269.6	287.2
3	1	148.99	ULV	528	142.480	43.38	112.76	2.3	0000	269.6	287.2
4	1	182.68	ULV	97	140.748	177.69	112.78	-3.6	0000	269.5	287.1
5	1	208.06	ULV	117	139.489	238.02	112.79	-3.0	0000	269.4	287.1
6	1	236.52	ULV	257	138.109	277.62	112.81	-0.3	0000	269.4	287.2
7	1	242.85	ULV	114	137.805	133.90	112.81	2.0	0000	269.4	287.2
8	2	283.08	DLV	376	135.899	358.48	112.84	1.9	0000	263.8	287.2
9	2	283.26	ULV	321	135.890	354.90	112.84	1.9	0000	263.8	287.2
10	2	291.69	DLV	342	135.494	189.36	112.84	-1.0	0000	263.7	287.3
11	2	298.57	ULV	373	135.170	59.08	112.85	-3.1	0000	263.7	287.3
12	2	331.24	ULV	123	133.625	223.31	112.87	1.5	0000	263.5	287.4
13	2	353.94	ULV	169	132.567	259.71	112.88	3.7	0000	263.4	287.5
14	2	380.10	ULV	584	131.393	304.32	112.90	-0.8	0000	263.3	287.6
15	3	436.29	DLV	334	128.962	146.45	112.94	4.3	0000	263.1	287.8
16	3	436.78	ULV	113	128.942	142.91	112.94	4.1	0000	263.1	287.9
17	3	446.25	ULV	277	128.540	77.87	112.94	-1.9	0000	263.0	287.9
18	3	448.79	DLV	355	128.432	61.64	112.94	-3.5	0000	263.0	287.9
19	3	448.93	ULV	380	128.426	60.79	112.94	-3.6	0000	263.0	287.9
20	3	459.92	ULV	334	127.963	356.58	112.95	1.8	0000	263.0	288.0
21	3	520.03	ULV	114	125.451	162.73	112.99	5.9	0000	262.6	288.4
22	4	523.25	DLV	349	125.318	159.06	113.00	3.5	0000	262.6	288.4
23	4	523.93	ULV	113	125.290	158.37	113.00	3.0	0000	262.7	288.4
24	4	537.78	ULV	108	124.724	150.12	113.01	-1.4	0000	262.6	288.5
25	4	541.95	DLV	334	124.556	149.71	113.01	-0.5	0000	262.5	288.5
26	4	541.95	ULV	107	124.556	149.71	113.01	-0.5	0000	262.6	288.5
27	4	558.31	ULV	110	123.903	157.44	113.02	5.1	0000	262.3	288.6
28	4	699.57	ULV	112	118.420	137.35	113.12	-4.3	0000	261.8	289.0
29	5	719.52	DLV	2561	117.683	319.31	113.14	-8.8	1110	261.5	289.1
30	5	719.59	ULV	621	117.680	319.98	113.14	-8.8	1110	261.5	289.1
31	6	784.99	DLV	338	115.324	331.59	113.19	-2.4	0000	261.2	289.3
32	6	785.17	ULV	341	115.317	333.93	113.19	-2.4	0000	261.2	289.3

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
33	7	824.78	DLV	2500	113.909	159.23	113.21	-11.4	1110	260.9	289.5
34	7	825.44	ULV	323	113.886	168.96	113.22	-11.6	1110	261.0	289.5
35	8	834.24	ULV	401	113.576	301.17	113.22	-4.5	0000	261.0	289.5
36	8	836.78	DLV	314	113.486	340.03	113.22	-3.0	0000	260.9	289.5
37	8	849.98	ULV	102	113.038	186.64	113.24	-5.5	0000	260.8	289.6
38	8	850.23	DLV	305	113.030	190.74	113.24	-5.1	0000	260.8	289.6
39	8	860.07	ULV	229	112.715	350.06	113.24	-7.6	0000	260.7	289.6
40	8	870.93	ULV	97	112.368	171.42	113.25	-9.0	0000	260.7	289.7
41	8	905.95	ULV	244	111.035	71.66	113.28	-6.7	0000	260.5	289.8
42	9	960.84	DLV	277	108.109	164.18	113.33	5.2	0000	260.2	290.1
43	9	961.16	ULV	103	108.089	172.18	113.33	4.8	0000	260.2	290.1
44	9	969.17	DLV	324	107.563	15.94	113.33	-5.2	0000	260.1	290.2
45	9	974.64	ULV	99	107.184	162.48	113.34	-7.1	0000	260.0	290.2
46	9	992.01	ULV	302	105.909	306.90	113.35	-6.5	0000	259.9	290.4
47	9	999.71	ULV	104	105.324	191.35	113.35	-4.6	0000	259.9	290.5
48	9	1028.85	ULV	125	103.165	99.53	113.37	1.5	0000	259.8	290.7
49	10	1051.52	DLV	258	101.512	200.14	113.39	-2.0	0000	259.5	290.8
50	10	1051.70	ULV	97	101.499	206.88	113.39	-2.0	0000	259.5	290.8
51	10	1056.76	DLV	278	101.132	36.19	113.39	-1.4	0000	259.4	290.8
52	10	1065.82	ULV	243	100.480	22.61	113.40	-4.2	0000	259.4	290.9
53	10	1066.86	ULV	216	100.406	62.74	113.40	-4.4	0000	259.4	290.9
54	10	1070.79	ULV	99	100.126	216.32	113.40	-3.1	0000	259.3	290.9
55	10	1100.60	ULV	233	98.062	4.69	113.42	-1.7	0000	259.0	290.8
56	11	1138.44	ULV	233	95.548	298.62	113.44	-4.5	0000	258.6	290.8
57	11	1139.34	DLV	289	95.489	342.00	113.44	-4.4	0000	258.6	290.8
58	11	1142.44	ULV	101	95.288	132.38	113.45	-4.3	0000	258.6	290.8
59	11	1143.32	DLV	260	95.231	175.60	113.45	-4.2	0000	258.6	290.8
60	11	1143.48	ULV	93	95.221	183.32	113.45	-4.2	0000	258.6	290.8
61	11	1147.38	ULV	224	94.969	14.95	113.45	-4.1	0000	258.6	290.8
62	11	1175.82	ULV	205	93.166	30.01	113.47	-4.0	0000	258.2	290.8
63	12	1229.80	DLV	233	89.863	183.15	113.51	-6.9	0000	257.5	290.9
64	12	1232.87	DLV	284	89.680	2.93	113.51	-7.3	0000	257.5	290.9
65	12	1235.17	ULV	93	89.543	137.91	113.51	-7.6	0000	257.5	291.0
66	12	1235.80	ULV	93	89.506	174.29	113.51	-7.7	0000	257.5	291.0
67	12	1238.19	ULV	206	89.364	314.48	113.51	-6.9	0000	257.5	291.0
68	12	1238.96	ULV	174	89.318	359.58	113.51	-6.7	0000	257.5	291.0
69	12	1250.63	ULV	203	88.633	320.01	113.52	-6.7	0000	257.4	291.1
70	13	1320.57	DLV	273	84.779	344.09	113.56	-6.3	0000	256.5	291.7
71	13	1323.16	ULV	90	84.641	130.27	113.56	-6.2	0000	256.4	291.7
72	13	1323.75	ULV	87	84.609	163.31	113.56	-6.2	0000	256.4	291.7
73	13	1326.62	DLV	249	84.457	324.94	113.56	-6.2	0000	256.4	291.8
74	13	1327.36	ULV	157	84.418	6.58	113.57	-6.2	0000	256.5	291.8
75	13	1332.80	ULV	189	84.130	311.73	113.57	-6.0	0000	256.4	291.8
76	13	1356.12	ULV	89	82.913	157.15	113.58	-2.4	0000	256.0	291.9
77	14	1410.22	DLV	255	80.197	355.35	113.60	-1.7	0000	255.4	292.0
78	14	1413.78	DLV	214	80.023	166.11	113.61	-2.3	0000	255.3	292.0

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
79	14	1415.88	ULV	127	79.921	266.48	113.61	-2.7	0000	255.3	292.0
80	14	1422.19	ULV	85	79.616	207.64	113.61	-3.2	0000	255.1	292.1
81	14	1441.44	ULV	146	78.701	40.37	113.62	-6.7	0000	255.0	292.1
82	14	1503.00	ULV	130	75.919	265.42	113.64	-0.9	0000	254.1	292.3
83	14	1526.20	ULV	92	74.907	145.49	113.65	-0.6	0000	253.7	292.4
84	15	1531.69	DLV	239	74.671	9.00	113.66	-0.7	0000	253.6	292.4
85	15	1536.08	DLV	212	74.482	187.62	113.66	-1.0	0000	253.6	292.4
86	15	1539.50	ULV	150	74.336	326.19	113.66	-1.6	0000	253.5	292.4
87	15	1553.32	ULV	87	73.751	157.75	113.66	3.3	0000	253.3	292.5
88	15	1557.03	ULV	141	73.596	301.23	113.66	2.4	0000	253.3	292.5
89	15	1572.87	ULV	85	72.938	170.63	113.67	0.4	0000	253.0	292.6
90	15	1583.85	ULV	87	72.487	203.42	113.67	-0.6	0000	252.8	292.6
91	16	1622.20	ULV	97	70.962	116.72	113.68	8.3	0000	252.2	292.8
92	16	1623.06	ULV	90	70.929	146.91	113.68	8.4	0000	252.3	292.8
93	16	1623.13	DLV	217	70.927	149.38	113.68	8.4	0000	252.2	292.8
94	16	1626.37	ULV	98	70.802	263.42	113.68	8.9	0000	252.2	292.8
95	16	1627.29	DLV	213	70.767	295.85	113.68	9.1	0000	252.2	292.8
96	16	1627.48	ULV	120	70.760	302.27	113.68	9.2	0000	252.2	292.8
97	16	1660.96	ULV	126	69.517	15.22	113.69	5.9	0000	251.6	293.0
98	17	1711.63	ULV	89	67.727	233.76	113.70	12.3	0000	250.8	293.2
99	17	1711.72	DLV	192	67.724	236.69	113.70	12.3	0000	250.8	293.2
100	17	1715.35	ULV	119	67.600	354.48	113.70	12.8	0000	250.7	293.2
101	17	1716.39	DLV	212	67.564	27.94	113.70	12.8	0000	250.7	293.2
102	17	1716.57	ULV	122	67.558	33.81	113.70	12.7	0000	250.7	293.2
103	17	1729.41	ULV	113	67.125	71.03	113.70	6.3	0000	250.4	293.3
104	17	1753.62	ULV	103	66.327	87.83	113.71	4.1	0000	250.0	293.3
105	18	1806.32	DLV	198	64.679	169.04	113.72	0.0	0000	249.0	293.4
106	18	1806.52	ULV	82	64.673	174.79	113.72	0.0	0000	249.1	293.4
107	18	1811.49	DLV	217	64.523	315.79	113.72	0.3	0000	248.9	293.4
108	18	1820.73	ULV	83	64.247	216.29	113.72	-0.4	0000	248.7	293.5
109	18	1821.81	ULV	88	64.215	247.07	113.72	-0.6	0000	248.7	293.5
110	18	1825.99	ULV	114	64.091	6.64	113.72	-0.2	0000	248.6	293.5
111	18	1858.65	ULV	82	63.148	196.31	113.72	2.4	0000	248.0	293.6
112	19	1898.87	DLV	2361	62.042	251.85	113.73	1.6	1110	247.1	293.7
113	19	1899.18	ULV	313	62.034	260.38	113.73	1.5	1110	247.1	293.7
114	20	1957.20	DLV	211	60.529	7.46	113.74	0.6	0000	245.9	293.8
115	20	1957.54	ULV	107	60.520	16.16	113.74	0.7	0000	245.8	293.8
116	21	1981.20	DLV	2350	59.931	261.60	113.75	0.4	1110	245.4	293.8
117	21	1981.54	ULV	315	59.922	270.08	113.75	0.3	1110	245.4	293.8
118	22	2006.19	ULV	80	59.318	191.17	113.76	2.0	0000	244.8	293.8
119	22	2006.31	DLV	192	59.315	194.29	113.76	2.1	0000	244.8	293.8
120	22	2011.83	ULV	111	59.182	336.12	113.76	1.7	0000	244.7	293.9
121	22	2013.40	DLV	204	59.144	15.18	113.76	0.8	0000	244.7	293.9
122	22	2013.68	ULV	106	59.137	22.09	113.76	0.7	0000	244.7	293.9
123	22	2030.97	ULV	93	58.724	91.64	113.76	-1.2	0000	244.3	293.9
124	22	2050.09	ULV	81	58.276	215.80	113.77	-0.8	0000	243.8	293.9

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
125	23	2095.42	DLV	187	57.245	255.88	113.79	1.5	0000	242.8	294.1
126	23	2101.81	DLV	205	57.103	49.55	113.79	0.6	0000	242.6	294.1
127	23	2102.06	ULV	103	57.097	55.43	113.79	0.7	0000	242.7	294.1
128	23	2113.15	ULV	105	56.852	313.60	113.79	-1.7	0000	242.3	294.2
129	23	2120.30	ULV	81	56.694	120.44	113.80	-2.0	0000	242.2	294.2
130	23	2137.47	ULV	78	56.320	162.67	113.80	0.7	0000	241.8	294.3
131	23	2155.94	ULV	79	55.923	219.22	113.81	-0.7	0000	241.4	294.4
132	24	2229.15	ULV	97	54.397	288.24	113.84	-3.5	0000	239.7	294.8
133	24	2230.70	DLV	196	54.365	317.23	113.84	-3.5	0000	239.7	294.8
134	24	2237.67	DLV	197	54.225	90.05	113.84	-3.0	0000	239.6	294.8
135	24	2250.41	ULV	104	53.970	329.32	113.85	-2.3	0000	239.2	294.9
136	24	2252.28	ULV	100	53.933	4.20	113.85	-2.1	0000	239.2	294.9
137	24	2259.08	ULV	81	53.798	130.70	113.85	-1.7	0000	239.0	294.9
138	24	2304.64	ULV	82	52.909	255.93	113.87	-1.3	0000	237.9	295.2
139	25	2318.59	DLV	185	52.641	134.44	113.87	0.3	0000	237.6	295.2
140	25	2318.69	ULV	81	52.639	136.26	113.87	0.3	0000	237.6	295.2
141	25	2324.73	ULV	84	52.524	240.68	113.87	-1.3	0000	237.4	295.2
142	25	2326.48	DLV	194	52.491	271.30	113.88	-1.9	0000	237.4	295.2
143	25	2326.79	ULV	89	52.485	276.72	113.88	-2.0	0000	237.4	295.2
144	25	2332.62	ULV	100	52.375	18.91	113.88	-1.5	0000	237.3	295.2
145	25	2374.15	ULV	97	51.597	347.44	113.89	-1.0	0000	236.3	295.2
146	26	2409.89	DLV	181	50.943	186.08	113.91	0.7	0000	235.4	295.2
147	26	2410.23	ULV	75	50.937	191.43	113.91	0.7	0000	235.3	295.2
148	26	2416.62	ULV	97	50.822	293.79	113.91	-1.7	0000	235.2	295.2
149	26	2418.44	ULV	100	50.789	322.88	113.91	-2.6	0000	235.2	295.2
150	26	2418.46	DLV	194	50.789	323.33	113.91	-2.6	0000	235.2	295.2
151	26	2425.39	ULV	86	50.665	74.48	113.91	-4.7	0000	235.0	295.2
152	26	2482.50	ULV	79	49.660	232.13	113.93	1.1	0000	233.6	295.5
153	27	2511.12	DLV	2318	49.168	307.37	113.94	-1.4	1110	232.9	295.6
154	27	2511.28	ULV	317	49.165	309.81	113.94	-1.4	1110	232.9	295.6
155	28	2563.74	DLV	189	48.276	61.97	113.96	-0.5	0000	231.6	295.5
156	28	2564.16	ULV	89	48.269	69.19	113.96	-0.5	0000	231.5	295.5
157	29	2580.93	DLV	2317	47.990	347.49	113.97	-0.2	1110	231.2	295.5
158	29	2581.31	ULV	313	47.984	353.49	113.97	-0.2	1110	231.2	295.5
159	30	2619.86	ULV	78	47.356	238.47	113.98	-1.3	0000	230.2	295.6
160	30	2621.77	DLV	185	47.325	268.54	113.98	-1.7	0000	230.1	295.6
161	30	2622.10	ULV	84	47.320	273.83	113.98	-1.7	0000	230.1	295.6
162	30	2628.44	ULV	93	47.218	15.21	113.98	-2.2	0000	229.9	295.6
163	30	2630.20	ULV	92	47.190	43.20	113.98	-2.2	0000	229.9	295.6
164	30	2630.34	DLV	189	47.187	45.43	113.98	-2.2	0000	229.9	295.6
165	30	2672.39	ULV	94	46.519	325.99	114.00	0.0	0000	228.8	295.9
166	31	2705.87	ULV	77	45.998	114.98	114.01	-1.5	0000	228.0	296.0
167	31	2707.74	ULV	73	45.969	146.49	114.01	-1.5	0000	228.0	296.0
168	31	2707.89	DLV	183	45.967	149.02	114.01	-1.5	0000	228.0	296.0
169	31	2714.90	ULV	80	45.860	266.08	114.01	-0.6	0000	227.8	296.0
170	31	2716.97	DLV	171	45.828	300.61	114.01	0.0	0000	227.8	296.0

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
171	31	2717.27	ULV	90	45.823	305.50	114.01	0.1	0000	227.7	296.0
172	31	2775.54	ULV	73	44.945	162.64	114.03	-3.3	0000	226.2	296.2
173	32	2794.26	DLV	172	44.666	124.90	114.04	-3.1	0000	225.8	296.2
174	32	2794.59	ULV	75	44.661	130.73	114.04	-3.1	0000	225.8	296.2
175	32	2800.80	ULV	76	44.569	238.99	114.04	-2.4	0000	225.6	296.2
176	32	2802.52	ULV	82	44.544	268.72	114.04	-2.1	0000	225.6	296.2
177	32	2802.83	DLV	183	44.540	274.15	114.04	-2.0	0000	225.6	296.2
178	32	2809.14	ULV	89	44.447	22.58	114.04	-0.8	0000	225.4	296.2
179	32	2866.69	ULV	76	43.615	235.11	114.06	-0.3	0000	224.1	296.2
180	33	2885.09	ULV	73	43.354	161.62	114.07	-0.5	0000	223.6	296.2
181	33	2885.27	DLV	180	43.352	164.51	114.07	-0.5	0000	223.6	296.2
182	33	2893.95	ULV	87	43.229	299.28	114.07	-1.0	0000	223.4	296.2
183	33	2896.42	DLV	167	43.195	337.72	114.07	-1.2	0000	223.3	296.2
184	33	2896.85	ULV	88	43.189	344.52	114.07	-1.2	0000	223.3	296.2
185	33	2907.30	ULV	72	43.042	150.22	114.07	1.2	0000	223.1	296.2
186	33	2954.03	ULV	73	42.396	181.56	114.09	1.8	0000	221.9	296.4
187	34	2973.26	DLV	183	42.134	103.65	114.09	3.4	0000	221.4	296.5
188	34	2980.09	ULV	73	42.041	204.86	114.09	5.3	0000	221.2	296.5
189	34	2982.05	DLV	178	42.015	234.94	114.09	5.5	0000	221.2	296.5
190	34	3006.86	ULV	81	41.680	281.09	114.10	-0.3	0000	220.6	296.5
191	34	3009.16	ULV	88	41.649	319.58	114.10	-0.9	0000	220.5	296.5
192	34	3020.10	ULV	73	41.502	135.86	114.11	0.1	0000	220.2	296.5
193	34	3049.48	ULV	75	41.110	240.87	114.11	-0.1	0000	219.6	296.6
194	35	3113.72	ULV	73	40.271	143.64	114.13	2.1	0000	217.8	296.6
195	35	3115.36	DLV	162	40.249	167.48	114.13	1.1	0000	218.0	296.6
196	35	3115.68	ULV	70	40.245	172.17	114.13	0.8	0000	217.8	296.6
197	35	3123.54	DLV	162	40.145	286.82	114.14	-3.4	0000	217.7	296.6
198	35	3138.22	ULV	70	39.957	143.66	114.14	0.3	0000	217.3	296.6
199	35	3139.92	ULV	72	39.936	167.98	114.14	0.3	0000	217.3	296.6
200	35	3163.60	ULV	73	39.636	122.61	114.15	0.2	0000	216.7	296.6
201	36	3205.12	ULV	84	39.118	333.78	114.16	-3.2	0000	215.7	296.7
202	36	3207.00	DLV	170	39.094	0.22	114.16	-2.6	0000	215.7	296.7
203	36	3213.61	ULV	75	39.013	92.71	114.16	-1.4	0000	215.5	296.7
204	36	3215.46	DLV	160	38.990	118.53	114.16	-1.3	0000	215.5	296.7
205	36	3215.82	ULV	72	38.985	123.57	114.16	-1.3	0000	215.5	296.7
206	36	3240.97	ULV	73	38.676	114.00	114.17	0.0	0000	214.9	296.9
207	36	3265.48	ULV	79	38.377	67.42	114.17	0.0	0000	214.3	297.1
208	37	3299.86	ULV	72	37.963	195.14	114.18	-2.5	0000	213.5	297.2
209	37	3301.78	DLV	169	37.940	222.78	114.18	-3.1	0000	213.4	297.2
210	37	3302.15	ULV	72	37.936	227.93	114.18	-3.2	0000	213.4	297.2
211	37	3308.63	ULV	83	37.858	317.25	114.19	-2.6	0000	213.3	297.2
212	37	3310.44	ULV	83	37.836	341.78	114.19	-1.5	0000	213.3	297.2
213	37	3310.55	DLV	169	37.835	343.32	114.19	-1.4	0000	213.3	297.2
214	37	3353.42	ULV	70	37.328	206.00	114.20	2.2	0000	212.2	297.0
215	38	3388.50	ULV	81	36.920	24.94	114.21	-0.9	0000	211.4	296.9
216	38	3390.36	ULV	80	36.899	53.75	114.21	-1.0	0000	211.3	296.9

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
217	38	3390.49	DLV	167	36.897	55.72	114.21	-1.1	0000	211.3	296.9
218	38	3397.55	ULV	69	36.816	164.89	114.21	-1.3	0000	211.2	296.9
219	38	3399.54	DLV	155	36.793	194.95	114.21	-0.8	0000	211.1	296.9
220	38	3399.91	ULV	70	36.789	200.56	114.21	-0.7	0000	211.1	296.9
221	38	3452.90	ULV	69	36.182	196.71	114.22	0.4	0000	209.8	296.9
222	39	3480.26	ULV	69	35.872	216.45	114.23	-0.2	0000	209.4	297.0
223	39	3482.18	ULV	71	35.851	244.85	114.23	-0.4	0000	209.3	297.0
224	39	3482.29	DLV	164	35.849	246.49	114.23	-0.4	0000	209.3	297.0
225	39	3489.59	ULV	80	35.768	355.83	114.23	0.2	0000	209.1	297.0
226	39	3508.66	DLV	155	35.556	282.69	114.24	1.2	0000	208.7	297.1
227	39	3509.10	ULV	79	35.551	289.20	114.24	1.2	0000	208.7	297.1
228	39	3549.16	ULV	72	35.111	92.99	114.25	-0.3	0000	207.8	297.2
229	40	3567.74	ULV	79	34.909	337.78	114.25	-0.5	0000	207.4	297.3
230	40	3569.85	DLV	153	34.886	4.83	114.25	-0.2	0000	207.3	297.3
231	40	3570.24	ULV	79	34.882	9.79	114.25	-0.3	0000	207.3	297.3
232	40	3577.35	ULV	73	34.805	100.69	114.25	-0.8	0000	207.1	297.3
233	40	3579.33	ULV	69	34.784	126.39	114.25	0.2	0000	207.1	297.3
234	40	3579.44	DLV	163	34.783	127.87	114.25	0.2	0000	207.1	297.3
235	40	3626.38	ULV	75	34.281	84.59	114.26	0.3	0000	206.0	297.3
236	41	3653.41	DLV	162	33.996	119.70	114.27	0.1	0000	205.4	297.3
237	41	3661.21	ULV	71	33.914	228.87	114.27	-0.7	0000	205.3	297.3
238	41	3663.24	DLV	166	33.892	258.16	114.27	-0.4	0000	205.1	297.3
239	41	3671.06	ULV	79	33.810	10.84	114.27	0.6	0000	205.0	297.3
240	41	3692.90	ULV	79	33.580	314.37	114.28	2.1	0000	204.5	297.3
241	41	3740.92	ULV	73	33.083	269.21	114.29	0.2	0000	203.5	297.3
242	41	3763.31	ULV	70	32.855	229.15	114.30	0.2	0000	203.1	297.3
243	42	3801.66	ULV	77	32.467	13.82	114.30	0.7	0000	202.2	297.3
244	42	3803.94	DLV	149	32.444	40.28	114.30	0.7	0000	202.2	297.3
245	42	3812.01	ULV	68	32.362	131.64	114.31	-0.2	0000	201.9	297.3
246	42	3814.14	ULV	68	32.340	154.76	114.31	-0.4	0000	201.9	297.2
247	42	3814.27	DLV	161	32.339	156.14	114.31	-0.4	0000	201.9	297.2
248	42	3825.10	ULV	75	32.230	286.19	114.31	-8.1	0000	201.7	297.2
249	42	3864.78	ULV	72	31.835	75.53	114.32	-1.5	0000	201.0	297.2
250	43	3885.28	ULV	76	31.634	293.06	114.32	1.9	0000	200.4	297.2
251	43	3887.63	DLV	145	31.611	313.87	114.32	2.3	0000	200.4	297.2
252	43	3888.05	ULV	77	31.607	317.64	114.32	2.4	0000	200.4	297.2
253	43	3895.87	ULV	75	31.530	31.60	114.32	0.2	0000	200.2	297.2
254	43	3898.05	ULV	75	31.509	53.39	114.33	-0.2	0000	200.2	297.2
255	43	3898.20	DLV	158	31.508	54.89	114.33	-0.2	0000	200.2	297.2
256	43	3949.98	ULV	73	31.005	45.61	114.34	-0.5	0000	199.2	297.2
257	44	3981.84	ULV	67	30.701	171.47	114.34	-0.9	0000	198.4	297.3
258	44	3984.08	ULV	67	30.680	206.88	114.34	-0.7	0000	198.4	297.3
259	44	3984.23	DLV	155	30.678	209.26	114.34	-0.7	0000	198.4	297.3
260	44	3992.75	ULV	77	30.598	349.60	114.35	0.3	0000	198.2	297.3
261	44	4015.47	DLV	156	30.383	24.86	114.35	0.1	0000	197.8	297.3
262	44	4015.99	ULV	75	30.378	33.65	114.35	0.0	0000	197.8	297.3

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
263	44	4057.89	ULV	74	29.983	304.90	114.36	-6.3	0000	196.9	297.3
264	45	4068.42	ULV	70	29.884	88.44	114.36	-5.3	0000	196.7	297.3
265	45	4070.72	ULV	68	29.863	119.70	114.36	-4.1	0000	196.7	297.3
266	45	4070.89	DLV	151	29.861	122.01	114.36	-4.1	0000	196.7	297.3
267	45	4079.60	ULV	69	29.780	241.16	114.36	-1.7	0000	196.5	297.3
268	45	4082.03	DLV	142	29.757	275.05	114.36	-1.6	0000	196.4	297.3
269	45	4082.52	ULV	72	29.752	281.90	114.36	-1.6	0000	196.4	297.3
270	45	4147.89	ULV	73	29.150	33.08	114.38	0.0	0000	195.1	297.3
271	46	4158.74	ULV	67	29.051	137.12	114.38	1.0	0000	194.9	297.3
272	46	4161.09	ULV	66	29.030	159.63	114.38	0.5	0000	194.9	297.3
273	46	4161.26	DLV	151	29.028	161.29	114.38	0.5	0000	194.8	297.3
274	46	4170.20	ULV	69	28.947	249.91	114.38	-3.3	0000	194.7	297.3
275	46	4172.70	DLV	149	28.925	277.25	114.38	-3.7	0000	194.6	297.3
276	46	4173.20	ULV	72	28.920	282.87	114.38	-3.8	0000	194.6	297.3
277	46	4240.23	ULV	73	28.317	40.04	114.40	-1.7	0000	193.5	297.3
278	47	4251.34	ULV	66	28.218	175.97	114.40	-2.5	0000	193.2	297.3
279	47	4253.75	ULV	66	28.197	204.58	114.40	-3.2	0000	193.1	297.3
280	47	4253.92	DLV	149	28.195	206.61	114.40	-3.3	0000	193.2	297.3
281	47	4263.09	ULV	73	28.114	312.88	114.40	-1.8	0000	193.0	297.3
282	47	4265.64	DLV	149	28.091	341.57	114.40	-0.6	0000	192.9	297.3
283	47	4266.17	ULV	73	28.087	347.45	114.40	-0.4	0000	192.9	297.3
284	47	4334.88	ULV	73	27.486	5.28	114.41	-1.2	0000	191.7	297.3
285	48	4336.96	DLV	148	27.469	27.06	114.41	-1.7	0000	191.6	297.3
286	48	4337.42	ULV	73	27.465	31.98	114.41	-1.8	0000	191.6	297.3
287	48	4348.76	ULV	68	27.368	156.25	114.42	0.7	0000	191.3	297.3
288	48	4348.91	DLV	151	27.366	157.98	114.42	0.8	0000	191.4	297.3
289	48	4358.30	ULV	68	27.286	261.38	114.42	-0.6	0000	191.2	297.3
290	48	4394.64	ULV	69	26.974	274.71	114.43	0.2	0000	190.5	297.2
291	48	4407.53	ULV	71	26.863	51.89	114.43	2.0	0000	190.3	297.2
292	50	4868.99	ULV	68	23.109	287.47	114.51	0.2	0000	182.4	297.0
293	50	4869.32	DLV	137	23.106	290.99	114.51	0.0	0000	182.4	297.0
294	50	4882.28	ULV	68	23.006	68.60	114.51	-0.6	0000	182.2	296.9
295	50	4885.44	DLV	144	22.982	100.10	114.51	-0.7	0000	182.1	296.9
296	50	4899.27	ULV	65	22.876	239.15	114.51	0.5	0000	181.9	296.9
297	50	4917.24	ULV	68	22.739	60.78	114.52	0.4	0000	181.7	296.9
298	50	4954.65	ULV	69	22.455	30.49	114.52	0.8	0000	181.1	296.8
299	51	5195.04	DLV	140	20.670	31.90	114.56	1.0	0000	177.6	296.5
300	51	5195.39	ULV	67	20.667	35.54	114.56	1.0	0000	177.6	296.5
301	51	5208.22	ULV	63	20.574	169.86	114.57	-0.9	0000	177.3	296.5
302	51	5212.01	DLV	137	20.547	208.59	114.57	-1.0	0000	177.2	296.5
303	51	5246.67	ULV	63	20.298	173.91	114.57	-0.3	0000	176.8	296.4
304	51	5295.50	ULV	64	19.950	265.25	114.58	-0.2	0000	176.2	296.3
305	51	5331.50	ULV	65	19.693	283.63	114.59	0.5	0000	175.7	296.3
306	54	5739.67	ULV	66	16.908	329.00	114.65	-0.1	0000	170.6	295.6
307	54	5739.87	DLV	121	16.907	330.85	114.65	-0.2	0000	170.6	295.6
308	54	5752.60	ULV	62	16.823	89.93	114.65	0.4	0000	170.4	295.5

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
309	54	5757.17	DLV	123	16.793	132.42	114.65	0.1	0000	170.3	295.5
310	54	5769.05	ULV	62	16.715	241.62	114.65	0.6	0000	170.2	295.5
311	54	5789.66	ULV	63	16.580	76.43	114.65	1.1	0000	170.0	295.4
312	54	5850.26	ULV	64	16.182	310.83	114.66	-0.9	0000	169.3	295.3
313	55	6077.82	ULV	63	14.731	287.98	114.70	-0.4	0000	166.8	294.8
314	55	6080.92	DLV	103	14.711	316.52	114.70	-0.5	0000	166.8	294.8
315	55	6093.01	ULV	62	14.635	72.99	114.70	-0.1	0000	166.8	294.7
316	55	6096.44	DLV	103	14.613	105.37	114.70	0.0	0000	166.7	294.7
317	55	6125.00	ULV	63	14.434	19.84	114.70	-0.8	0000	166.4	294.7
318	55	6142.93	ULV	59	14.322	198.49	114.71	1.0	0000	166.3	294.6
319	55	6159.47	ULV	62	14.220	357.90	114.71	-0.5	0000	166.1	294.6
320	56	6411.50	ULV	60	12.695	111.94	114.75	-0.2	0000	163.8	294.0
321	56	6415.09	DLV	96	12.674	145.56	114.75	-1.6	0000	163.8	294.0
322	56	6427.86	ULV	61	12.598	264.80	114.75	0.4	0000	163.7	293.9
323	56	6431.39	DLV	95	12.578	297.25	114.75	0.3	0000	163.7	293.9
324	56	6448.51	ULV	61	12.477	89.92	114.75	0.9	0000	163.6	293.9
325	56	6464.90	ULV	59	12.381	226.04	114.75	-2.3	0000	163.5	293.8
326	56	6511.12	ULV	59	12.111	218.11	114.76	1.5	0000	163.1	293.7
327	57	6750.22	DLV	102	10.729	40.05	114.79	-0.3	0000	161.2	293.2
328	57	6750.95	ULV	60	10.725	46.09	114.79	-0.4	0000	161.2	293.2
329	57	6767.14	ULV	58	10.633	183.68	114.79	-0.5	0000	161.1	293.1
330	57	6767.41	DLV	101	10.631	185.96	114.79	-0.5	0000	161.1	293.1
331	57	6780.87	ULV	61	10.555	293.84	114.80	-0.2	0000	161.0	293.1
332	57	6798.05	ULV	61	10.457	68.48	114.80	-1.1	0000	160.9	293.1
333	57	6816.34	ULV	58	10.354	201.78	114.80	-0.8	0000	160.7	293.0
334	58	7065.12	DLV	94	8.970	88.92	114.83	-2.4	0000	159.1	292.4
335	58	7078.99	ULV	58	8.894	189.94	114.83	0.0	0000	159.0	292.4
336	58	7082.90	DLV	94	8.873	218.35	114.84	0.2	0000	158.9	292.4
337	58	7096.87	ULV	60	8.797	317.98	114.84	0.4	0000	158.9	292.3
338	58	7101.62	ULV	60	8.770	352.55	114.84	0.4	0000	158.9	292.3
339	58	7118.61	ULV	58	8.677	124.95	114.84	-0.9	0000	158.7	292.3
340	58	7134.11	ULV	58	8.593	249.61	114.84	-1.0	0000	158.7	292.2
341	59	7392.59	DLV	86	7.206	5.03	114.87	1.9	0000	157.3	291.6
342	59	7393.35	ULV	58	7.202	10.62	114.87	2.0	0000	157.3	291.6
343	59	7407.07	ULV	57	7.129	109.27	114.88	2.3	0000	157.2	291.6
344	59	7411.10	DLV	88	7.108	137.74	114.88	1.9	0000	157.1	291.5
345	59	7425.62	ULV	57	7.031	241.16	114.88	0.2	0000	157.0	291.5
346	59	7448.00	ULV	58	6.914	50.81	114.88	0.5	0000	157.0	291.5
347	59	7501.38	ULV	58	6.635	63.91	114.89	0.5	0000	156.8	291.3
348	60	7727.68	ULV	57	5.468	328.55	114.92	0.1	0000	155.7	290.8
349	60	7731.85	DLV	77	5.447	357.78	114.92	-0.3	0000	155.7	290.8
350	60	7732.70	ULV	57	5.442	3.72	114.92	-0.4	0000	155.7	290.8
351	60	7746.84	ULV	57	5.371	100.45	114.92	-0.2	0000	155.7	290.7
352	60	7751.00	DLV	82	5.349	128.32	114.92	-1.1	0000	155.7	290.7
353	60	7767.11	ULV	56	5.267	234.28	114.92	-0.2	0000	155.5	290.7
354	60	7789.75	ULV	57	5.153	28.52	114.92	-0.3	0000	155.5	290.6

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
355	63	8222.76	DLV	63	3.025	147.74	114.97	-2.1	0000	154.2	289.5
356	63	8222.77	ULV	57	3.025	147.83	114.97	-2.1	0000	154.2	289.5
359	65	8271.38	DLV	71	2.790	91.93	114.98	-0.2	0000	154.1	289.4
360	65	8271.38	ULV	54	2.790	91.97	114.98	-0.2	0000	154.2	289.4
361	66	8280.57	DLV	71	2.746	150.09	114.98	0.0	0000	154.2	289.3
362	66	8280.58	ULV	53	2.746	150.15	114.98	0.0	0000	154.1	289.3
365	68	8329.69	DLV	58	2.511	110.06	114.99	0.5	0000	154.1	289.2
366	68	8329.70	ULV	53	2.511	110.13	114.99	0.5	0000	154.1	289.2
369	70	8378.19	DLV	58	2.281	83.81	114.99	-0.3	0000	153.9	289.2
370	70	8378.20	ULV	53	2.281	83.88	114.99	-0.3	0000	153.9	289.2
371	71	8417.38	DLV	67	2.096	315.32	115.00	0.2	0000	153.9	289.1
372	71	8417.39	ULV	59	2.096	315.40	115.00	0.2	0000	153.9	289.1
373	72	8426.54	DLV	67	2.053	18.76	115.00	-0.6	0000	153.9	289.1
374	72	8426.54	ULV	55	2.053	18.81	115.00	-0.6	0000	153.9	289.1
379	75	8516.38	DLV	68	1.630	278.51	115.01	-2.2	0000	153.7	288.8
380	75	8516.39	ULV	57	1.630	278.60	115.01	-2.2	0000	153.7	288.8
381	76	8525.33	DLV	65	1.589	344.72	115.01	-2.1	0000	153.7	288.8
382	76	8525.34	ULV	54	1.589	344.80	115.01	-2.1	0000	153.7	288.8
385	78	8574.64	DLV	63	1.361	313.59	115.01	-0.9	0000	153.6	288.8
386	78	8574.64	ULV	53	1.361	313.63	115.01	-0.9	0000	153.7	288.8
389	80	8623.32	DLV	65	1.131	294.19	115.02	-1.0	0000	153.6	288.7
390	80	8623.34	ULV	53	1.131	294.29	115.02	-1.0	0000	153.7	288.7
393	82	8673.15	DLV	61	0.899	255.01	115.02	0.3	0000	153.5	288.5
394	82	8673.16	ULV	53	0.899	255.07	115.02	0.3	0000	153.5	288.5
395	83	8712.03	DLV	63	0.720	143.06	115.03	-0.3	0000	153.5	288.3
396	83	8712.04	ULV	57	0.720	143.14	115.03	-0.3	0000	153.5	288.3
397	84	8721.30	DLV	61	0.677	204.27	115.03	-0.6	0000	153.5	288.3
398	84	8721.31	ULV	52	0.677	204.33	115.03	-0.6	0000	153.5	288.3
401	86	8771.69	DLV	116	0.445	176.01	115.03	0.8	0001	153.4	288.3
402	86	8771.70	ULV	52	0.445	176.09	115.03	0.8	0001	153.4	288.3
403	91	8824.75	DLV	114	0.205	163.64	115.04	-1.3	0001	153.4	288.2
404	91	8824.75	ULV	52	0.205	163.68	115.04	-1.3	0001	153.4	288.2
411	95	8843.33	DLV	104	0.120	278.74	115.04	0.6	0001	153.4	288.2
412	95	8843.35	ULV	52	0.120	278.83	115.04	0.6	0001	153.4	288.2
413	96	8845.05	DLV	105	0.112	289.73	115.04	0.6	0001	153.4	288.2
414	96	8845.06	ULV	53	0.112	289.83	115.04	0.6	0001	153.4	288.2
417	98	8848.47	DLV	104	0.097	311.59	115.04	0.5	0001	153.4	288.2
418	98	8848.47	ULV	53	0.097	311.63	115.04	0.5	0001	153.4	288.2
419	99	8850.18	DLV	104	0.089	322.40	115.04	0.4	0001	153.5	288.1
420	99	8850.19	ULV	53	0.089	322.48	115.04	0.4	0001	153.5	288.1
423	101	8853.60	DLV	104	0.073	344.00	115.04	0.3	0001	153.4	288.1
424	101	8853.61	ULV	53	0.073	344.08	115.04	0.3	0001	153.4	288.1
427	103	8857.02	DLV	104	0.058	5.35	115.04	0.2	0001	153.4	288.1
428	103	8857.03	ULV	53	0.058	5.39	115.04	0.2	0001	153.4	288.1
431	105	8860.45	DLV	103	0.042	25.87	115.04	0.1	0001	153.5	288.1
432	105	8860.46	ULV	53	0.042	25.93	115.04	0.1	0001	153.5	288.1

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
435	107	8863.88	DLV	104	0.025	48.04	115.04	0.1	0001	153.4	288.1
436	107	8863.88	ULV	52	0.025	48.08	115.04	0.1	0001	153.4	288.1
439	109	8867.30	DLV	104	0.009	68.20	115.04	0.0	0001	153.4	288.1
440	109	8867.31	ULV	53	0.009	68.24	115.04	0.0	0001	153.4	288.1
441	110	8869.01	DLV	108	0.004	72.52	115.04	-0.2	0001	153.4	288.1
442	110	8869.02	ULV	52	0.004	72.57	115.04	-0.2	0001	153.4	288.1
445	112	8872.44	DLV	140	0	74.75	115.05	-1.4	0001	153.4	288.1
446	112	8872.45	ULV	52	0	74.75	115.05	-1.4	0001	153.4	288.1
447	113	8873.58	DLV	150	0	73.28	115.05	-1.4	0001	153.4	288.1
448	113	8873.59	ULV	52	0	73.26	115.05	-1.4	0001	153.4	288.1
449	114	8876.24	DLV	144	0	69.82	115.05	-1.4	0001	153.4	288.1
450	114	8876.26	ULV	52	0	69.81	115.05	-1.4	0001	153.4	288.1
453	116	8879.24	DLV	144	0	65.93	115.05	-1.4	0001	153.4	288.1
454	116	8879.25	ULV	52	0	65.92	115.05	-1.4	0001	153.4	288.1
456	117	8880.39	ULV	52	0	64.95	115.05	-1.4	0001	153.4	288.1
459	119	8883.38	DLV	143	0	64.95	115.05	-1.4	0001	153.5	288.1
460	119	8883.39	ULV	51	0	64.95	115.05	-1.4	0001	153.4	288.1
465	122	8888.37	DLV	146	0	64.95	115.05	-1.4	0001	153.4	288.0
466	122	8888.39	ULV	52	0	64.95	115.05	-1.4	0001	153.5	288.0
470	124	8891.28	ULV	52	0	64.95	115.05	-1.4	0001	153.4	288.0
471	125	8893.13	DLV	144	0	64.95	115.05	-1.4	0001	153.4	288.0
472	125	8893.14	ULV	52	0	64.95	115.05	-1.4	0001	153.4	288.0
475	127	8895.40	DLV	143	0	64.95	115.05	-1.4	0001	153.5	288.0
476	127	8895.41	ULV	51	0	64.95	115.05	-1.4	0001	153.5	288.0
481	130	8900.63	DLV	141	0	64.95	115.05	-1.4	0001	153.4	288.0
482	130	8900.64	ULV	51	0	64.95	115.05	-1.4	0001	153.5	288.0
493	136	8909.75	DLV	142	0	64.95	115.05	-1.4	0001	153.5	288.0
494	136	8909.76	ULV	52	0	64.95	115.05	-1.4	0001	153.5	288.0
499	139	8914.63	DLV	141	0	64.95	115.05	-1.4	0001	153.6	287.9
500	139	8914.64	ULV	52	0	64.95	115.05	-1.4	0001	153.6	287.9
501	140	8915.76	DLV	143	0	64.95	115.05	-1.4	0001	153.5	287.9
502	140	8915.77	ULV	52	0	64.95	115.05	-1.4	0001	153.5	287.9
503	141	8918.02	DLV	143	0	64.95	115.05	-1.4	0001	153.5	287.9
504	141	8918.03	ULV	52	0	64.95	115.05	-1.4	0001	153.6	287.9
505	142	8923.64	DLV	151	0	64.95	115.05	-1.4	0001	153.6	287.9
506	142	8923.65	ULV	52	0	64.95	115.05	-1.4	0001	153.6	287.9
507	143	8931.63	DLV	151	0	64.95	115.05	-1.4	0001	153.7	287.8
508	143	8931.64	ULV	52	0	64.95	115.05	-1.4	0001	153.7	287.8
509	144	8941.57	DLV	151	0	64.95	115.05	-1.4	0001	153.7	287.8
510	144	8941.59	ULV	52	0	64.95	115.05	-1.4	0001	153.7	287.8
511	145	8949.83	DLV	151	0	64.95	115.05	-1.4	0001	153.8	287.7
512	145	8949.84	ULV	52	0	64.95	115.05	-1.4	0001	153.8	287.7
513	146	8958.77	DLV	140	0	64.94	115.06	-1.4	0001	153.9	287.7
514	146	8958.77	ULV	52	0	64.94	115.06	-1.4	0001	153.9	287.7
515	147	8967.01	DLV	151	0	64.94	115.06	-1.4	0001	154.0	287.7
516	147	8967.02	ULV	52	0	64.94	115.06	-1.4	0001	154.1	287.7

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
517	148	8975.43	DLV	151	0	64.94	115.06	-1.4	0001	154.2	287.6
518	148	8975.44	ULV	52	0	64.94	115.06	-1.4	0001	154.2	287.6
519	149	8983.71	DLV	151	0	64.94	115.06	-1.4	0001	154.2	287.6
520	149	8983.72	ULV	52	0	64.94	115.06	-1.4	0001	154.2	287.6
521	150	8991.99	DLV	150	0	64.94	115.06	-1.4	0001	154.3	287.6
522	150	8992.00	ULV	51	0	64.94	115.06	-1.4	0001	154.3	287.6
523	151	9000.28	DLV	150	0	64.94	115.06	-1.4	0001	154.5	287.5
524	151	9000.28	ULV	51	0	64.94	115.06	-1.4	0001	154.5	287.5
525	152	9030.13	ULV	53	0	64.94	115.06	-1.4	0001	154.9	287.4
526	152	9030.43	DLV	135	0	64.94	115.06	-1.4	0001	154.9	287.4
527	152	9050.89	DLV	135	0	64.93	115.07	-1.4	0001	155.3	287.4
528	152	9051.72	ULV	52	0	64.93	115.07	-1.4	0001	155.3	287.4
529	152	9066.83	ULV	52	0	64.93	115.07	-1.4	0001	155.6	287.4
530	152	9087.29	ULV	51	0	64.93	115.07	-1.4	0001	155.9	287.3
531	152	9129.40	ULV	53	0	64.92	115.08	-1.4	0001	156.7	287.3
532	153	9373.66	ULV	52	0	64.90	115.10	-1.4	0001	161.1	287.1
533	153	9378.19	DLV	147	0	64.90	115.10	-1.4	0001	161.2	287.1
534	153	9394.11	ULV	53	0	64.90	115.10	-1.4	0001	161.5	287.1
535	153	9398.61	DLV	147	0	64.90	115.10	-1.4	0001	161.5	287.1
536	153	9419.91	ULV	53	0	64.89	115.11	-1.4	0001	162.0	287.1
537	153	9439.22	ULV	52	0	64.89	115.11	-1.4	0001	162.3	287.0
538	153	9456.67	ULV	52	0	64.89	115.11	-1.4	0001	162.6	287.0
539	154	9700.93	ULV	53	0	64.86	115.14	-1.4	0001	166.6	286.7
540	154	9705.45	DLV	138	0	64.86	115.14	-1.4	0001	166.6	286.7
541	154	9721.39	ULV	53	0	64.86	115.14	-1.4	0001	166.9	286.7
542	154	9725.59	ULV	52	0	64.86	115.14	-1.4	0001	166.9	286.7
543	154	9725.89	DLV	149	0	64.86	115.14	-1.4	0001	166.9	286.7
544	154	9783.93	ULV	52	0	64.86	115.14	-1.4	0001	167.8	286.7
545	154	9788.09	ULV	52	0	64.85	115.15	-1.4	0001	167.9	286.6
546	155	10011.9	ULV	52	0	64.83	115.17	-1.4	0001	170.8	286.4
547	155	10012.3	DLV	147	0	64.83	115.17	-1.4	0001	170.9	286.4
548	155	10029.4	ULV	53	0	64.83	115.17	-1.4	0001	171.1	286.4
549	155	10032.7	DLV	149	0	64.83	115.17	-1.4	0001	171.1	286.4
550	155	10048.6	ULV	52	0	64.83	115.17	-1.4	0001	171.3	286.4
551	155	10069.1	ULV	53	0	64.83	115.17	-1.4	0001	171.6	286.3
552	155	10074.5	ULV	52	0	64.82	115.18	-1.4	0001	171.6	286.3
553	156	10314.6	ULV	52	0	64.80	115.20	-1.4	0001	174.3	285.9
554	156	10319.1	DLV	138	0	64.80	115.20	-1.4	0001	174.3	285.9
555	156	10335.0	ULV	53	0	64.80	115.20	-1.4	0001	174.5	285.9
556	156	10339.5	DLV	151	0	64.80	115.20	-1.4	0001	174.5	285.9
557	156	10360.8	ULV	52	0	64.80	115.20	-1.4	0001	174.8	285.9
558	156	10397.6	ULV	53	0	64.79	115.21	-1.4	0001	175.2	285.9
559	156	10421.0	ULV	52	0	64.79	115.21	-1.4	0001	175.5	285.8
560	157	10621.4	ULV	52	0	64.77	115.23	-1.4	0001	177.1	285.7
561	157	10625.9	DLV	150	0	64.77	115.23	-1.4	0001	177.2	285.7
562	157	10643.0	ULV	52	0	64.77	115.23	-1.4	0001	177.3	285.7

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
563	157	10646.3	DLV	150	0	64.77	115.23	-1.4	0001	177.4	285.7
564	157	10667.1	ULV	52	0	64.76	115.24	-1.4	0001	177.5	285.7
565	157	10688.1	ULV	53	0	64.76	115.24	-1.4	0001	177.7	285.7
566	157	10723.6	ULV	53	0	64.76	115.24	-1.4	0001	178.0	285.7
567	158	10907.7	ULV	53	0	64.74	115.26	-1.4	0001	179.3	285.6
568	158	10912.3	DLV	148	0	64.74	115.26	-1.4	0001	179.4	285.6
569	158	10928.2	ULV	53	0	64.74	115.26	-1.4	0001	179.4	285.6
570	158	10932.7	DLV	150	0	64.74	115.26	-1.4	0001	179.5	285.6
571	158	10952.9	ULV	53	0	64.73	115.27	-1.4	0001	179.5	285.6
572	158	10970.3	ULV	53	0	64.73	115.27	-1.4	0001	179.7	285.6
573	158	10974.5	ULV	52	0	64.73	115.27	-1.4	0001	179.8	285.6
574	159	11194.1	ULV	53	0	64.71	115.29	-1.4	0001	181.3	285.6
575	159	11198.6	DLV	151	0	64.71	115.29	-1.4	0001	181.3	285.6
576	159	11215.8	ULV	52	0	64.71	115.29	-1.4	0001	181.5	285.6
577	159	11219.1	DLV	149	0	64.71	115.29	-1.4	0001	181.5	285.6
578	159	11239.8	ULV	52	0	64.70	115.30	-1.4	0001	181.6	285.6
579	159	11296.4	ULV	53	0	64.70	115.30	-1.4	0001	181.9	285.5
580	159	11301.7	ULV	52	0	64.70	115.30	-1.4	0001	182.0	285.5
581	160	11464.6	DLV	149	0	64.68	115.32	-1.4	0001	182.8	285.3
582	160	11480.5	ULV	53	0	64.68	115.32	-1.4	0001	183.0	285.3
583	160	11485.0	DLV	150	0	64.68	115.32	-1.4	0001	183.0	285.3
584	160	11500.9	ULV	53	0	64.68	115.32	-1.4	0001	183.1	285.3
585	160	11506.3	ULV	53	0	64.68	115.32	-1.4	0001	183.1	285.3
586	160	11543.0	ULV	53	0	64.67	115.33	-1.4	0001	183.3	285.3
587	160	11566.5	ULV	53	0	64.67	115.33	-1.4	0001	183.5	285.3
588	161	11746.4	ULV	52	0	64.65	115.35	-1.4	0001	184.4	285.1
589	161	11750.9	DLV	150	0	64.65	115.35	-1.4	0001	184.4	285.1
590	161	11771.0	ULV	53	0	64.65	115.35	-1.4	0001	184.5	285.1
591	161	11771.3	DLV	150	0	64.65	115.35	-1.4	0001	184.5	285.1
592	161	11788.5	ULV	52	0	64.65	115.35	-1.4	0001	184.6	285.1
593	161	11792.6	ULV	52	0	64.65	115.35	-1.4	0001	184.6	285.1
594	161	11807.7	ULV	53	0	64.64	115.36	-1.4	0001	184.6	285.1
602	163	12319.1	ULV	52	0	64.59	115.41	-1.4	0001	186.8	284.9
603	163	12323.6	DLV	150	0	64.59	115.41	-1.4	0001	186.8	284.9
604	163	12339.6	ULV	53	0	64.59	115.41	-1.4	0001	186.8	284.9
605	163	12344.1	DLV	150	0	64.59	115.41	-1.4	0001	186.9	284.9
606	163	12361.2	ULV	53	0	64.59	115.41	-1.4	0001	187.0	284.9
607	163	12365.4	ULV	52	0	64.59	115.41	-1.4	0001	187.0	284.9
608	163	12384.7	ULV	52	0	64.58	115.42	-1.4	0001	187.0	284.9
609	164	12589.6	DLV	140	0	64.56	115.44	-1.4	0001	187.6	284.9
610	164	12589.7	ULV	52	0	64.56	115.44	-1.4	0001	187.6	284.9
611	164	12605.5	ULV	52	0	64.56	115.44	-1.4	0001	187.7	284.9
612	164	12610.0	DLV	150	0	64.56	115.44	-1.4	0001	187.7	284.9
613	164	12625.9	ULV	53	0	64.56	115.44	-1.4	0001	187.8	284.9
614	164	12647.6	ULV	52	0	64.56	115.44	-1.4	0001	187.8	284.9
615	164	12651.7	ULV	52	0	64.56	115.44	-1.4	0001	187.8	284.9

Seq #	Cyc. #	M_Time (seconds)	Type	DN	Alt_2011 (km)	Az_2007 ºR of ☼	Sun AZ ºE of N	E-W Tilt (deg)	Lamps	Tv (ºK)	Tea (ºK)
616	165	12875.6	ULV	52	0	64.53	115.47	-1.4	0001	188.5	284.8
617	165	12875.9	DLV	151	0	64.53	115.47	-1.4	0001	188.6	284.8
618	165	12893.0	ULV	53	0	64.53	115.47	-1.4	0001	188.6	284.8
619	165	12896.3	DLV	149	0	64.53	115.47	-1.4	0001	188.6	284.8
620	165	12912.3	ULV	52	0	64.53	115.47	-1.4	0001	188.7	284.8
621	165	12932.7	ULV	53	0	64.53	115.47	-1.4	0001	188.7	284.8
622	165	12938.1	ULV	52	0	64.53	115.47	-1.4	0001	188.7	284.8

Appendix 17 - DLV details including dark bias offset.

Seq # = The sequence number of the violet (as encoded in the archive filename)
Cyc# = The Descent cycle in which the data was taken,
Cycle Type = The name of the corresponding descent cycle.
Time = The number of seconds after T0 when the measurement was made.
DN = The data number between 0 and 4095 corresponding to the violet signal strength.
Bias = The detector reading when no signal is present (dark), chosen by cycle and trend.
Lamps = The state of the DISR calibration and surface lamps, CCCS. 0 is off, 1 is on.

Seq #	Cyc. #	Cycle Type	Time (sec.)	DN	Bias	Lamps
1	1	Image	144.253	379	31	0000
2	1	Image	148.801	393	43	0000
8	2	Image	283.076	376	43	0000
10	2	Image	291.688	342	31	0000
15	3	NoImage	436.291	334	31	0000
18	3	NoImage	448.791	355	43	0000
22	4	NoImage	523.254	349	43	0000
25	4	NoImage	541.946	334	43	0000
29	5	Cal_A	719.521	2561	43	1110
31	6	Cal_B	784.991	338	55	0000
33	7	Cal_C	824.782	2500	43	1110
36	8	Image	836.780	314	43	0000
38	8	Image	850.234	305	43	0000
42	9	NoImage	960.835	277	31	0000
44	9	NoImage	969.167	324	55	0000
49	10	NoImage	1051.52	258	31	0000
51	10	NoImage	1056.76	278	43	0000
57	11	NoImage	1139.34	289	55	0000
59	11	NoImage	1143.32	260	42	0000
63	12	NoImage	1229.80	233	32	0000
64	12	NoImage	1232.87	284	55	0000
70	13	NoImage	1320.57	273	55	0000
73	13	NoImage	1326.62	249	43	0000
77	14	Image	1410.22	255	43	0000
78	14	Image	1413.78	214	31	0000
84	15	NoImage	1531.69	239	43	0000
85	15	NoImage	1536.08	212	43	0000
93	16	NoImage	1623.13	217	43	0000
95	16	NoImage	1627.29	213	43	0000
99	17	NoImage	1711.72	192	31	0000
101	17	NoImage	1716.39	212	31	0000
105	18	NoImage	1806.32	198	31	0000
107	18	NoImage	1811.49	217	43	0000
112	19	Cal_A	1898.87	2361	43	1110
114	20	Cal_B	1957.20	211	43	0000
116	21	Cal_C	1981.20	2350	43	1110
119	22	NoImage	2006.31	192	31	0000

Seq #	Cyc. #	Cycle Type	Time (sec.)	DN	Bias	Lamps
302	51	HNS	5212.01	137	43	0000
307	54	HNS	5739.87	121	43	0000
309	54	HNS	5757.17	123	43	0000
314	55	HNS	6080.92	103	31	0000
316	55	HNS	6096.44	103	31	0000
321	56	HNS	6415.09	96	31	0000
323	56	HNS	6431.39	95	31	0000
327	57	HNS	6750.22	102	43	0000
330	57	HNS	6767.41	101	43	0000
334	58	HNS	7065.12	94	43	0000
336	58	HNS	7082.90	94	43	0000
341	59	HNS	7392.59	86	43	0000
344	59	HNS	7411.10	88	43	0000
349	60	HNS	7731.85	77	43	0000
352	60	HNS	7751.00	82	43	0000
355	63	MNS	8222.76	63	37	0000
359	65	MNS	8271.38	71	49	0000
361	66	MNS	8280.57	71	49	0000
365	68	MNS	8329.69	58	37	0000
369	70	MNS	8378.19	58	37	0000
371	71	MNS	8417.38	67	49	0000
373	72	MNS	8426.54	67	49	0000
379	75	MNS	8516.38	68	49	0000
381	76	MNS	8525.33	65	49	0000
385	78	MNS	8574.64	63	49	0000
389	80	MNS	8623.32	65	49	0000
393	82	MNS	8673.15	61	49	0000
395	83	MNS	8712.03	63	49	0000
397	84	MNS	8721.30	61	49	0000
401	86	MNS	8771.69	116	49	0001
403	91	VLNS	8824.75	114	38	0001
411	95	VLNS	8843.33	104	38	0001
413	96	VLNS	8845.05	105	38	0001
417	98	VLNS	8848.47	104	38	0001
419	99	VLNS	8850.18	104	38	0001
423	101	VLNS	8853.60	104	38	0001
427	103	VLNS	8857.02	104	38	0001

Seq #	Cyc. #	Cycle Type	Time (sec.)	DN	Bias	Lamps	Seq #	Cyc. #	Cycle Type	Time (sec.)	DN	Bias	Lamps
121	22	NoImage	2013.40	204	43	0000	431	105	VLNS	8860.45	103	38	0001
125	23	Image	2095.42	187	31	0000	435	107	VLNS	8863.88	104	38	0001
126	23	Image	2101.81	205	43	0000	439	109	VLNS	8867.30	104	38	0001
133	24	NoImage	2230.70	196	43	0000	441	110	VLNS	8869.01	108	38	0001
134	24	NoImage	2237.67	197	43	0000	445	112	VLNS	8872.44	140	38	0001
139	25	NoImage	2318.59	185	31	0000	447	113	VLNS	8873.58	150	38	0001
142	25	NoImage	2326.48	194	43	0000	449	114	VLNS	8876.24	144	38	0001
146	26	Flat	2409.89	181	31	0000	453	116	VLNS	8879.24	144	38	0001
150	26	Flat	2418.46	194	43	0000	459	119	VLNS	8883.38	143	38	0001
153	27	Cal_A	2511.12	2318	43	1110	465	122	VLNS	8888.37	146	38	0001
155	28	Cal_B	2563.74	189	43	0000	471	125	VLNS	8893.13	144	38	0001
157	29	Cal_C	2580.93	2317	43	1110	475	127	VLNS	8895.40	143	38	0001
160	30	NoImage	2621.77	185	43	0000	481	130	VLNS	8900.63	141	38	0001
164	30	NoImage	2630.34	189	43	0000	493	136	VLNS	8909.75	142	38	0001
168	31	NoImage	2707.89	183	43	0000	499	139	VLNS	8914.63	141	38	0001
170	31	NoImage	2716.97	171	31	0000	501	140	VLNS	8915.76	143	38	0001
173	32	NoImage	2794.26	172	31	0000	503	141	Surf_A	8918.02	143	38	0001
177	32	NoImage	2802.83	183	43	0000	505	142	Surf_B	8923.64	151	43	0001
181	33	NoImage	2885.27	180	43	0000	507	143	Surf_B	8931.63	151	43	0001
183	33	NoImage	2896.42	167	31	0000	509	144	Surf_B	8941.57	151	43	0001
187	34	Image	2973.26	183	43	0000	511	145	Surf_B	8949.83	151	43	0001
189	34	Image	2982.05	178	43	0000	513	146	Surf_B	8958.77	140	31	0001
195	35	NoImage	3115.36	162	31	0000	515	147	Surf_B	8967.01	151	43	0001
197	35	NoImage	3123.54	162	31	0000	517	148	Surf_B	8975.43	151	43	0001
202	36	NoImage	3207.00	170	43	0000	519	149	Surf_B	8983.71	151	43	0001
204	36	NoImage	3215.46	160	31	0000	521	150	Surf_B	8991.99	150	43	0001
209	37	NoImage	3301.78	169	43	0000	523	151	Surf_C	9000.28	150	43	0001
213	37	NoImage	3310.55	169	43	0000	526	152	HNS	9030.43	135	31	0001
217	38	NoImage	3390.49	167	43	0000	527	152	HNS	9050.89	135	31	0001
219	38	NoImage	3399.54	155	31	0000	533	153	HNS	9378.19	147	43	0001
224	39	NoImage	3482.29	164	43	0000	535	153	HNS	9398.61	147	43	0001
226	39	NoImage	3508.66	155	32	0000	540	154	HNS	9705.45	138	31	0001
230	40	NoImage	3569.85	153	31	0000	543	154	HNS	9725.89	149	43	0001
234	40	NoImage	3579.44	163	43	0000	547	155	HNS	10012.3	147	43	0001
236	41	Image	3653.41	162	43	0000	549	155	HNS	10032.7	149	43	0001
238	41	Image	3663.24	166	43	0000	554	156	HNS	10319.1	138	31	0001
244	42	NoImage	3803.94	149	31	0000	556	156	HNS	10339.5	151	43	0001
247	42	NoImage	3814.27	161	43	0000	561	157	HNS	10625.9	150	43	0001
251	43	NoImage	3887.63	145	31	0000	563	157	HNS	10646.3	150	43	0001
255	43	NoImage	3898.20	158	43	0000	568	158	HNS	10912.3	148	43	0001
259	44	NoImage	3984.23	155	43	0000	570	158	HNS	10932.7	150	43	0001
261	44	NoImage	4015.47	156	43	0000	575	159	HNS	11198.6	151	43	0001
266	45	NoImage	4070.89	151	43	0000	577	159	HNS	11219.1	149	43	0001
268	45	NoImage	4082.03	142	31	0000	581	160	HNS	11464.6	149	43	0001
273	46	NoImage	4161.26	151	43	0000	583	160	HNS	11485.0	150	43	0001
275	46	NoImage	4172.70	149	43	0000	589	161	HNS	11750.9	150	43	0001

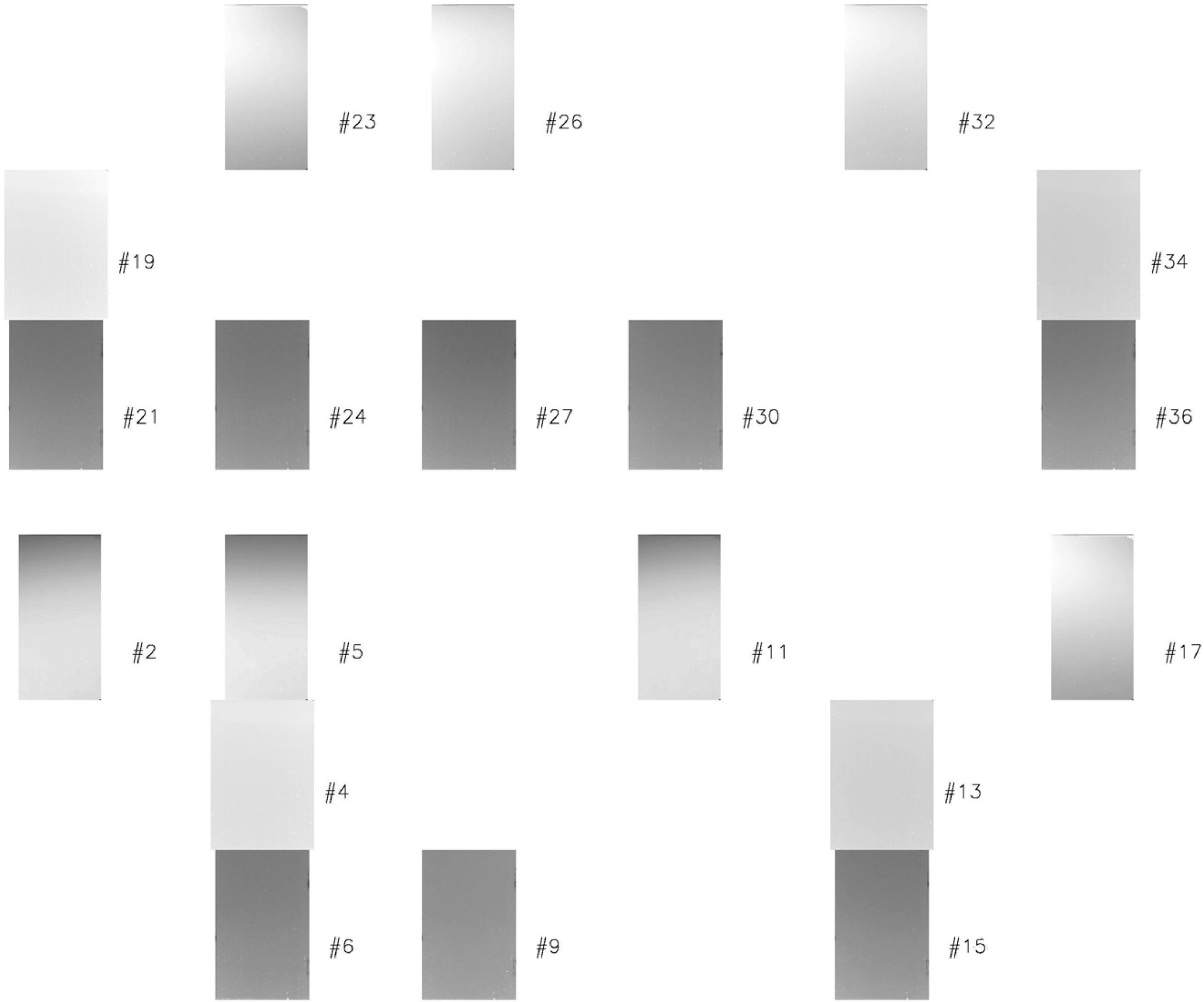
Seq #	Cyc. #	Cycle Type	Time (sec.)	DN	Bias	Lamps
280	47	NoImage	4253.92	149	43	0000
282	47	NoImage	4265.64	149	43	0000
285	48	Image	4336.96	148	43	0000
288	48	Image	4348.91	151	43	0000
293	50	HNS	4869.32	137	43	0000
295	50	HNS	4885.44	144	43	0000
299	51	HNS	5195.04	140	43	0000

Seq #	Cyc. #	Cycle Type	Time (sec.)	DN	Bias	Lamps
591	161	HNS	11771.3	150	43	0001
603	163	HNS	12323.6	150	43	0001
605	163	HNS	12344.1	150	43	0001
609	164	HNS	12589.6	140	31	0001
612	164	HNS	12610.0	150	43	0001
617	164	HNS	12875.9	151	43	0001
619	164	HNS	12896.3	149	43	0001

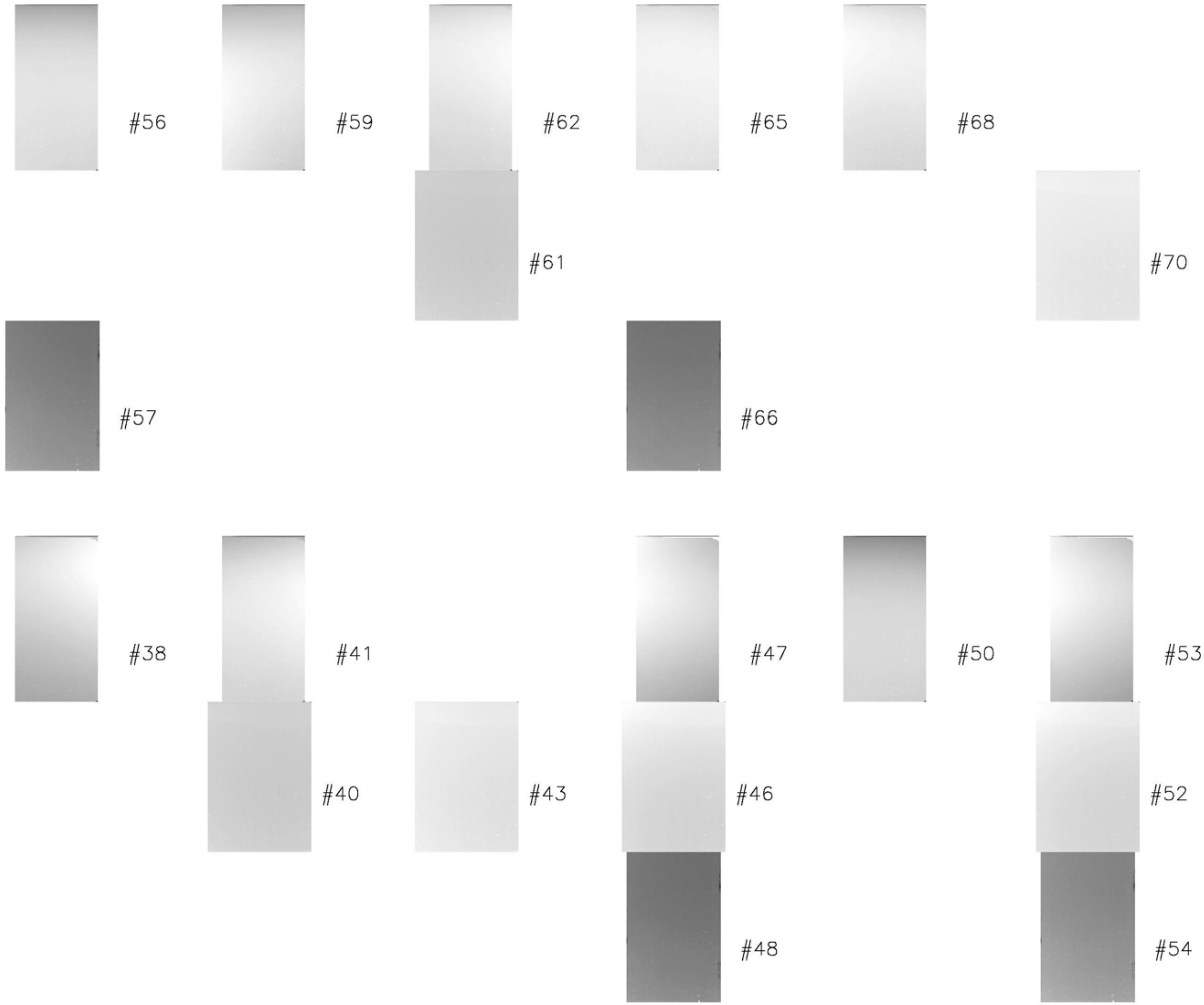
Appendix 18 - Huygens DISR Image Thumbnails

This file presents thumbnails of images from the Titan Descent, printed 12 triplets (36 images total) per page in two rows starting in the lower left corner of the page, and progressing chronologically to the upper right. The High Resolution Images (HRI) are situated at the bottom of the triplet, the Medium Resolution Images (MRI) in the middle, and the Side Looking Images (SLI) at the top, the same relative position as when they were taken. The images are projected as the camera (DISR) would have seen them (i.e. the left side of the image is left looking out from the probe).

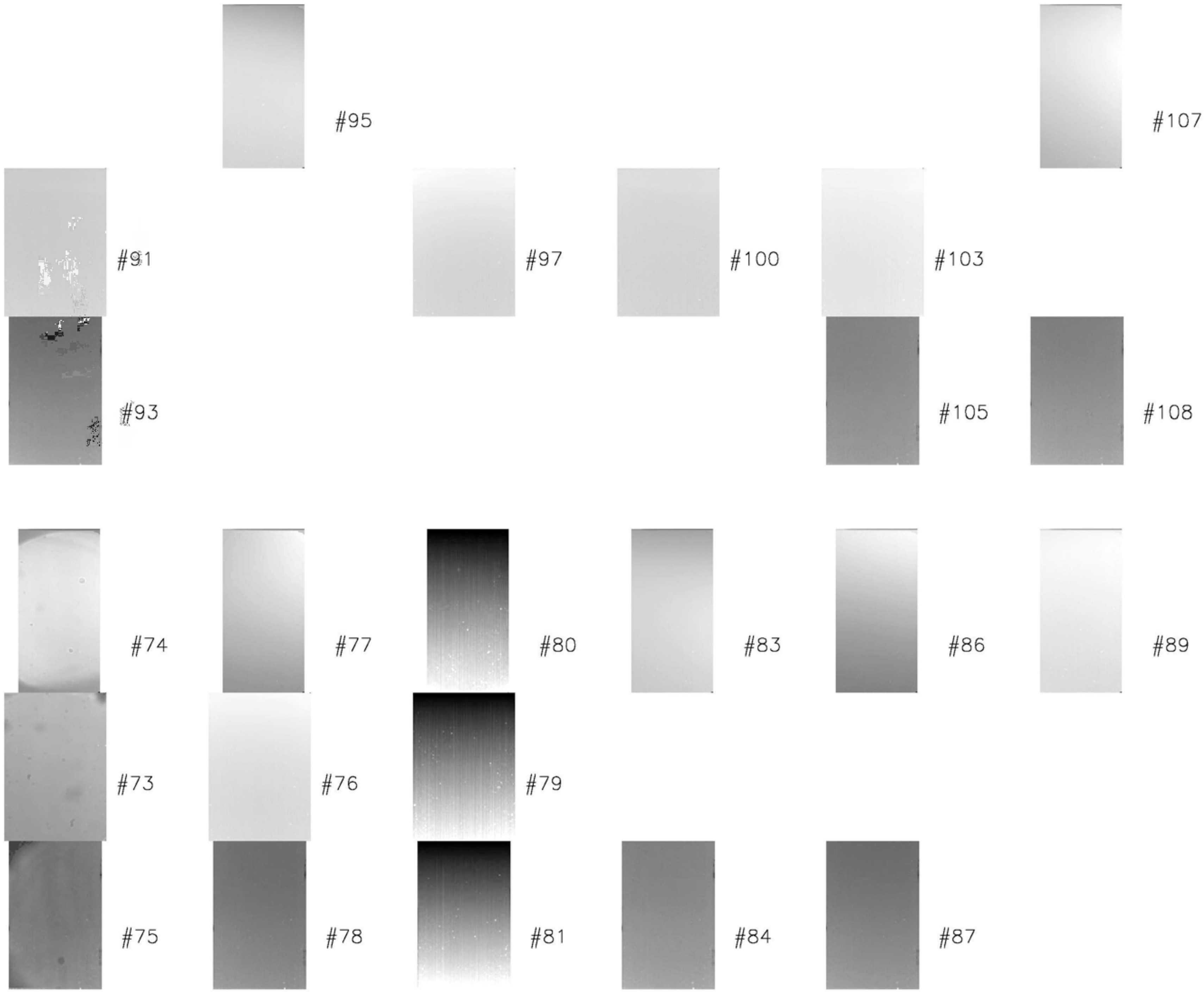
The images are photometrically scaled from the minimum being the lowest pixel DN value to the maximum being twice the average of the DN of all the pixels (i.e. from minimum(p) to 2 x average(p)) in 8 bits (0 to 255 DN). They are take from the PC converted image set (i.e. Data Base 2, or DB2). The number to the right of each image corresponds to its sequence number. Gaps exist where images were lost.



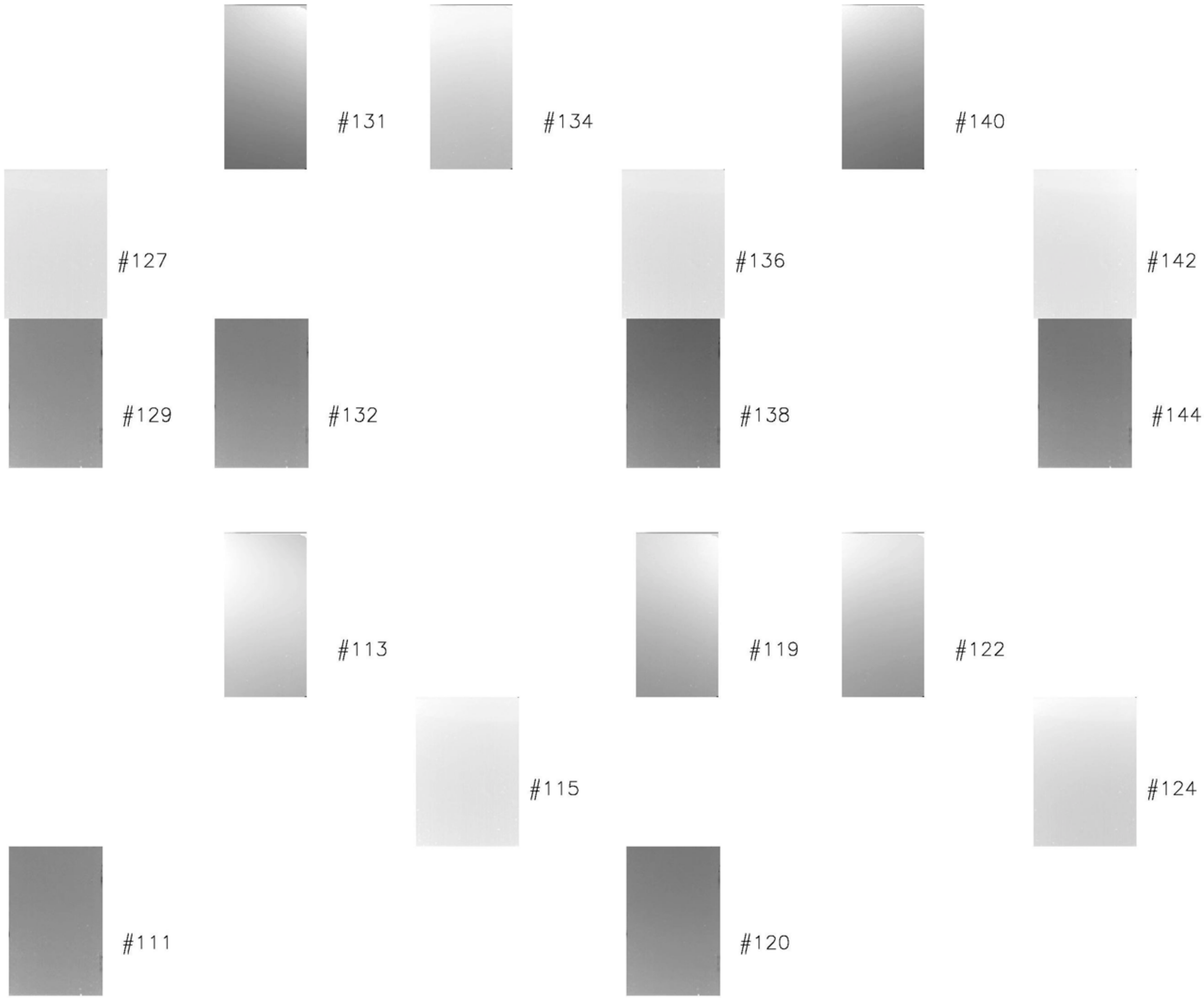
Images from C:\df3\14Jan05\Log\stream_524b\: 1 thru 36



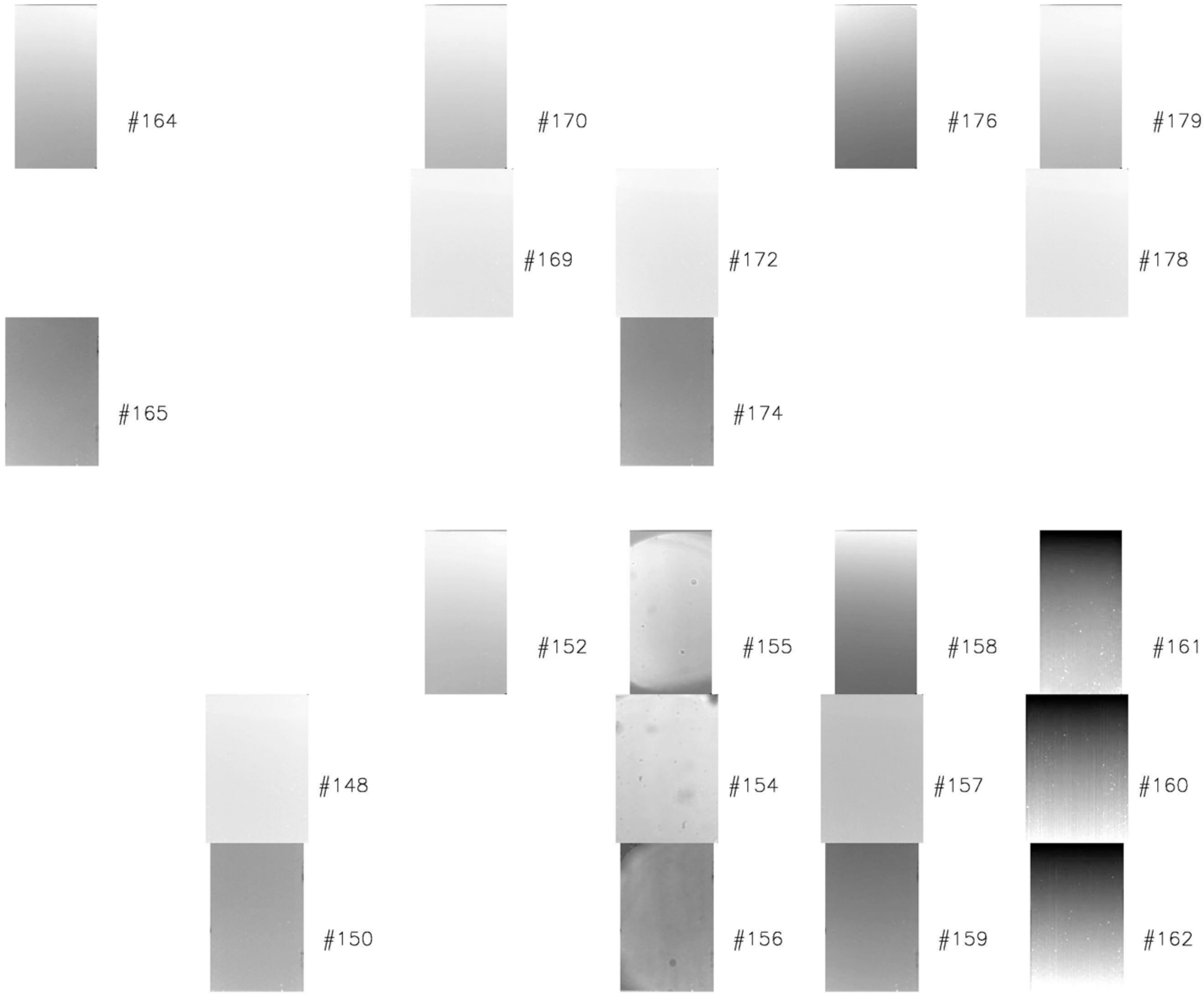
Images from C:\df3\14Jan05\Log\stream_524b\: 37 thru 72



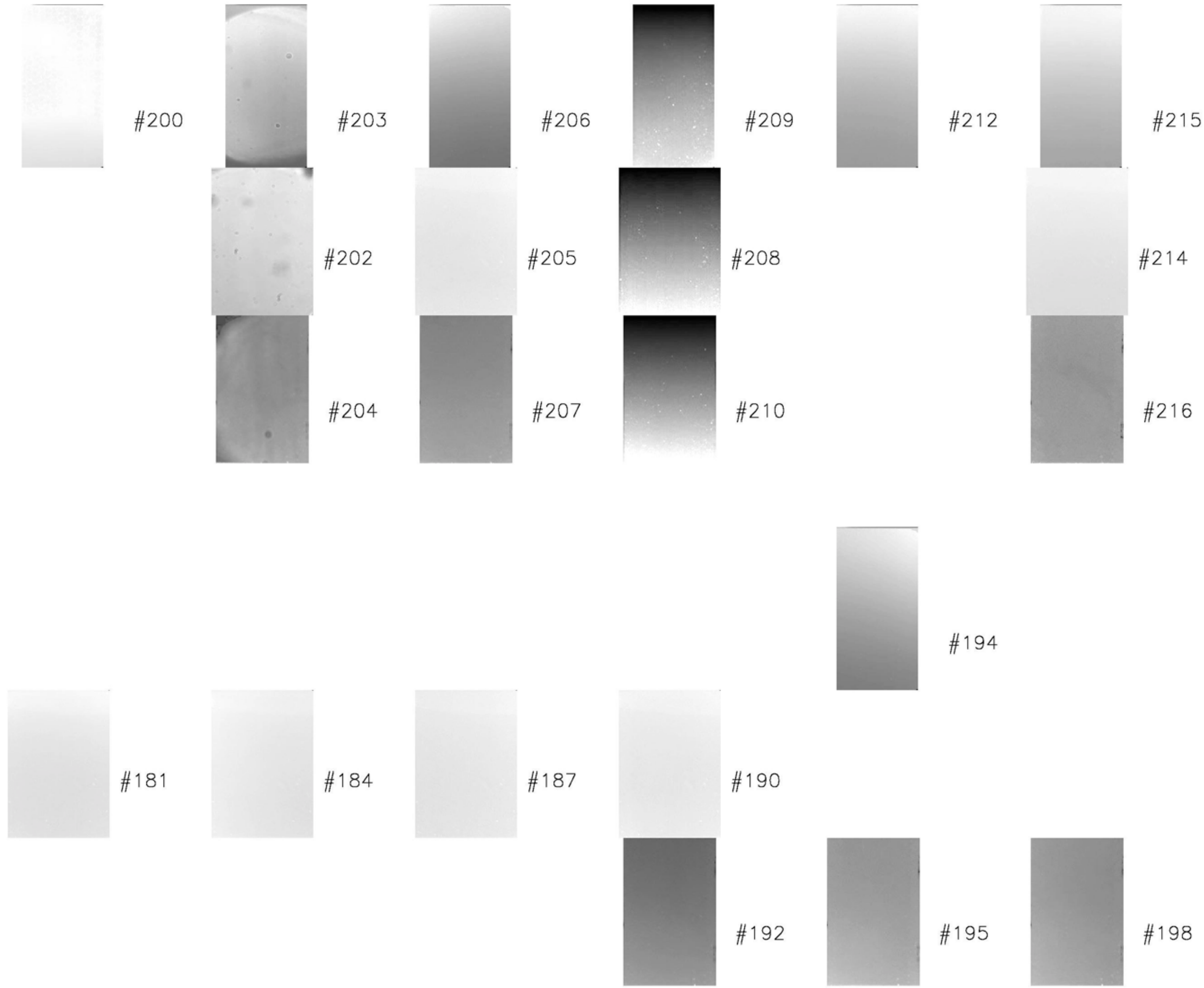
Images from C:\df3\14Jan05\Log\stream_524b\: 73 thru 108



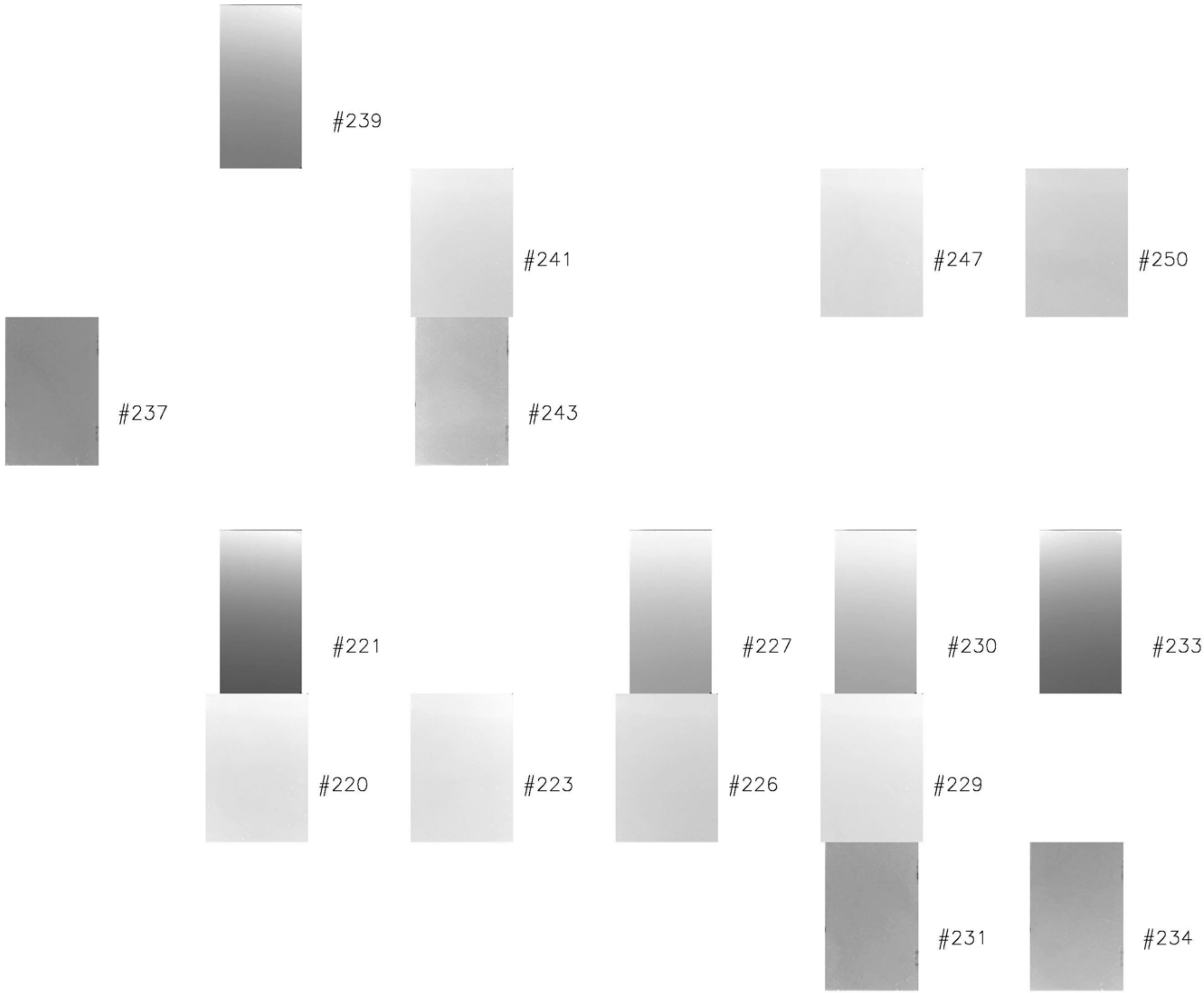
Images from C:\df3\14Jan05\Log\stream_524b\: 109 thru 144



Images from C:\df3\14Jan05\Log\stream_524b\: 145 thru 180



Images from C:\df3\14Jan05\Log\stream_524b\: 181 thru 216



Images from C:\df3\14Jan05\Log\stream_524b\: 217 thru 252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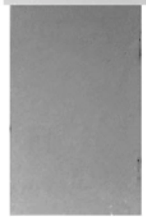
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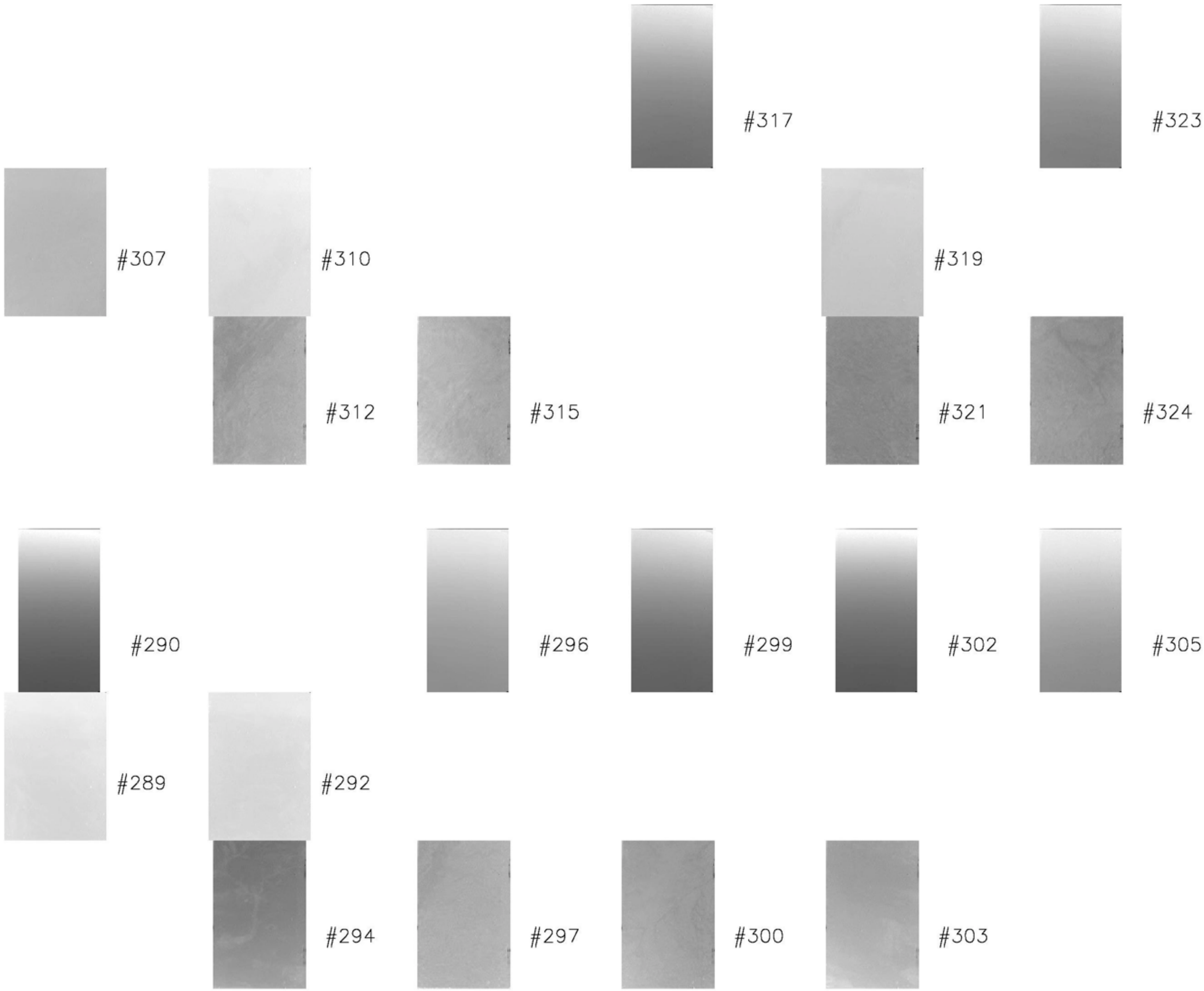
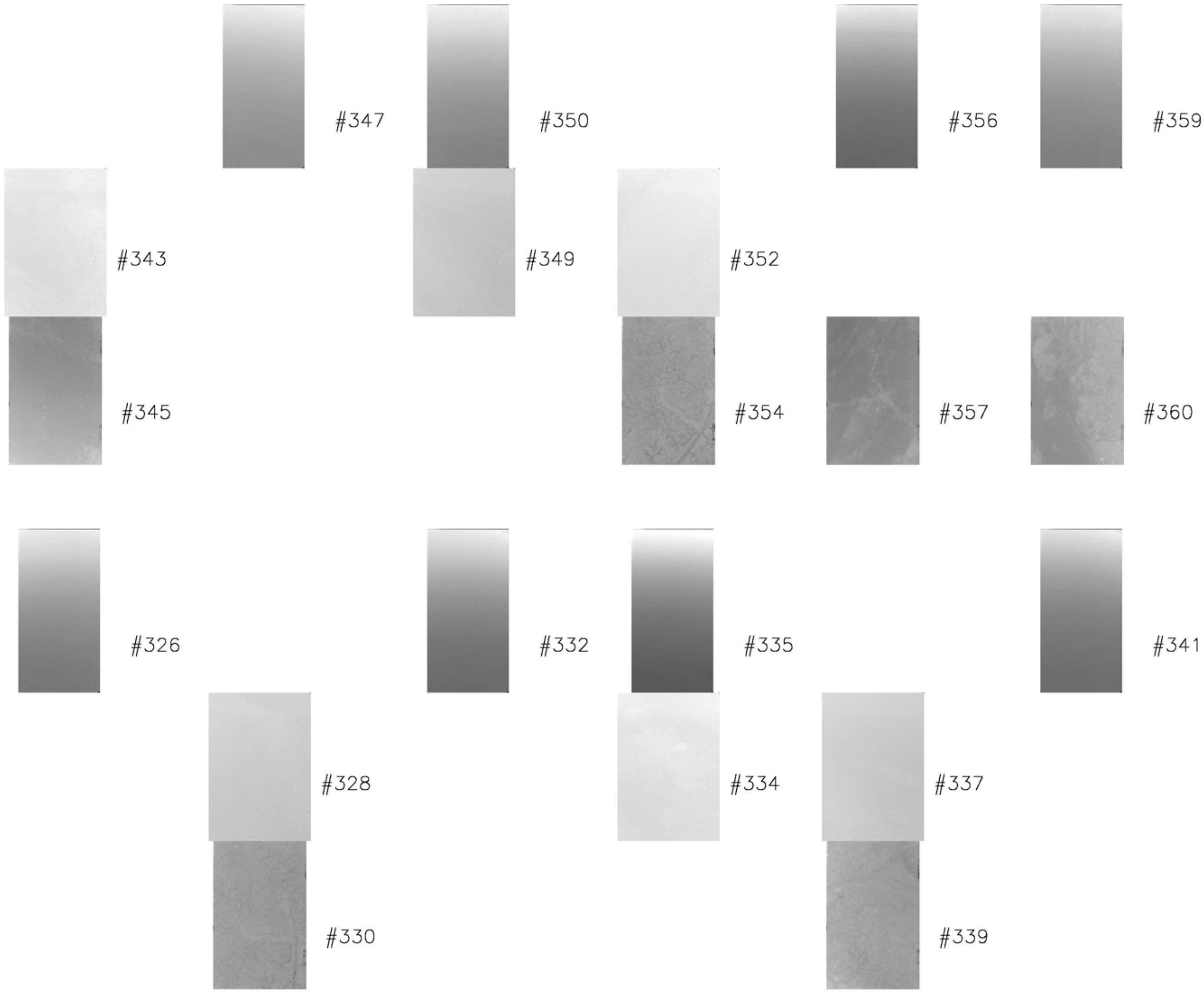
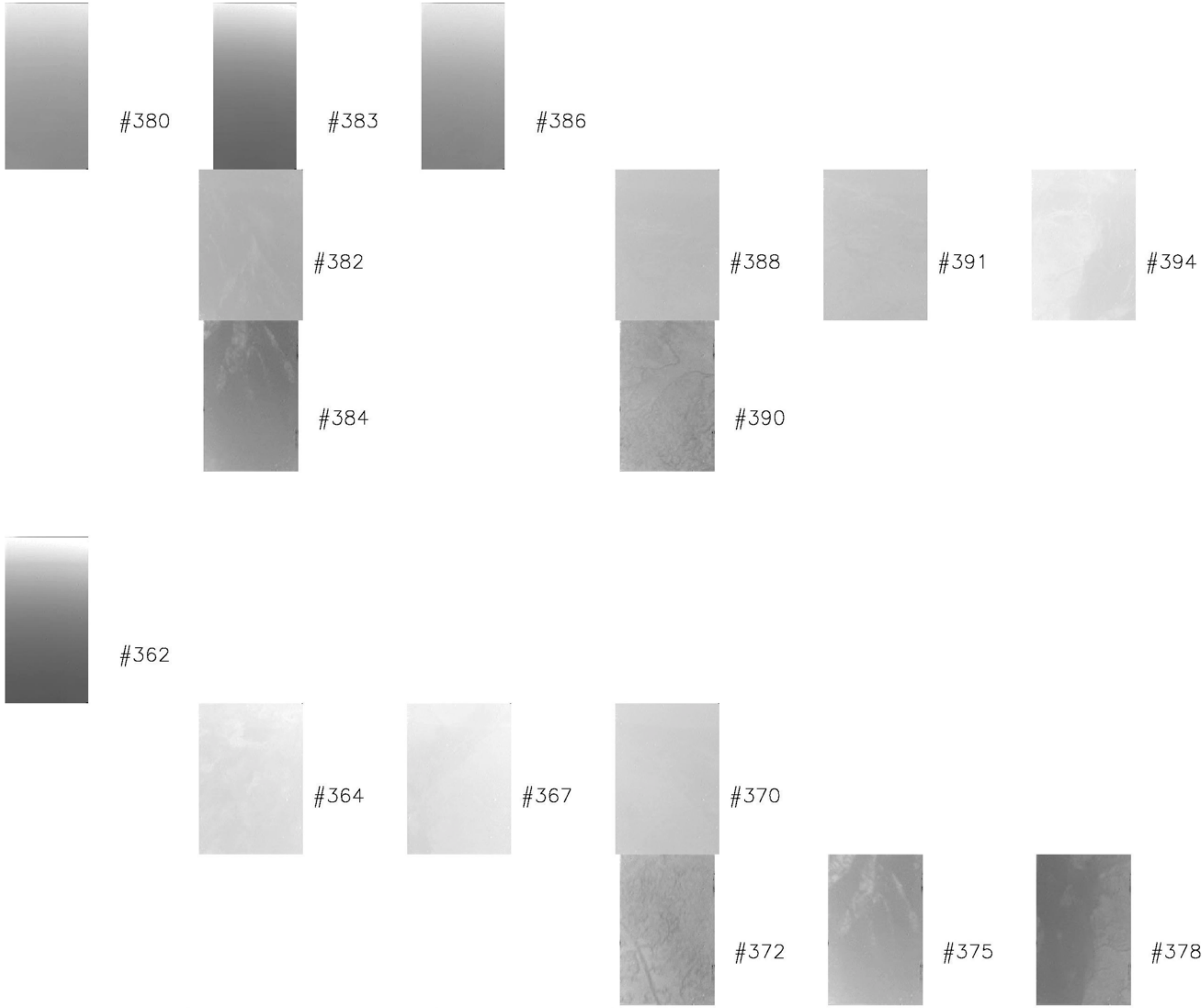
Images from C:\df3\14Jan05\Log\stream_524b\: 253 thru 288



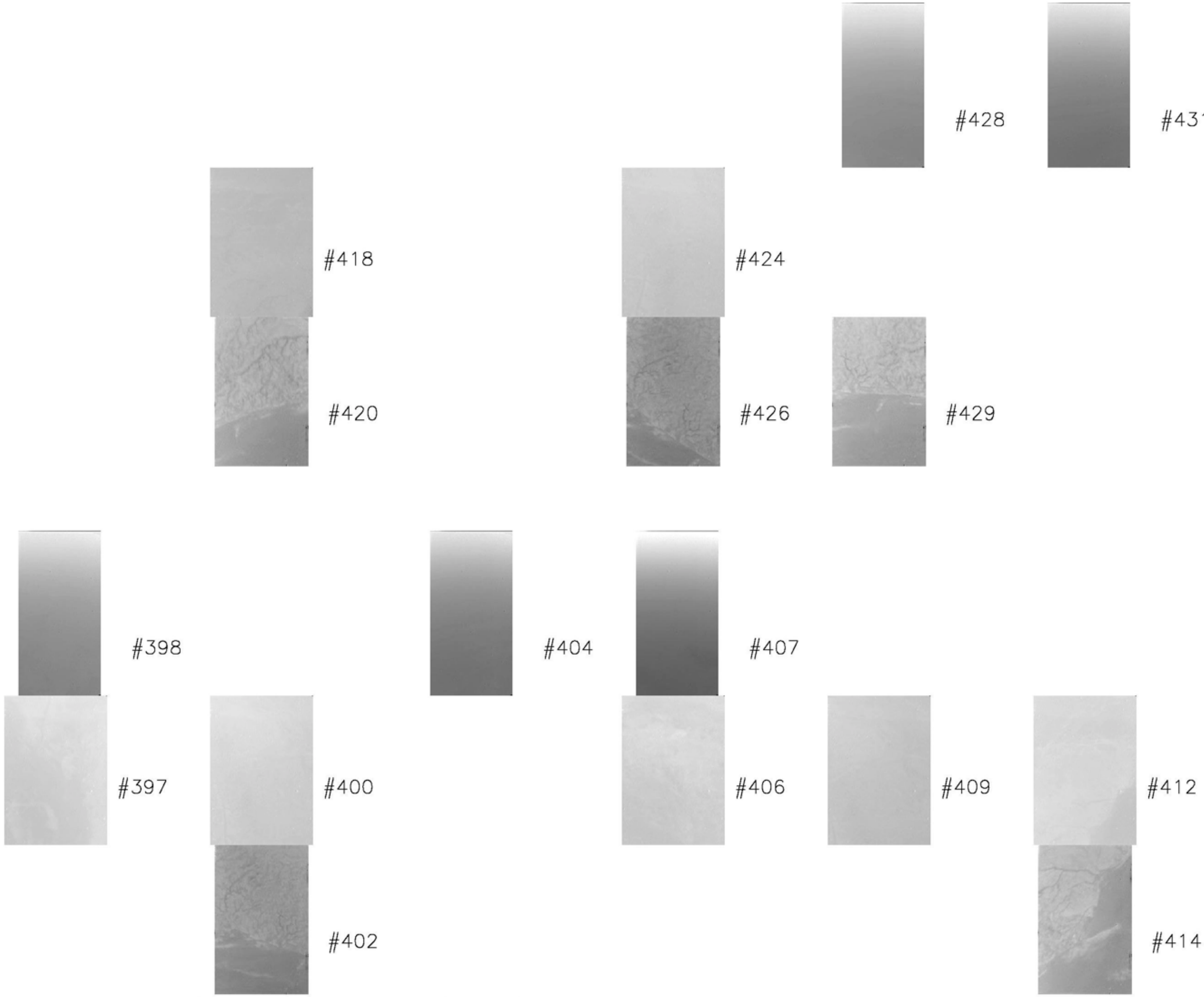
Images from C:\df3\14Jan05\Log\stream_524b\: 289 thru 324



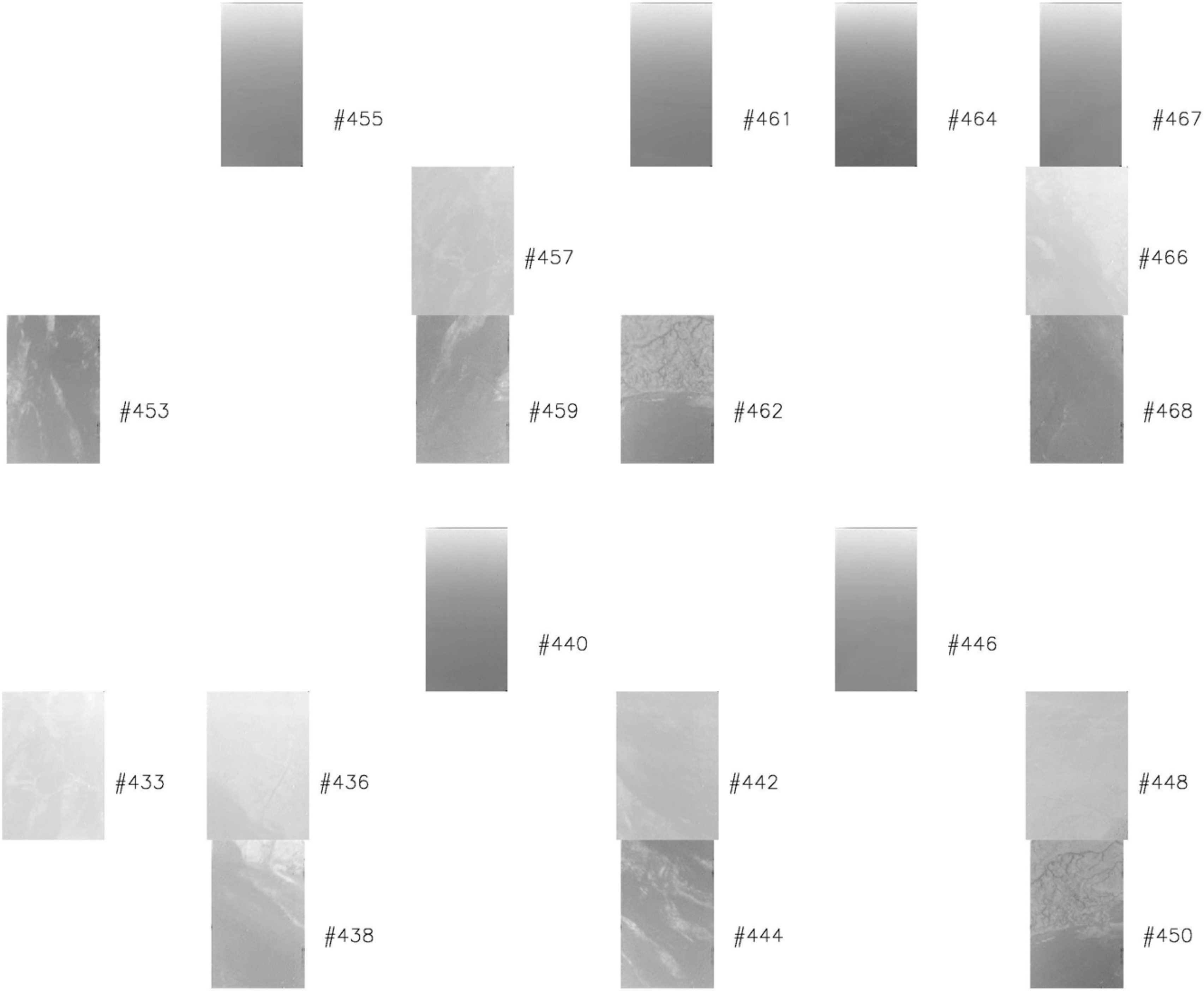
Images from C:\df3\14Jan05\Log\stream_524b\: 325 thru 360



Images from C:\df3\14Jan05\Log\stream_524b\: 361 thru 396



Images from C:\df3\14Jan05\Log\stream_524b\: 397 thru 432



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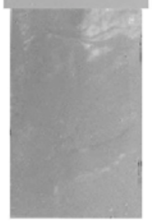

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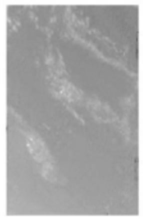

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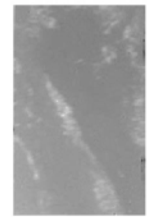

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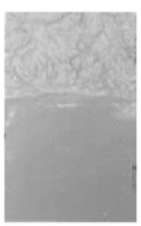

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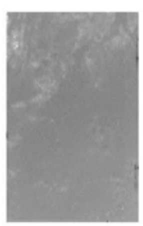

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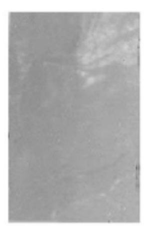

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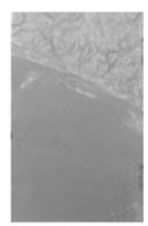

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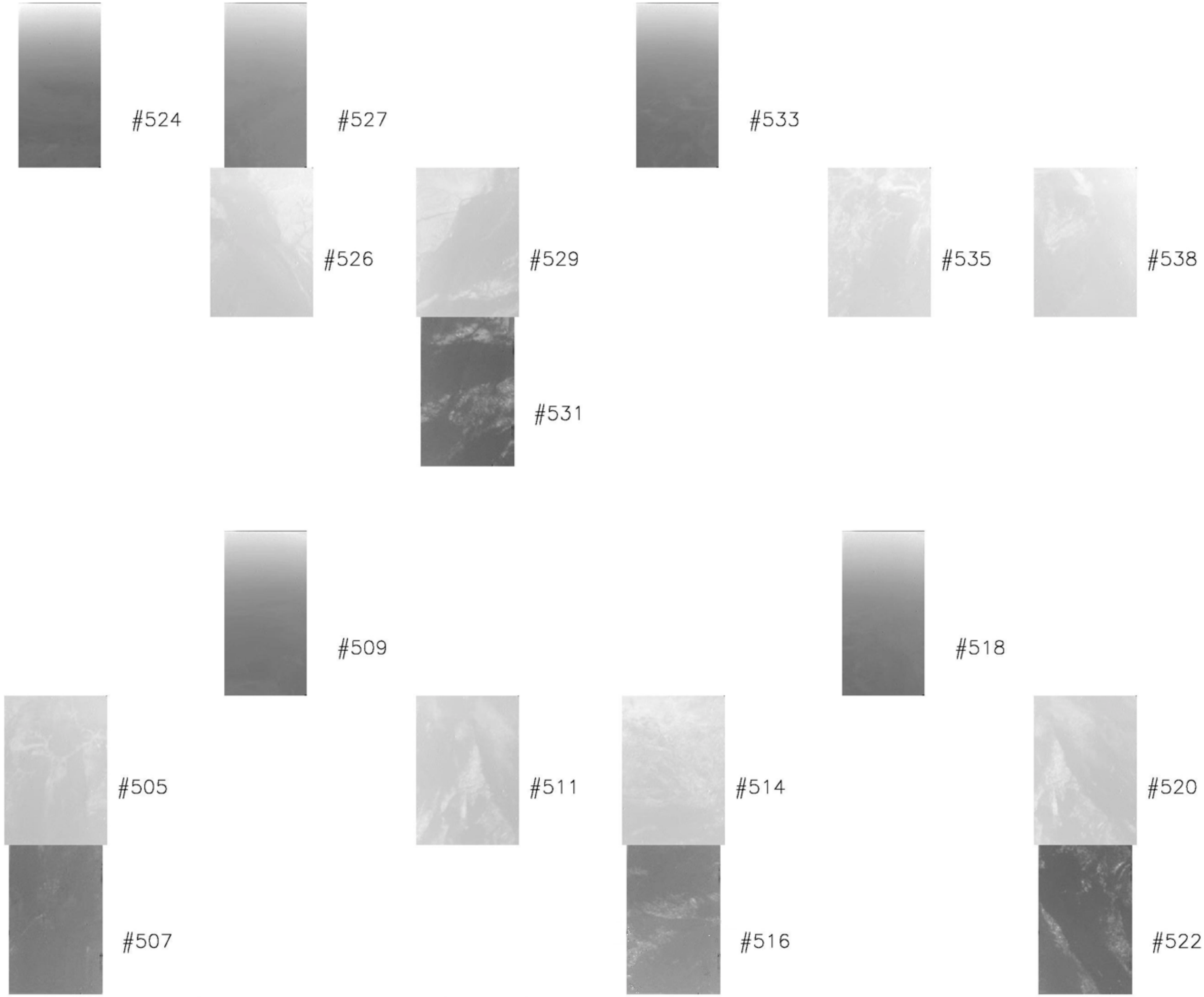

Images from C:\df3\14Jan05\Log\stream_524b\: 505 thru 540


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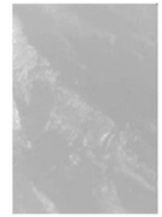
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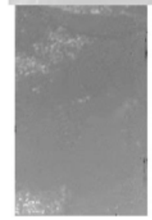
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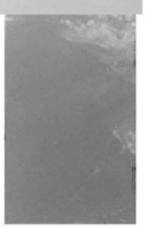
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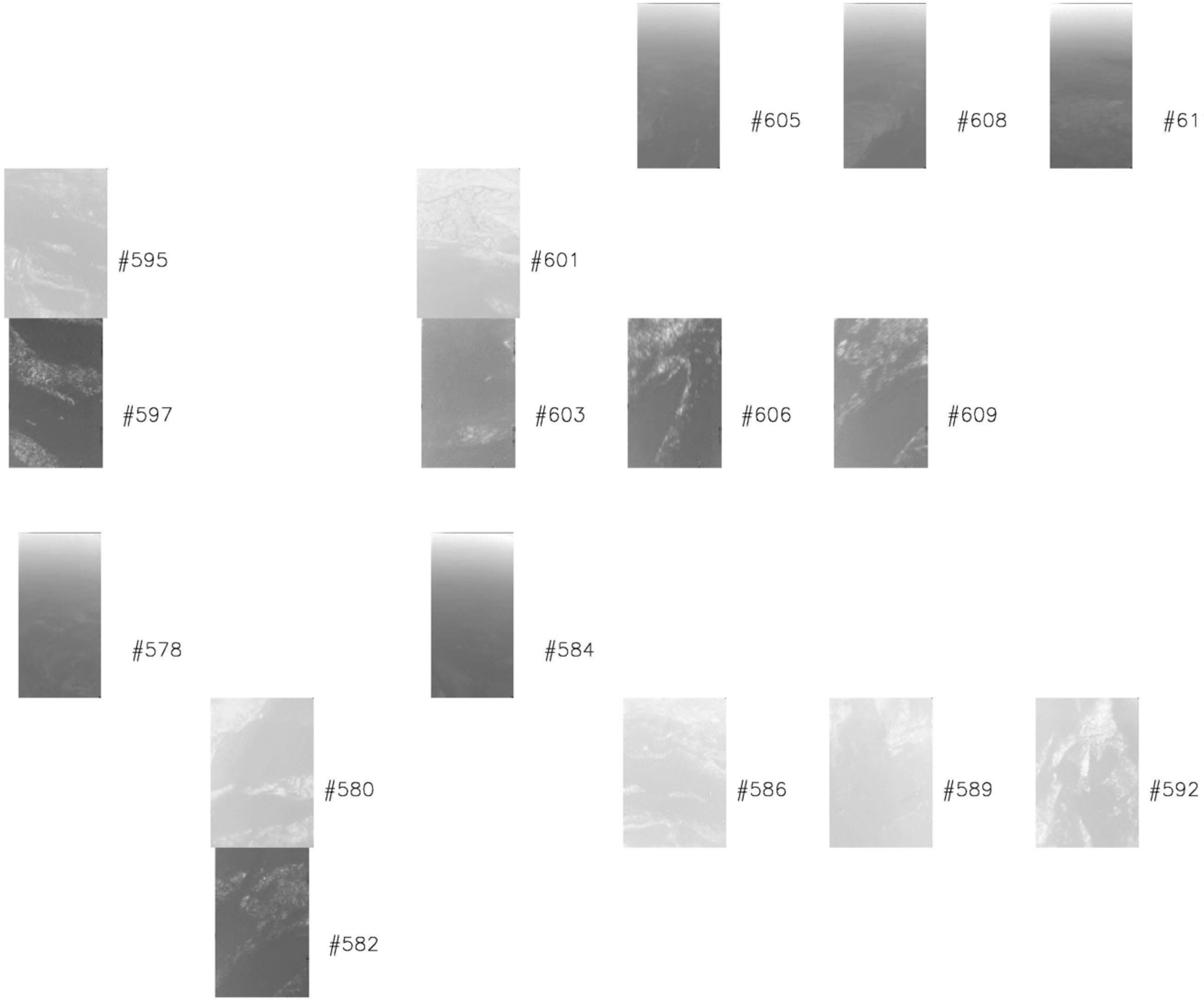

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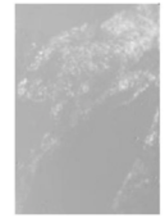
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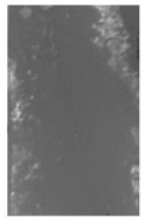
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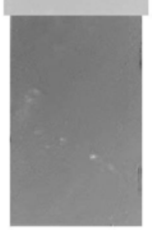
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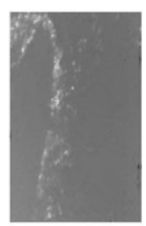
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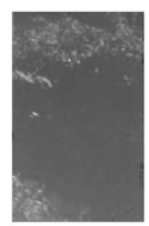
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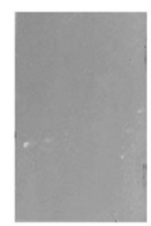
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Images from C:\df3\14Jan05\Log\stream_524b\: 613 thru 648


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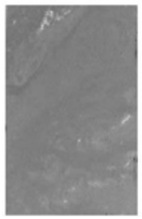
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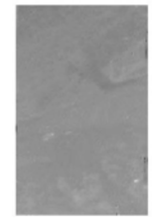
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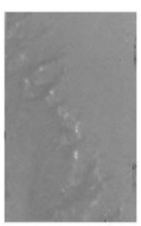
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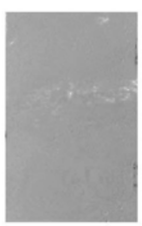
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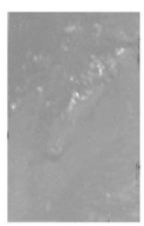
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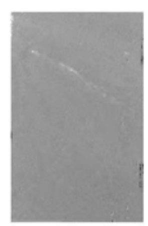
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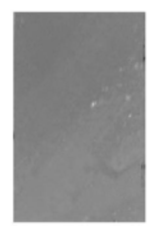
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Images from C:\df3\14Jan05\Log\stream_524b\: 649 thru 684


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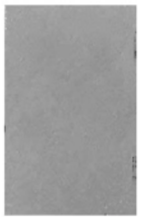
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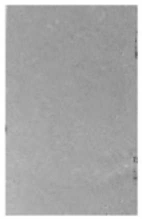
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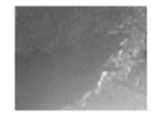
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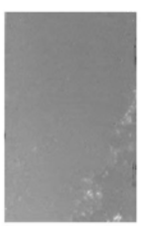
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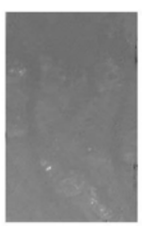
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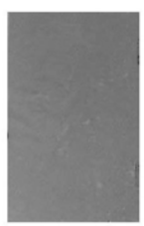
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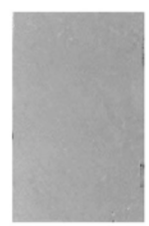
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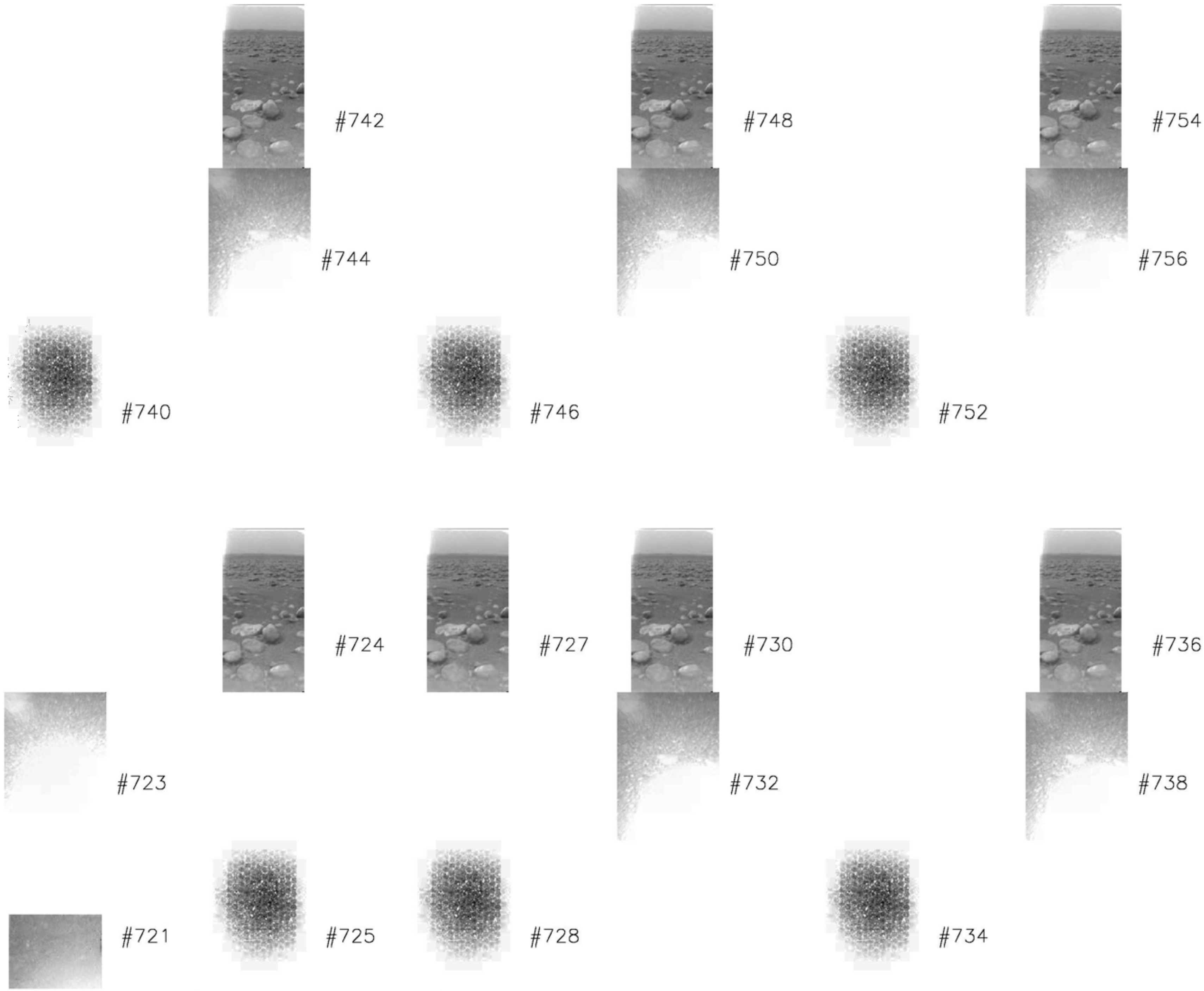
Images from C:\df3\14Jan05\Log\stream_524b\: 685 thru 720



Images from C:\df3\14Jan05\Log\stream_524b\: 721 thru 756

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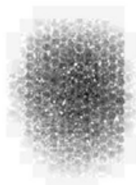

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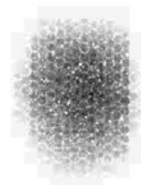

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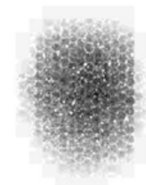

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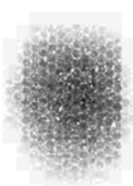

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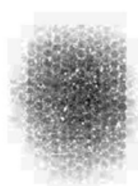

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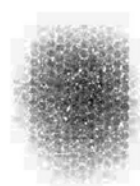

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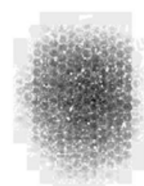

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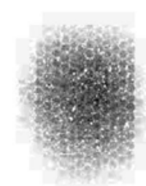

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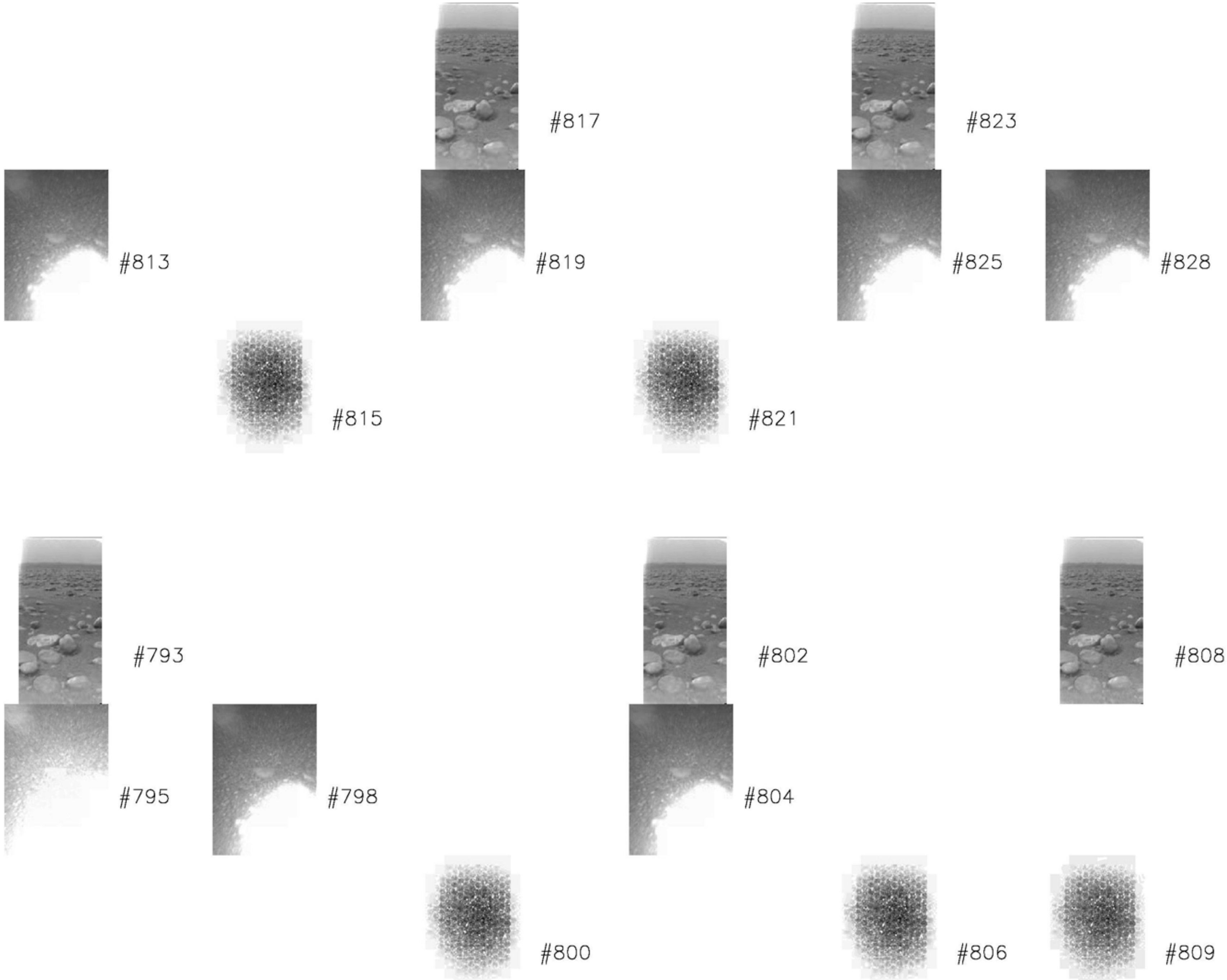
Images from C:\df3\14Jan05\Log\stream_524b\: 757 thru 792



Images from C:\df3\14Jan05\Log\stream_524b\: 793 thru 828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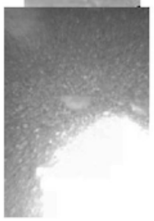
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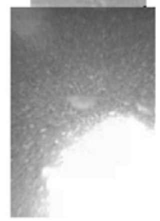
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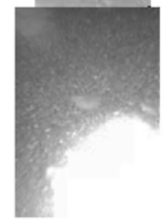
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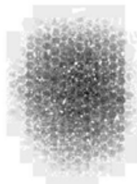
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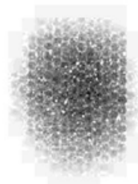
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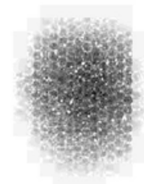
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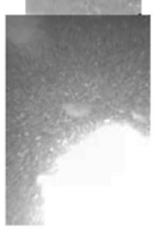
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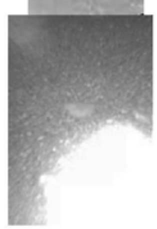
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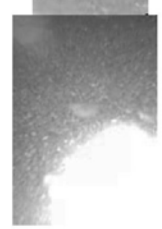
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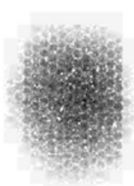
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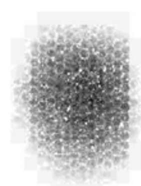
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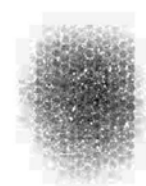
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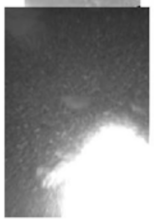
Images from C:\df3\14Jan05\Log\stream_524b\: 829 thru 864


#883


#889


#895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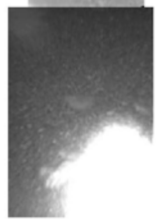
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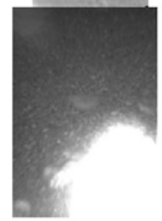
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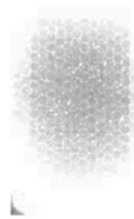
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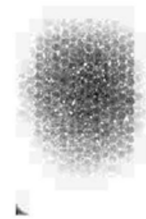
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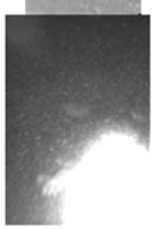
#868


#874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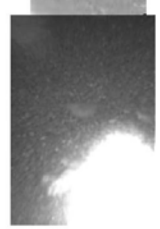
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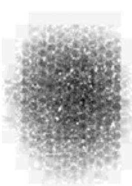
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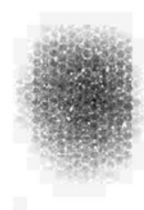
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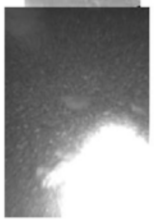
#881

Images from C:\df3\14Jan05\Log\stream_524b\: 865 thru 900


#919


#928


#931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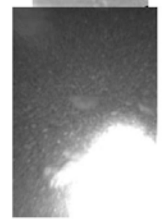
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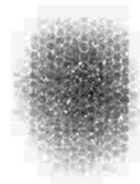
#923


#926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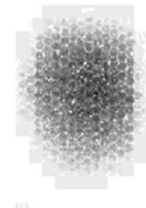
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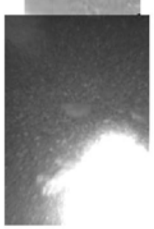
#901


#907


#916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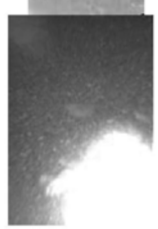
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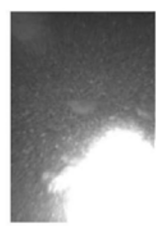
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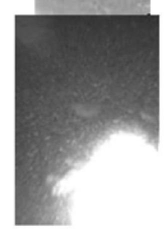
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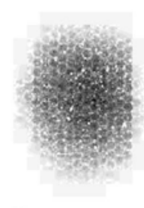
#905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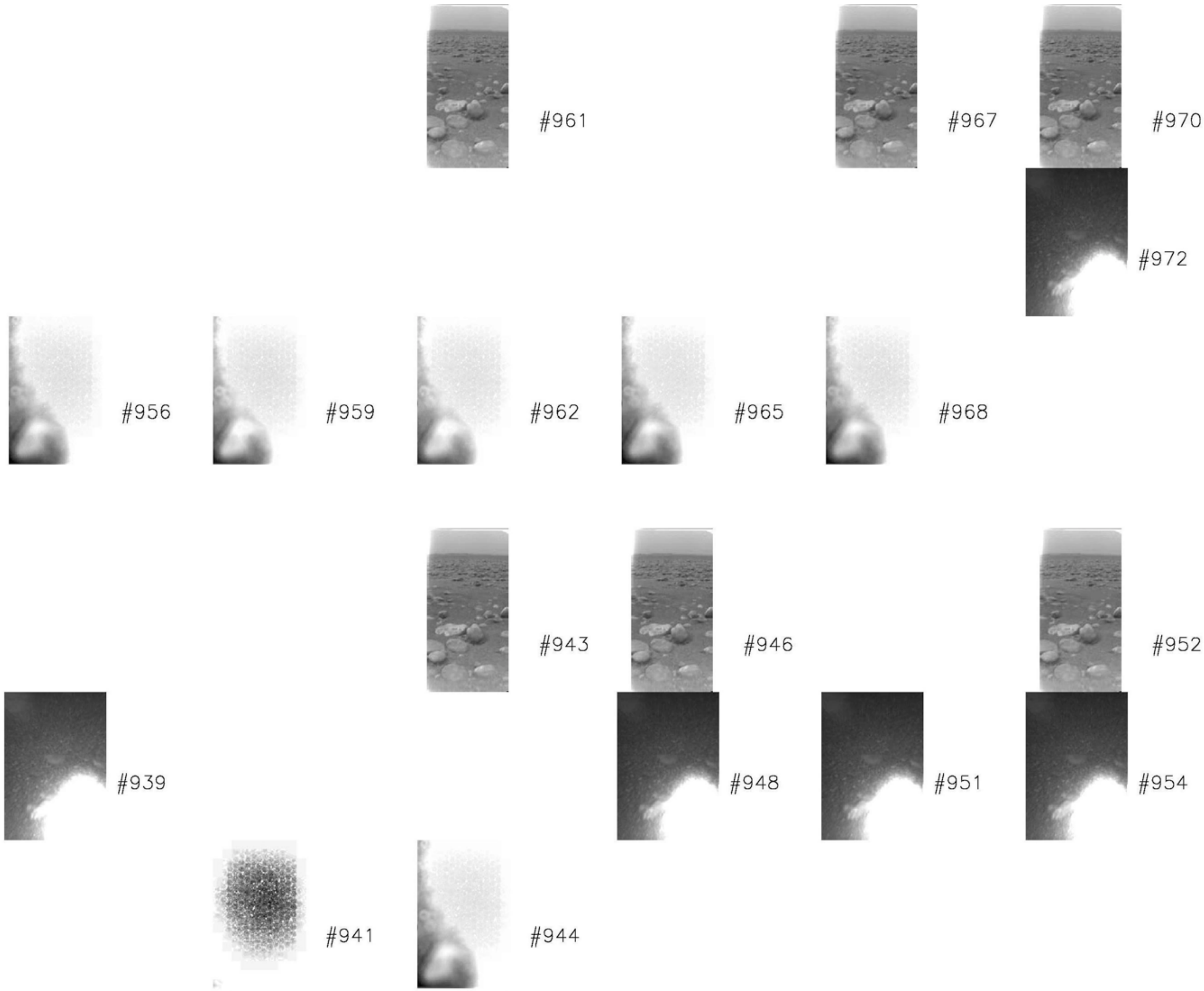
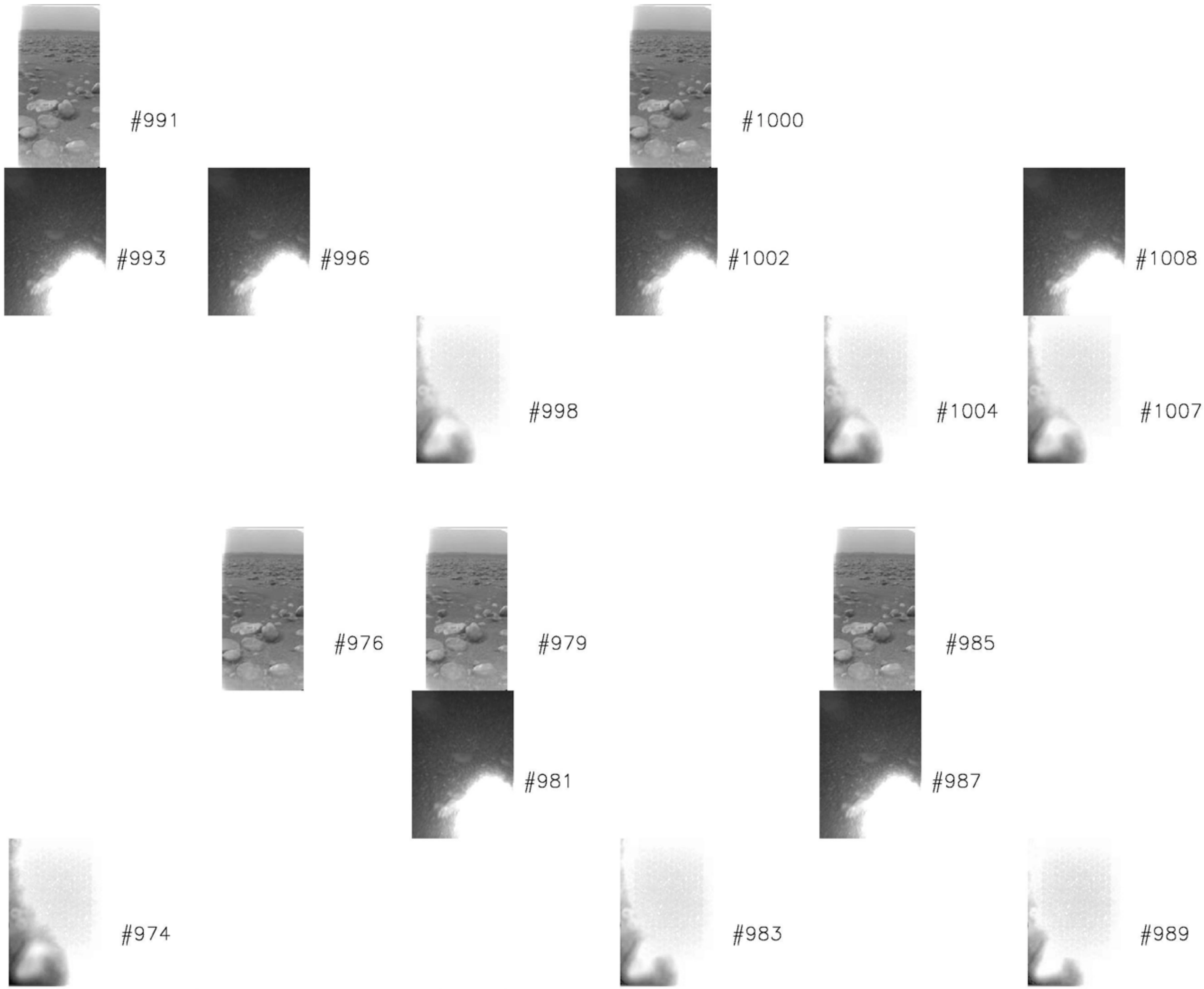
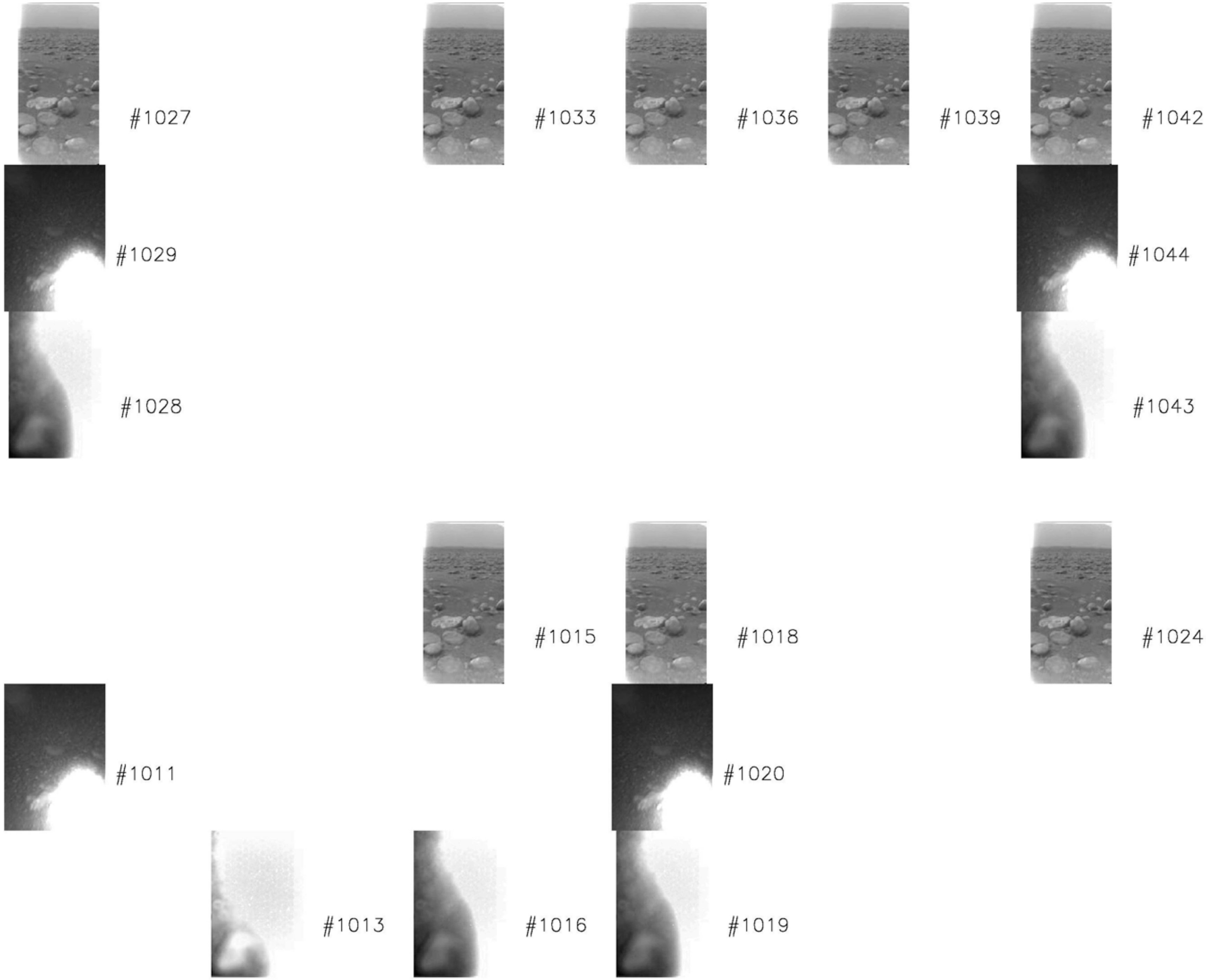
Images from C:\df3\14Jan05\Log\stream_524b\: 901 thru 936



Images from C:\df3\14Jan05\Log\stream_524b\: 937 thru 972



Images from C:\df3\14Jan05\Log\stream_524b\: 973 thru 1008



Images from C:\df3\14Jan05\Log\stream_524b\: 1009 thru 1044

#1063

#1066

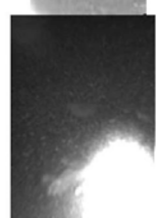
#1068

#1048

#1051

#1054

#1060



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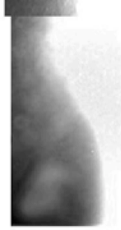
#1052



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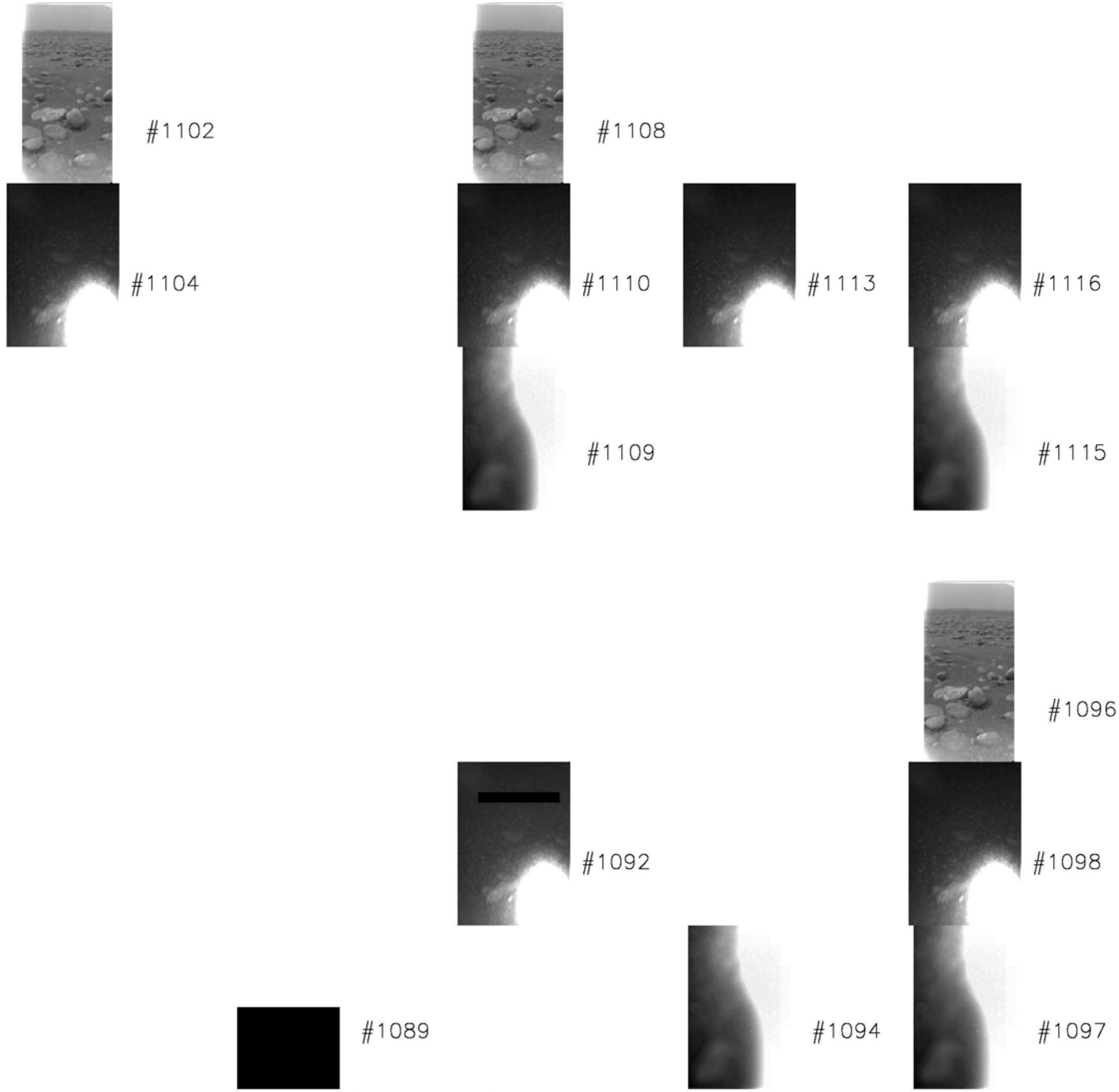
Images from C:\df3\14Jan05\Log\stream_524b\: 1045 thru 1080



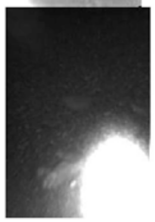
Images from C:\df3\14Jan05\Log\stream_524b\: 1081 thru 1116


#1138


#1144


#1147


#1150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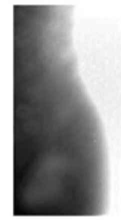
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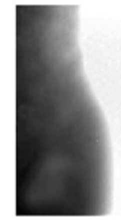
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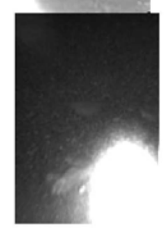
#1120


#1123


#1129


#1132


#1125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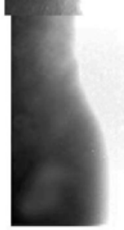
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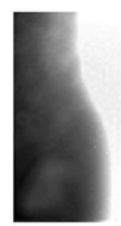
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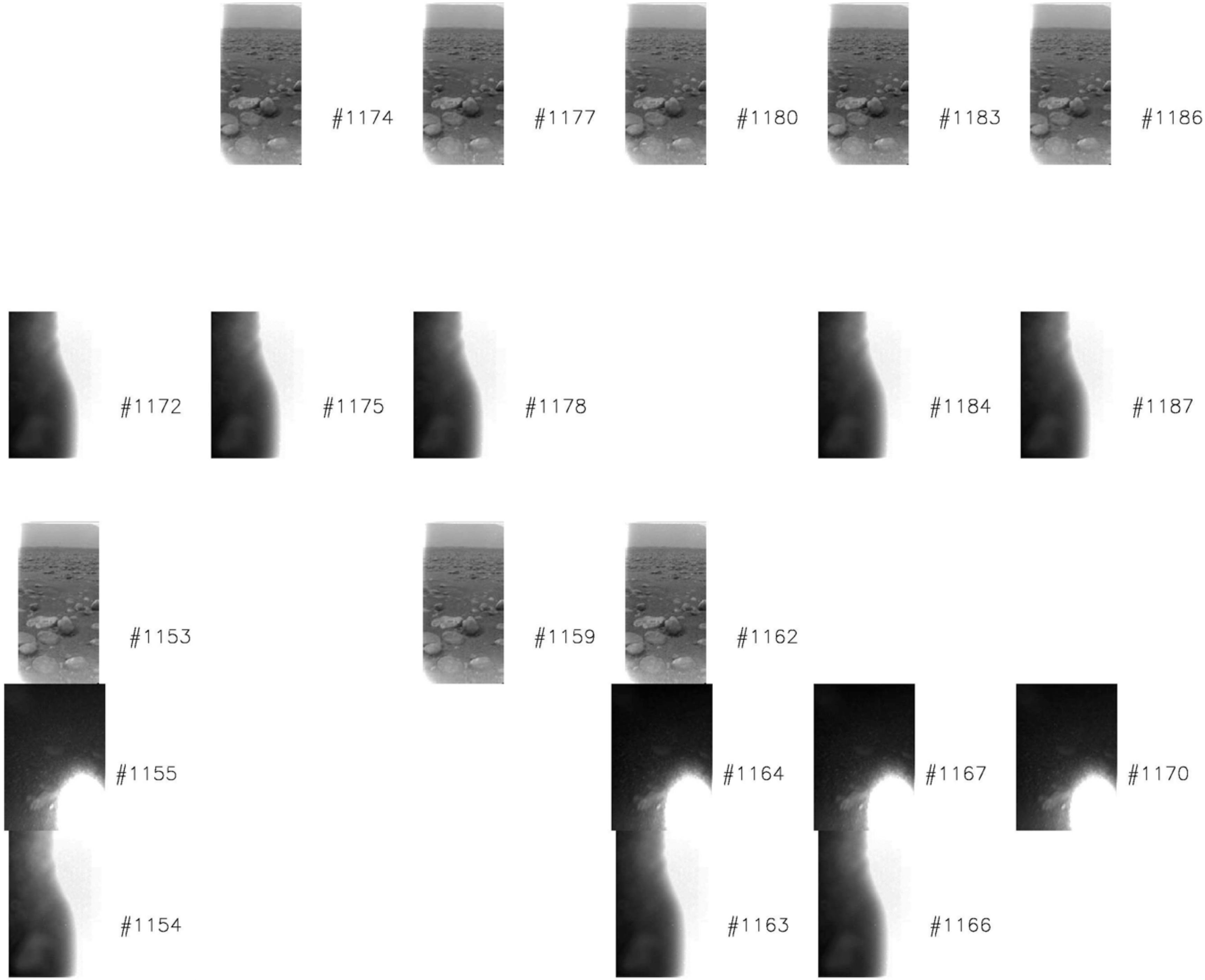
Images from C:\df3\14Jan05\Log\stream_524b\: 1117 thru 1152



Images from C:\df3\14Jan05\Log\stream_524b\: 1153 thru 1188

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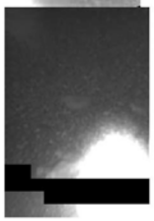
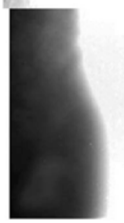


#1209

#1212

#1215



#1211

#1189

#1195

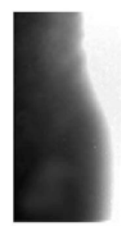
#1198

#1201

#1204

#1191

#1196



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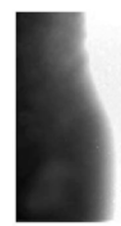

#1205

Images from C:\df3\14Jan05\Log\stream_524b\: 1189 thru 1215

Appendix 19 - NASAView Image Display Software

The DISR images are included in the PDS archive in several formats as described in section 5.8 of the Guide. The image files in Archive directory: \DATA\IMAGE\IMAGE_FORMAT are specifically formatted to be viewed using the NASAView Image Display Software.

NASAView is a PDS archive product display program that runs on multiple platforms in a GUI environment. This application was built using the Label Library Light (L3), Object Access Library (OAL) and the XVT Development Solution for C package. Label Library Light parses PDS ODL labels and creates an in-memory representation of the label information. The Object Access Library uses the parse tree and accesses the actual PDS object. The XVT Development solution supplies the cross-platform GUI support and an object-oriented environment.

Details

Version	3.8.0
Release Date	May 9, 2011
License	Public Domain
Programming Language	C
Source Code	Not available
Package Size	6.5 MB (approx.)
Support Software Required	X-Windows, Motif

Downloads

Platform	Comment
Solaris	Built and tested on 2.7.
Linux	Built 32-bit binary on Red Hat 7.3 and tested on Red Hat Enterprise 3. Built and tested 64-bit binary on Red Hat Enterprise 4.
Windows	Built on XP with Service Pack 3. Requires at least Service Pack 2.
Macintosh	Built on 10.4.11. Tested on PowerPC running 10.2.X, on Intel Core 2 Duo and i7 running 10.6.X.

Notes

2011-05-09, MC(EN) Updated;
This is a maintenance release of NASAView, which includes fixes for supporting 16-bit unsigned images, 32-bit multi-banded images, and tables containing items within a bit column.

Also included in this release is the deployment of a Mac Intel and Mac PowerPC package instead of the single Mac package released in previous versions. This is due to NASAView having to do architecture-dependent, byte-swapping in order to read the data properly .
For more details, please see the Release Notes section of the NASAView documentation.

From: http://pds.nasa.gov/tools/nasa-view.shtml

Appendix 20 - DISR Image Dataset List

1 Line #: Chronological numbering of the images received (note 545 & 546 were undecipherable & are removed).
2 Seq#: The sequence number assigned to the image when it was taken. These correspond to the first number in the file name.
2a Cycl: The number designation for the descent cycle in which the observation was made.
3 M_time: The mission time when the exposure began in seconds after T0.
4 Altitude: The altitude of the probe at the beginning of the exposure, in kilometers.
5 ºE of N: The bearing of the DISR sensor head (+Z axis) when the exposure began in degrees east of north.
6 Type: The image dataset type; Side Looking Imager (SLI), Downward Looking Imager 1 (DLI1) or Down Looking Imager 2 (DLI2)
7 Type: The image dataset type; Side Looking Imager (SLI), High Resolution Imager (HRI), or Medium Resolution Imager (MRI)
8 Exp.: Exposure time in milliseconds.
9 Lamps: Calibration and Surface Lamp power status flags, 0 = off, 1 = on. In order Cal1,Cal2,Cal3,SSL.
10 Process: B=Bad Pixel Mapped, S=Summed, L=Lossless Compressed Q=Square-rooted, H=Hardware Compressed, E=AutoExposed
11 Min.: The brightness value of the darkest pixel in the array on a scale from 0 to 4095 (12 bits).
12 Max.: The brightness value of the brightest pixel in the array on a scale from 0 to 4095 (12 bits).
13 Ave.: The average brightness of all pixels in the array on a scale from 0 to 4095 (12 bits).
14 Sqrt Min: The lower threshold value (5%) for the square rooter conversion from 12 to 8 bits.
15 Sqrt Max: The upper extent (95%) of the pixel value range used by the square rooter in conversion from 12 to 8 bits.
16 C-Ratio: The compression ratio resulting from hardware compression relative to un-compressed, 8 bit/pixel images.

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
1	2	1	143.579	142.775	315.6	SLI	(SLI)	7	0000	BxxQHE	26	1531	1146.1	286	1738	14.5
2	4	1	146.594	142.635	226.5	DLI2	(MRI)	7	0000	BxxQHE	39	1272	1107.42	1035	1193	13.8
3	5	1	146.594	142.635	226.5	SLI	(SLI)	7	0000	BxxQHE	20	1464	1108.51	254	1722	6.6
4	6	1	146.594	142.635	226.5	DLI1	(HRI)	7	0000	BxxQHE	1784	2938	2328.13	2169	2511	5.5
5	9	1	157.446	142.111	271.6	DLI1	(HRI)	7	0000	BxxQHE	1752	2994	2401.27	2276	2548	8.5
6	11	1	169.448	141.454	292.9	SLI	(SLI)	7	0000	BxxQHE	23	1559	1170.15	370	1706	12.2
7	13	1	180.258	140.869	355.9	DLI2	(MRI)	7	0000	BxxQHE	52	1306	1044.29	989	1111	7.5
8	15	1	180.258	140.869	355.9	DLI1	(HRI)	7	0000	BxxQHE	1645	2884	2234.25	2024	2472	8.5
9	17	1	202.258	139.780	137.4	SLI	(SLI)	7	0000	BxxQHE	29	2202	1727.1	865	2571	6.6
10	19	1	204.766	139.660	73.7	DLI2	(MRI)	7	0000	BxxQHE	40	1150	1030.47	943	1145	7.2
11	21	1	204.766	139.660	73.7	DLI1	(HRI)	7	0000	BxxQHE	1559	2966	2195.04	1959	2469	7.3
12	23	1	216.672	139.086	138.4	SLI	(SLI)	7	0000	BxxQHE	32	2285	1825.92	907	2693	7
13	24	1	216.672	139.086	138.4	DLI1	(HRI)	7	0000	BxxQHE	1645	2966	2232.91	2043	2465	5.4
14	26	1	229.985	138.414	181.4	SLI	(SLI)	7	0000	BxxQHE	20	1601	1366.92	962	1770	10.5

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
15	27	1	229.985	138.414	181.4	DLI1	(HRI)	7	0000	BxxQHE	1616	2966	2195.65	1950	2478	7.1
16	30	1	255.990	137.171	316.9	DLI1	(HRI)	7	0000	BxxQHE	1616	2884	2215.38	2010	2450	9
17	32	1	262.311	136.866	181.0	SLI	(SLI)	7	0000	BxxQHE	28	1565	1317.59	933	1715	5.3
18	34	1	279.832	136.036	176.6	DLI2	(MRI)	7	0000	BxxQHE	61	1317	1036.84	970	1118	9.6
19	36	1	279.832	136.036	176.6	DLI1	(HRI)	7	0000	BxxQHE	1587	2966	2242.41	1994	2522	7.1
20	38	2	285.236	135.784	68.3	SLI	(SLI)	7	0000	BxxQHE	34	1988	1571.03	841	2327	13.5
21	40	2	306.261	134.816	31.6	DLI2	(MRI)	7	0000	BxxQHE	79	1317	1028.34	964	1104	9.5
22	41	2	306.261	134.816	31.6	SLI	(SLI)	7	0000	BxxQHE	24	1510	1289.34	925	1619	9.1
23	43	2	309.700	134.660	330.7	DLI2	(MRI)	7	0000	BxxQHE	52	1239	1099.23	1012	1196	7
24	46	2	320.590	134.162	145.4	DLI2	(MRI)	7	0000	BxxQHE	48	1325	1123.85	934	1374	13.2
25	47	2	320.590	134.162	145.4	SLI	(SLI)	7	0000	BxxQHE	30	2243	1827.46	1010	2610	9.3
26	48	2	320.590	134.162	145.4	DLI1	(HRI)	7	0000	BxxQHE	1720	2994	2249.39	2088	2448	8
27	50	2	333.173	133.527	306.6	SLI	(SLI)	7	0000	BxxQHE	26	1610	1216.12	598	1610	5
28	52	2	343.829	133.053	150.4	DLI2	(MRI)	7	0000	BxxQHE	48	1302	1109.59	921	1351	12.7
29	53	2	343.829	133.053	150.4	SLI	(SLI)	7	0000	BxxQHE	30	2183	1772.02	982	2522	9.3
30	54	2	343.829	133.053	150.4	DLI1	(HRI)	7	0000	BxxQHE	1630	2830	2239.65	2058	2454	5.4
31	56	2	356.279	132.474	342.1	SLI	(SLI)	7	0000	BxxQHE	20	1490	1213.57	750	1514	14.7
32	57	2	356.279	132.474	342.1	DLI1	(HRI)	7	0000	BxxQHE	1645	2966	2245.63	2030	2486	8.5
33	59	2	367.849	131.931	198.0	SLI	(SLI)	7	0000	BxxQHE	20	1535	1305.71	829	1699	8.4
34	61	2	383.157	131.290	23.8	DLI2	(MRI)	7	0000	BxxQHE	60	1294	997.56	938	1070	6.9
35	62	2	383.157	131.290	23.8	SLI	(SLI)	7	0000	BxxQHE	20	1453	1270.49	1032	1524	7.4
36	65	2	391.230	130.911	298.7	SLI	(SLI)	7	0000	BxxQHE	20	1383	1251.3	1106	1386	10.4
37	66	2	391.230	130.911	298.7	DLI1	(HRI)	7	0000	BxxQHE	1559	2994	2184.01	1982	2422	8.4
38	68	2	401.388	130.441	197.1	SLI	(SLI)	7	0000	BxxQHE	20	1434	1270.83	1028	1520	6.7
39	70	2	430.981	129.202	299.1	DLI2	(MRI)	7	0000	BxxQHE	78	1261	1135.02	1063	1221	6.9
40	73	5	719.101	117.698	68.4	DLI2	(MRI)	7	1110	BxxQHx	99	3759	2322.64	1762	2906	9.5
41	74	5	719.101	117.698	68.4	SLI	(SLI)	7	1110	BxxQHx	38	2726	2197.02	1004	2992	9.9
42	75	5	719.101	117.698	68.4	DLI1	(HRI)	7	1110	BxxQHx	1884	3323	2484.45	2324	2684	6.9
43	76	6	784.781	115.336	82.1	DLI2	(MRI)	7	0000	BxxQHx	44	1235	1073.25	902	1298	14.8
44	77	6	784.781	115.336	82.1	SLI	(SLI)	7	0000	BxxQHx	40	2577	1881.51	0	0	11.3
45	78	6	784.781	115.336	82.1	DLI1	(HRI)	7	0000	BxxQHx	1660	2830	2147.85	1979	2357	7.9
46	79	6	805.297	114.568	354.5	DLI2	(MRI)	0	0000	BxxQHx	3	273	81.45	1	246	8.6
47	80	6	805.297	114.568	354.5	SLI	(SLI)	0	0000	BxxQHx	2	267	87.6	1	266	7.8
48	81	6	805.297	114.568	354.5	DLI1	(HRI)	0	0000	BxxQHx	3	775	125.64	1	398	8.8
49	83	8	831.194	113.691	8.3	SLI	(SLI)	7	0000	BxxQHE	24	1652	1272.46	778	1658	9.1
50	84	8	831.194	113.691	8.3	DLI1	(HRI)	7	0000	BxxQHE	1616	2701	2153.83	1992	2352	8.1

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
51	86	8	836.984	113.483	96.4	SLI	(SLI)	7	0000	BxxQHE	36	2830	1890.83	0	0	14.4
52	87	8	836.984	113.483	96.4	DLI1	(HRI)	7	0000	BxxQHE	1616	2966	2200.79	1952	2488	7.3
53	89	8	846.371	113.146	242.6	SLI	(SLI)	7	0000	BxxQHE	24	1393	1258.92	1040	1488	6.3
54	91	8	867.931	112.402	234.1	DLI2	(MRI)	7	0000	BxxQHE	55	1283	991.02	926	1074	9
55	93	8	867.931	112.402	234.1	DLI1	(HRI)	7	0000	BxxQHE	1645	2830	2185.84	1927	2481	8.7
56	95	8	873.597	112.214	329.9	SLI	(SLI)	7	0000	BxxQHE	20	1636	1309.69	838	1630	7.1
57	97	8	882.852	111.915	129.5	DLI2	(MRI)	7	0000	BxxQHE	48	1259	1074.2	875	1341	11.8
58	100	8	893.640	111.542	320.7	DLI2	(MRI)	7	0000	BxxQHE	45	1306	1056.23	981	1147	6.4
59	103	8	907.527	111.003	214.1	DLI2	(MRI)	7	0000	BxxQHE	40	1284	1161.61	1051	1297	8.5
60	105	8	907.527	111.003	214.1	DLI1	(HRI)	7	0000	BxxQHE	1784	3051	2397.19	2254	2562	8.9
61	107	8	917.525	110.604	43.3	SLI	(SLI)	7	0000	BxxQHE	30	1861	1544.55	993	2083	9.8
62	108	8	917.525	110.604	43.3	DLI1	(HRI)	7	0000	BxxQHE	1616	2830	2220.65	2021	2451	5.7
63	111	8	928.732	110.061	269.5	DLI1	(HRI)	7	0000	BxxQHE	1630	2752	2194.43	2063	2353	8.1
64	113	8	941.111	109.365	181.4	SLI	(SLI)	7	0000	BxxQHE	30	1907	1569.97	974	2162	10.2
65	115	8	955.716	108.442	154.8	DLI2	(MRI)	7	0000	BxxQHE	36	1158	1030.01	926	1162	6.3
66	119	14	1408.822	80.259	42.1	SLI	(SLI)	7	0000	BxxQHE	24	1866	1360.13	617	2147	7.4
67	120	14	1408.822	80.259	42.1	DLI1	(HRI)	7	0000	BxxQHE	1157	2394	1740.95	1558	1954	8.3
68	122	14	1411.709	80.117	180.6	SLI	(SLI)	7	0000	BxxQHE	27	1901	1374.94	610	2210	15.9
69	124	14	1433.358	79.082	132.4	DLI2	(MRI)	7	0000	BxxQHE	40	1108	929.56	745	1175	7.4
70	127	14	1437.360	78.893	321.9	DLI2	(MRI)	7	0000	BxxQHE	39	1045	893.14	834	966	6
71	129	14	1437.360	78.893	321.9	DLI1	(HRI)	7	0000	BxxQHE	1365	2394	1886.59	1758	2038	6.5
72	131	14	1447.472	78.415	77.0	SLI	(SLI)	7	0000	BxxQHE	38	2993	1813.42	0	0	14.5
73	132	14	1447.472	78.415	77.0	DLI1	(HRI)	7	0000	BxxQHE	1306	2394	1830	1670	2022	6.8
74	134	14	1458.944	77.868	247.6	SLI	(SLI)	7	0000	BxxQHE	20	1455	1185.57	751	1657	8.7
75	136	14	1469.484	77.402	5.0	DLI2	(MRI)	7	0000	BxxQHE	37	946	813.68	746	894	6.7
76	138	14	1469.484	77.402	5.0	DLI1	(HRI)	7	0000	BxxQHE	1329	2350	1730.25	1555	1933	6.6
77	140	14	1480.658	76.907	140.1	SLI	(SLI)	7	0000	BxxQHE	32	2675	1580.78	0	0	13.6
78	142	14	1493.819	76.322	349.5	DLI2	(MRI)	7	0000	BxxQHE	44	983	871.98	781	991	10.4
79	144	14	1493.819	76.322	349.5	DLI1	(HRI)	7	0000	BxxQHE	1377	2372	1825.87	1686	1994	9.7
80	148	14	1517.582	75.280	266.3	DLI2	(MRI)	7	0000	BxxQHE	40	994	898.5	816	1000	6.9
81	150	14	1517.582	75.280	266.3	DLI1	(HRI)	7	0000	BxxQHE	1365	2222	1881.95	1776	2004	6.5
82	152	14	1528.992	74.787	13.0	SLI	(SLI)	7	0000	BxxQHE	26	1439	1149.18	682	1666	11.2
83	154	19	1899.137	62.035	12.8	DLI2	(MRI)	7	1110	BxxQHx	69	2350	1887.52	1494	2286	10.4
84	155	19	1899.137	62.035	12.8	SLI	(SLI)	7	1110	BxxQHx	27	1994	1509.85	527	2313	9.6
85	156	19	1899.137	62.035	12.8	DLI1	(HRI)	7	1110	BxxQHx	1239	2285	1773.83	1619	1953	8.7
86	157	20	1957.467	60.524	128.1	DLI2	(MRI)	7	0000	BxxQHx	21	880	625.1	586	674	13

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
87	158	20	1957.467	60.524	128.1	SLI	(SLI)	7	0000	BxxQHx	24	2141	1190.97	0	0	7.5
88	159	20	1957.467	60.524	128.1	DLI1	(HRI)	7	0000	BxxQHx	1045	1850	1421.42	1214	1654	10.8
89	160	20	1971.488	60.173	123.2	DLI2	(MRI)	0	0000	BxxQHx	2	140	40.9	1	121	11.8
90	161	20	1971.488	60.173	123.2	SLI	(SLI)	0	0000	BxxQHx	2	265	84.71	1	221	9.3
91	162	20	1971.488	60.173	123.2	DLI1	(HRI)	0	0000	BxxQHx	2	444	70.5	1	227	8.1
92	164	23	2095.627	57.241	14.7	SLI	(SLI)	7	0000	BxxQHE	16	1392	1041.23	505	1639	6.5
93	165	23	2095.627	57.241	14.7	DLI1	(HRI)	7	0000	BxxQHE	1081	1901	1516.65	1350	1702	4.7
94	169	23	2122.812	56.637	293.2	DLI2	(MRI)	8	0000	BxxQHE	32	855	771.23	688	872	9.9
95	170	23	2122.812	56.637	293.2	SLI	(SLI)	8	0000	BxxQHE	16	1357	1105.76	681	1551	7.2
96	172	23	2126.550	56.556	21.2	DLI2	(MRI)	8	0000	BxxQHE	32	807	730.04	650	826	5.8
97	174	23	2126.550	56.556	21.2	DLI1	(HRI)	8	0000	BxxQHE	1137	2008	1586.5	1449	1747	5.6
98	176	23	2148.503	56.081	170.2	SLI	(SLI)	8	0000	BxxQHE	24	2349	1357.48	0	0	13.2
99	178	23	2152.849	55.988	266.3	DLI2	(MRI)	7	0000	BxxQHE	24	803	724.33	646	822	10
100	179	23	2152.849	55.988	266.3	SLI	(SLI)	7	0000	BxxQHE	16	1293	1059.31	646	1482	7.8
101	181	23	2162.632	55.780	116.7	DLI2	(MRI)	7	0000	BxxQHE	24	755	663.04	582	774	6
102	184	23	2173.517	55.549	350.3	DLI2	(MRI)	8	0000	BxxQHE	24	812	728.27	649	815	10.1
103	187	23	2184.678	55.313	231.2	DLI2	(MRI)	7	0000	BxxQHE	14	769	683.18	629	751	8.6
104	190	23	2195.827	55.079	109.9	DLI2	(MRI)	6	0000	BxxQHE	26	613	556.24	510	614	8.4
105	192	23	2195.827	55.079	109.9	DLI1	(HRI)	6	0000	BxxQHE	901	1705	1242.27	1076	1436	7.3
106	194	23	2210.629	54.774	53.5	SLI	(SLI)	7	0000	BxxQHE	17	1918	1236.96	326	2262	14.2
107	195	23	2210.629	54.774	53.5	DLI1	(HRI)	7	0000	BxxQHE	1036	1736	1440.18	1322	1586	7.4
108	198	23	2225.973	54.461	343.6	DLI1	(HRI)	7	0000	BxxQHE	1081	1884	1517.56	1398	1662	8.1
109	200	26	2453.856	50.160	279.4	SLI	(SLI)	35	0000	BxxQHx	42	4086	3911.26	3192	4095	7.6
110	202	27	2511.562	49.160	68.0	DLI2	(MRI)	7	1110	BxxQHx	57	2182	1750.96	1342	2150	7.8
111	203	27	2511.562	49.160	68.0	SLI	(SLI)	7	1110	BxxQHx	20	2141	1478.33	0	0	9.8
112	204	27	2511.562	49.160	68.0	DLI1	(HRI)	7	1110	BxxQHx	1045	2008	1537.56	1398	1706	7
113	205	28	2563.949	48.272	179.5	DLI2	(MRI)	7	0000	BxxQHx	34	627	565.68	513	635	12.3
114	206	28	2563.949	48.272	179.5	SLI	(SLI)	7	0000	BxxQHx	16	1720	1030.73	0	0	8
115	207	28	2563.949	48.272	179.5	DLI1	(HRI)	7	0000	BxxQHx	901	1601	1255.04	1150	1370	9.4
116	208	28	2577.148	48.053	40.0	DLI2	(MRI)	0	0000	BxxQHx	0	91	24.86	1	78	8.7
117	209	28	2577.148	48.053	40.0	SLI	(SLI)	0	0000	BxxQHx	0	190	43.21	1	114	9.2
118	210	28	2577.148	48.053	40.0	DLI1	(HRI)	0	0000	BxxQHx	1	340	52.89	1	172	7.7
119	212	34	2974.113	42.120	230.2	SLI	(SLI)	9	0000	BxxQHE	17	1541	1099.08	474	1854	7.6
120	214	34	2977.146	42.079	274.7	DLI2	(MRI)	9	0000	BxxQHE	16	859	762.03	654	890	15
121	215	34	2977.146	42.079	274.7	SLI	(SLI)	9	0000	BxxQHE	13	1514	1142.21	576	1772	9
122	216	34	2977.146	42.079	274.7	DLI1	(HRI)	9	0000	BxxQHE	1317	1884	1626.38	1580	1676	8.4

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
123	220	34	3011.991	41.610	120.0	DLI2	(MRI)	8	0000	BxxQHE	8	676	596.24	516	700	12.5
124	221	34	3011.991	41.610	120.0	SLI	(SLI)	8	0000	BxxQHE	16	2626	1331.61	0	0	9.4
125	223	34	3016.798	41.545	197.2	DLI2	(MRI)	9	0000	BxxQHE	8	796	705.17	622	814	7.6
126	226	34	3025.334	41.430	333.5	DLI2	(MRI)	9	0000	BxxQHE	24	880	709.24	615	817	7.1
127	227	34	3025.334	41.430	333.5	SLI	(SLI)	9	0000	BxxQHE	11	1487	1077.52	473	1783	7.6
128	229	34	3043.132	41.193	254.9	DLI2	(MRI)	9	0000	BxxQHE	20	845	748.12	638	874	15.6
129	230	34	3043.132	41.193	254.9	SLI	(SLI)	9	0000	BxxQHE	12	1514	1130.33	546	1794	8.3
130	231	34	3043.132	41.193	254.9	DLI1	(HRI)	9	0000	BxxQHE	1272	1850	1603.9	1551	1665	7.5
131	233	34	3059.762	40.974	158.9	SLI	(SLI)	8	0000	BxxQHE	14	2026	1056.69	0	0	11.1
132	234	34	3059.762	40.974	158.9	DLI1	(HRI)	8	0000	BxxQHE	859	1517	1260.44	1143	1389	5.3
133	237	34	3066.419	40.887	267.4	DLI1	(HRI)	7	0000	BxxQHE	923	1660	1282.75	1234	1338	8.2
134	239	34	3074.481	40.781	33.0	SLI	(SLI)	9	0000	BxxQHE	14	1849	1107.71	0	0	13.1
135	241	34	3093.346	40.535	317.5	DLI2	(MRI)	9	0000	BxxQHE	16	886	746.41	620	892	5.1
136	243	34	3093.346	40.535	317.5	DLI1	(HRI)	9	0000	BxxQHE	1187	1768	1596.74	1514	1690	4
137	247	41	3655.204	33.977	258.8	DLI2	(MRI)	11	0000	BxxQHE	20	901	782.02	662	926	6.4
138	250	41	3658.491	33.942	304.5	DLI2	(MRI)	9	0000	BxxQHE	24	793	610.06	533	699	6.1
139	253	41	3681.615	33.701	271.6	DLI2	(MRI)	9	0000	BxxQHE	16	716	621.22	534	726	8.6
140	256	41	3684.931	33.666	317.8	DLI2	(MRI)	12	0000	BxxQHE	20	1011	793.45	694	914	9.6
141	259	41	3696.560	33.545	119.4	DLI2	(MRI)	11	0000	BxxQHE	16	887	664.41	595	753	6.7
142	262	41	3706.605	33.437	264.1	DLI2	(MRI)	11	0000	BxxQHE	28	896	776.94	661	915	9.7
143	265	41	3719.953	33.298	91.2	DLI2	(MRI)	12	0000	BxxQHE	20	860	726.53	599	889	6.5
144	268	41	3729.247	33.202	219.2	DLI2	(MRI)	10	0000	BxxQHE	20	735	647.04	573	739	5.7
145	271	41	3742.730	33.063	48.2	DLI2	(MRI)	11	0000	BxxQHE	0	880	653.36	606	710	7.7
146	273	41	3742.730	33.063	48.2	DLI1	(HRI)	11	0000	BxxQHE	1099	1918	1540.32	1388	1704	8.6
147	275	41	3752.885	32.959	189.9	SLI	(SLI)	11	0000	BxxQHE	12	2306	1289.75	0	0	10.9
148	277	41	3768.152	32.805	52.4	DLI2	(MRI)	12	0000	BxxQHE	16	931	710.72	648	788	10.7
149	278	41	3768.152	32.805	52.4	SLI	(SLI)	12	0000	BxxQHE	18	2393	1270.31	0	0	8.3
150	280	41	3792.579	32.559	16.4	DLI2	(MRI)	8	0000	BxxQHE	28	633	489.18	444	540	6.8
151	282	41	3792.579	32.559	16.4	DLI1	(HRI)	8	0000	BxxQHE	832	1413	1122.61	1012	1240	6.2
152	283	48	4340.143	27.443	175.4	DLI2	(MRI)	9	0000	BxxQHE	26	671	493.06	446	550	7.8
153	286	48	4344.141	27.407	219.2	DLI2	(MRI)	14	0000	BxxQHE	40	970	778.95	678	898	6.1
154	289	48	4366.215	27.217	100.7	DLI2	(MRI)	14	0000	BxxQHE	20	833	712.66	608	836	9.5
155	290	48	4366.215	27.217	100.7	SLI	(SLI)	14	0000	BxxQHE	20	3483	1577.83	0	0	9.8
156	292	48	4370.242	27.183	142.5	DLI2	(MRI)	14	0000	BxxQHE	8	873	726.33	650	826	6.3
157	294	48	4370.242	27.183	142.5	DLI1	(HRI)	14	0000	BxxQHE	1261	2182	1686.14	1513	1899	7
158	296	48	4382.328	27.081	261.1	SLI	(SLI)	10	0000	BxxQHE	10	1413	915.98	358	1606	14.6

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
159	297	48	4382.328	27.081	261.1	DLI1	(HRI)	10	0000	BxxQHE	970	1517	1309.63	1240	1380	8.2
160	299	48	4396.638	26.957	51.0	SLI	(SLI)	14	0000	BxxQHE	18	2830	1439.03	0	0	9.7
161	300	48	4396.638	26.957	51.0	DLI1	(HRI)	14	0000	BxxQHE	1283	2122	1767.41	1644	1916	6.1
162	302	48	4402.640	26.904	115.4	SLI	(SLI)	14	0000	BxxQHE	20	3229	1462.77	0	0	9.4
163	303	48	4402.640	26.904	115.4	DLI1	(HRI)	14	0000	BxxQHE	1118	1972	1645.58	1478	1846	5.3
164	305	48	4422.928	26.728	329.5	SLI	(SLI)	12	0000	BxxQHE	11	1664	1080.48	362	1962	7
165	307	48	4429.851	26.669	42.7	DLI2	(MRI)	14	0000	BxxQHE	14	1118	754.71	694	826	6.9
166	310	48	4449.594	26.501	254.8	DLI2	(MRI)	14	0000	BxxQHE	16	957	822.04	707	953	4.1
167	312	48	4449.594	26.501	254.8	DLI1	(HRI)	14	0000	BxxQHE	1413	2102	1814.42	1718	1910	3.8
168	315	48	4457.806	26.429	344.1	DLI1	(HRI)	14	0000	BxxQHE	1389	1972	1759.18	1661	1871	7.2
169	317	48	4493.170	26.130	26.2	SLI	(SLI)	14	0000	BxxQHE	18	2306	1267.12	0	0	9.1
170	319	50	4858.373	23.191	286.0	DLI2	(MRI)	16	0000	BxxQHE	12	1197	901.05	787	1033	8.6
171	321	50	4858.373	23.191	286.0	DLI1	(HRI)	16	0000	BxxQHE	1573	2438	1979.48	1918	2050	7.8
172	323	50	4863.924	23.147	346.4	SLI	(SLI)	17	0000	BxxQHE	12	2263	1342.29	0	0	9.2
173	324	50	4863.924	23.147	346.4	DLI1	(HRI)	17	0000	BxxQHE	1517	2350	1946.61	1845	2055	6.5
174	326	50	4886.309	22.976	223.2	SLI	(SLI)	16	0000	BxxQHE	12	2349	1333.46	0	0	8.9
175	328	50	4894.781	22.912	308.2	DLI2	(MRI)	15	0000	BxxQHE	40	1081	823.94	725	935	8.5
176	330	50	4894.781	22.912	308.2	DLI1	(HRI)	15	0000	BxxQHE	1341	2222	1817.47	1739	1897	7.2
177	332	50	4903.298	22.846	34.5	SLI	(SLI)	15	0000	BxxQHE	14	2306	1219.69	0	0	8.4
178	334	50	4911.798	22.781	120.4	DLI2	(MRI)	16	0000	BxxQHE	1	828	718.98	623	825	8.3
179	335	50	4911.798	22.781	120.4	SLI	(SLI)	16	0000	BxxQHE	20	3229	1427.3	0	0	5.5
180	337	50	4934.439	22.607	344.9	DLI2	(MRI)	16	0000	BxxQHE	24	1099	835.98	730	950	6.9
181	339	50	4934.439	22.607	344.9	DLI1	(HRI)	16	0000	BxxQHE	1413	2264	1901.42	1791	2037	6.7
182	341	50	4940.921	22.558	42.7	SLI	(SLI)	16	0000	BxxQHE	14	2349	1199.07	0	0	8.1
183	343	50	4948.626	22.500	103.8	DLI2	(MRI)	10	0000	BxxQHE	23	530	462.51	414	518	6.7
184	345	50	4948.626	22.500	103.8	DLI1	(HRI)	10	0000	BxxQHE	769	1283	1060.06	945	1199	5.3
185	347	50	4976.883	22.287	283.9	SLI	(SLI)	13	0000	BxxQHE	15	1630	1022.65	405	1847	13.1
186	349	50	4985.384	22.223	334.0	DLI2	(MRI)	16	0000	BxxQHE	40	1099	819.33	717	927	8.8
187	350	50	4985.384	22.223	334.0	SLI	(SLI)	16	0000	BxxQHE	16	2063	1257.52	0	0	8.5
188	352	50	5025.209	21.923	276.0	DLI2	(MRI)	16	0000	BxxQHE	36	978	858.09	752	980	7.8
189	354	50	5025.209	21.923	276.0	DLI1	(HRI)	16	0000	BxxQHE	1517	2222	1894.97	1822	1970	7.7
190	356	51	5199.304	20.637	190.7	SLI	(SLI)	17	0000	BxxQHE	18	2626	1334.13	0	0	16.2
191	357	51	5199.304	20.637	190.7	DLI1	(HRI)	17	0000	BxxQHE	1272	2285	1744.93	1622	1886	8.7
192	359	51	5205.747	20.590	258.5	SLI	(SLI)	19	0000	BxxQHE	12	2438	1435.27	0	0	8.7
193	360	51	5205.747	20.590	258.5	DLI1	(HRI)	19	0000	BxxQHE	1531	2438	2047.24	1883	2217	6.7
194	362	51	5225.375	20.452	94.3	SLI	(SLI)	18	0000	BxxQHE	18	3618	1539.7	0	0	8.3

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
195	364	51	5237.900	20.364	209.4	DLI2	(MRI)	13	0000	BxxQHE	8	680	582.8	500	684	8.3
196	367	51	5242.846	20.329	254.0	DLI2	(MRI)	16	0000	BxxQHE	12	917	806.49	698	918	6.8
197	370	51	5251.671	20.265	333.0	DLI2	(MRI)	19	0000	BxxQHE	36	1218	931.49	811	1057	4.5
198	372	51	5251.671	20.265	333.0	DLI1	(HRI)	19	0000	BxxQHE	1630	2394	2084.95	1954	2234	3.7
199	375	51	5263.246	20.182	73.6	DLI1	(HRI)	19	0000	BxxQHE	1329	2142	1815.3	1662	1986	7.1
200	378	51	5280.701	20.056	231.0	DLI1	(HRI)	16	0000	BxxQHE	1239	2243	1671.5	1502	1870	6.6
201	380	51	5289.452	19.994	318.1	SLI	(SLI)	14	0000	BxxQHE	13	1616	987.95	397	1795	12
202	382	51	5301.105	19.912	78.3	DLI2	(MRI)	19	0000	BxxQHE	16	1207	769.98	689	855	16.6
203	383	51	5301.105	19.912	78.3	SLI	(SLI)	19	0000	BxxQHE	12	2830	1314.21	0	0	8.2
204	384	51	5301.105	19.912	78.3	DLI1	(HRI)	19	0000	BxxQHE	1377	2285	1802.64	1638	1990	8.8
205	386	51	5318.586	19.786	262.8	SLI	(SLI)	18	0000	BxxQHE	16	2306	1378.52	0	0	8.7
206	388	51	5327.324	19.724	354.1	DLI2	(MRI)	19	0000	BxxQHE	1	1261	876.03	794	970	6.3
207	390	51	5327.324	19.724	354.1	DLI1	(HRI)	19	0000	BxxQHE	1573	2350	2012.47	1895	2141	6.1
208	391	54	5728.691	16.980	339.9	DLI2	(MRI)	20	0000	BxxQHE	4	1228	873.24	788	972	7.9
209	394	54	5734.449	16.942	34.1	DLI2	(MRI)	21	0000	BxxQHE	20	971	847.68	719	965	5.8
210	397	54	5756.588	16.797	241.7	DLI2	(MRI)	21	0000	BxxQHE	28	1090	877.41	724	1040	8
211	398	54	5756.588	16.797	241.7	SLI	(SLI)	21	0000	BxxQHE	12	2222	1295.93	0	0	7.8
212	400	54	5764.764	16.743	317.0	DLI2	(MRI)	20	0000	BxxQHE	40	1157	921.25	781	1079	8.7
213	402	54	5764.764	16.743	317.0	DLI1	(HRI)	20	0000	BxxQHE	1451	2530	1994.14	1806	2174	7.3
214	404	54	5772.955	16.689	32.1	SLI	(SLI)	20	0000	BxxQHE	14	2306	1183.15	0	0	7.2
215	406	54	5783.747	16.618	133.2	DLI2	(MRI)	18	0000	BxxQHE	32	873	689.19	587	789	7.1
216	407	54	5783.747	16.618	133.2	SLI	(SLI)	18	0000	BxxQHE	16	2938	1277.75	0	0	5.9
217	409	54	5803.181	16.490	324.4	DLI2	(MRI)	20	0000	BxxQHE	36	1250	914.56	788	1060	6.7
218	412	54	5808.759	16.455	18.4	DLI2	(MRI)	21	0000	BxxQHE	16	1099	880.25	746	982	5.6
219	414	54	5808.759	16.455	18.4	DLI1	(HRI)	21	0000	BxxQHE	1426	2350	1998.77	1787	2209	6.1
220	418	54	5842.962	16.229	355.5	DLI2	(MRI)	21	0000	BxxQHE	30	1283	879.43	803	961	6.2
221	420	54	5842.962	16.229	355.5	DLI1	(HRI)	21	0000	BxxQHE	1426	2328	1965.82	1756	2160	5.6
222	424	54	5875.791	16.015	302.0	DLI2	(MRI)	16	0000	BxxQHE	12	962	723.84	621	831	6.7
223	426	54	5875.791	16.015	302.0	DLI1	(HRI)	16	0000	BxxQHE	1177	1954	1562.35	1442	1678	6.3
224	428	55	6069.604	14.783	330.2	SLI	(SLI)	21	0000	BxxQHE	16	2064	1212.8	426	2318	13.2
225	429	55	6069.604	14.783	330.2	DLI1	(HRI)	21	0000	BxxQHE	1329	2222	1896.21	1674	2114	7.3
226	431	55	6074.770	14.750	15.6	SLI	(SLI)	22	0000	BxxQHE	12	2438	1281.6	0	0	7.4
227	433	55	6095.430	14.618	210.5	DLI2	(MRI)	21	0000	BxxQHE	32	924	791.83	682	918	8.9
228	436	55	6103.179	14.570	283.0	DLI2	(MRI)	21	0000	BxxQHE	24	1065	898.74	706	1074	7.7
229	438	55	6103.179	14.570	283.0	DLI1	(HRI)	21	0000	BxxQHE	1353	2131	1882	1690	2146	8.4
230	440	55	6110.936	14.521	355.6	SLI	(SLI)	22	0000	BxxQHE	12	2263	1243.09	0	0	7.6

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
231	442	55	6121.281	14.457	96.7	DLI2	(MRI)	22	0000	BxxQHE	8	1081	765.15	674	866	6.1
232	444	55	6121.281	14.457	96.7	DLI1	(HRI)	22	0000	BxxQHE	1306	2122	1780.5	1610	1962	5.3
233	446	55	6139.457	14.344	279.4	SLI	(SLI)	22	0000	BxxQHE	15	2182	1303.4	510	2418	11.5
234	448	55	6147.327	14.295	355.5	DLI2	(MRI)	22	0000	BxxQHE	48	1228	877.54	799	957	4.1
235	450	55	6147.327	14.295	355.5	DLI1	(HRI)	22	0000	BxxQHE	1426	2438	1950.85	1720	2168	3.7
236	453	55	6155.162	14.246	71.0	DLI1	(HRI)	17	0000	BxxQHE	962	1768	1401.82	1262	1570	8.1
237	455	55	6181.350	14.085	324.2	SLI	(SLI)	22	0000	BxxQHE	14	2222	1292.29	462	2458	12.6
238	457	55	6207.675	13.924	202.3	DLI2	(MRI)	22	0000	BxxQHE	1	1072	788.98	678	914	5.6
239	459	55	6207.675	13.924	202.3	DLI1	(HRI)	22	0000	BxxQHE	1329	2102	1782.26	1656	1928	5.5
240	461	55	6223.477	13.827	343.6	SLI	(SLI)	22	0000	BxxQHE	12	2222	1253.06	0	0	16
241	462	55	6223.477	13.827	343.6	DLI1	(HRI)	22	0000	BxxQHE	1426	2372	1962.1	1727	2193	7.9
242	464	56	6407.207	12.722	187.0	SLI	(SLI)	24	0000	BxxQHE	14	2577	1291.13	0	0	6.4
243	466	56	6415.380	12.672	263.0	DLI2	(MRI)	26	0000	BxxQHE	24	1197	980.44	770	1210	15.6
244	467	56	6415.380	12.672	263.0	SLI	(SLI)	26	0000	BxxQHE	14	2483	1425.73	0	0	8.5
245	468	56	6415.380	12.672	263.0	DLI1	(HRI)	26	0000	BxxQHE	1630	2530	2079.91	1975	2221	9
246	470	56	6423.561	12.623	339.6	SLI	(SLI)	24	0000	BxxQHE	16	2306	1300.63	0	0	15.5
247	471	56	6423.561	12.623	339.6	DLI1	(HRI)	24	0000	BxxQHE	1426	2438	2042.53	1784	2320	8
248	473	56	6445.387	12.492	177.6	SLI	(SLI)	24	0000	BxxQHE	16	2883	1373.29	0	0	14.2
249	474	56	6445.387	12.492	177.6	DLI1	(HRI)	24	0000	BxxQHE	1401	2285	1838.27	1738	1958	7.4
250	476	56	6450.842	12.461	224.6	SLI	(SLI)	24	0000	BxxQHE	18	2530	1344.82	0	0	14.7
251	477	56	6450.842	12.461	224.6	DLI1	(HRI)	24	0000	BxxQHE	1451	2264	1921.73	1789	2087	7.1
252	479	56	6461.805	12.397	315.4	SLI	(SLI)	24	0000	BxxQHE	15	2259	1318.57	509	2479	11.1
253	480	56	6461.805	12.397	315.4	DLI1	(HRI)	24	0000	BxxQHE	1477	2484	2015.43	1772	2308	5.7
254	482	56	6475.522	12.318	63.7	SLI	(SLI)	21	0000	BxxQHE	14	2530	1151.73	0	0	6.3
255	484	56	6486.535	12.255	144.1	DLI2	(MRI)	24	0000	BxxQHE	12	978	803.7	654	978	7.7
256	487	56	6497.543	12.190	224.4	DLI2	(MRI)	25	0000	BxxQHE	20	1306	879.23	746	1026	4.3
257	489	56	6497.543	12.190	224.4	DLI1	(HRI)	25	0000	BxxQHE	1517	2350	1973.62	1834	2142	3.7
258	492	56	6525.171	12.029	88.5	DLI1	(HRI)	25	0000	BxxQHE	1283	2264	1817.86	1659	1993	6.1
259	494	56	6533.488	11.981	156.0	SLI	(SLI)	25	0000	BxxQHE	16	3418	1477.48	0	0	6.6
260	496	56	6569.504	11.769	108.7	DLI2	(MRI)	25	0000	BxxQHE	12	1137	784.39	678	914	6.5
261	498	56	6569.504	11.769	108.7	DLI1	(HRI)	25	0000	BxxQHE	1261	2264	1836.35	1649	2035	6.1
262	500	57	6740.531	10.785	77.0	SLI	(SLI)	26	0000	BxxQHE	16	2726	1252.03	0	0	6.4
263	501	57	6740.531	10.785	77.0	DLI1	(HRI)	26	0000	BxxQHE	1329	2372	1862.23	1694	2062	6.5
264	503	57	6746.249	10.752	122.5	SLI	(SLI)	27	0000	BxxQHE	14	3229	1407.76	0	0	13.3
265	505	57	6757.682	10.687	218.2	DLI2	(MRI)	26	0000	BxxQHE	40	1099	846.93	725	979	8
266	507	57	6757.682	10.687	218.2	DLI1	(HRI)	26	0000	BxxQHE	1451	2484	1892.92	1790	2010	8.4

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
267	509	57	6777.725	10.572	23.8	SLI	(SLI)	24	0000	BxxQHE	12	2222	1149.12	0	0	13.6
268	511	57	6783.487	10.540	69.5	DLI2	(MRI)	28	0000	BxxQHE	32	1099	850.09	716	988	8.1
269	514	57	6794.904	10.476	159.2	DLI2	(MRI)	26	0000	BxxQHE	20	984	800.67	645	987	5.8
270	516	57	6794.904	10.476	159.2	DLI1	(HRI)	26	0000	BxxQHE	1329	2222	1772.85	1638	1918	6.4
271	518	57	6803.846	10.425	226.1	SLI	(SLI)	28	0000	BxxQHE	14	2675	1413.4	0	0	6.4
272	520	57	6832.413	10.264	80.4	DLI2	(MRI)	26	0000	BxxQHE	16	1002	780.77	658	922	6.6
273	522	57	6832.413	10.264	80.4	DLI1	(HRI)	26	0000	BxxQHE	1329	2676	1824.43	1648	2052	5.2
274	524	57	6841.619	10.212	152.7	SLI	(SLI)	26	0000	BxxQHE	16	2777	1279.67	0	0	5.8
275	526	57	6855.479	10.136	263.8	DLI2	(MRI)	27	0000	BxxQHE	20	1124	920.08	714	1170	10.4
276	527	57	6855.479	10.136	263.8	SLI	(SLI)	27	0000	BxxQHE	15	2306	1320.44	498	2478	8.1
277	529	57	6869.978	10.055	24.3	DLI2	(MRI)	26	0000	BxxQHE	28	1099	859.6	694	1062	5.7
278	531	57	6869.978	10.055	24.3	DLI1	(HRI)	26	0000	BxxQHE	1477	2651	1924.43	1728	2176	5.5
279	533	57	6893.246	9.924	203.9	SLI	(SLI)	26	0000	BxxQHE	14	2306	1186.34	0	0	12.2
280	535	58	7065.392	8.970	205.7	DLI2	(MRI)	29	0000	BxxQHE	32	1004	856.7	730	1010	8.3
281	538	58	7071.329	8.937	248.7	DLI2	(MRI)	29	0000	BxxQHE	28	1081	913.72	766	1090	8.9
282	541	58	7083.214	8.871	335.5	DLI2	(MRI)	30	0000	BxxQHE	24	1251	1027.99	786	1242	3.9
283	543	58	7083.214	8.871	335.5	DLI1	(HRI)	30	0000	BxxQHE	1587	2778	2126.92	1906	2434	4.2
284	547	58	7110.154	8.723	172.9	DLI2	(MRI)	28	0000	BxxQHE	24	1063	792.99	659	949	8.1
285	550	58	7122.170	8.658	268.3	DLI2	(MRI)	25	0000	BxxQHE	16	1031	803.21	617	1047	6.5
286	553	58	7131.169	8.610	340.9	DLI2	(MRI)	28	0000	BxxQHE	16	1164	939.32	708	1156	6
287	555	58	7131.169	8.610	340.9	DLI1	(HRI)	28	0000	BxxQHE	1504	2676	1951.47	1768	2216	5.9
288	557	58	7149.142	8.511	123.9	SLI	(SLI)	32	0000	BxxQHE	18	3290	1449.82	0	0	12.5
289	558	58	7149.142	8.511	123.9	DLI1	(HRI)	32	0000	BxxQHE	1426	2701	2020.22	1787	2297	5.8
290	560	58	7161.166	8.446	219.2	SLI	(SLI)	30	0000	BxxQHE	12	2438	1264.35	0	0	12.4
291	561	58	7161.166	8.446	219.2	DLI1	(HRI)	30	0000	BxxQHE	1545	2350	1975.21	1850	2114	6
292	564	58	7170.164	8.398	286.3	DLI1	(HRI)	28	0000	BxxQHE	1490	2306	1917.39	1830	2022	8.6
293	566	58	7188.228	8.302	61.7	SLI	(SLI)	28	0000	BxxQHE	12	2626	1206.1	0	0	13.1
294	568	58	7200.310	8.236	153.8	DLI2	(MRI)	30	0000	BxxQHE	24	1026	843.52	684	1044	6.8
295	571	59	7388.261	7.229	88.0	DLI2	(MRI)	29	0000	BxxQHE	1	1157	758.49	640	912	7.7
296	574	59	7397.540	7.181	156.4	DLI2	(MRI)	34	0000	BxxQHE	8	1127	891.61	752	1068	7.7
297	576	59	7397.540	7.181	156.4	DLI1	(HRI)	34	0000	BxxQHE	1504	2676	2059.43	1902	2254	7.6
298	578	59	7403.735	7.148	200.8	SLI	(SLI)	32	0000	BxxQHE	14	2577	1273.33	0	0	11.6
299	580	59	7428.478	7.016	16.4	DLI2	(MRI)	32	0000	BxxQHE	32	1181	921.18	736	1184	7.4
300	582	59	7428.478	7.016	16.4	DLI1	(HRI)	32	0000	BxxQHE	1377	3229	2042.25	1844	2292	7.5
301	584	59	7437.739	6.968	83.3	SLI	(SLI)	33	0000	BxxQHE	14	2993	1310.77	0	0	12.6
302	586	59	7443.943	6.935	132.2	DLI2	(MRI)	32	0000	BxxQHE	36	959	811.15	688	960	5.8

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
303	589	59	7456.311	6.871	230.7	DLI2	(MRI)	32	0000	BxxQHE	24	1076	898.28	756	1072	6.5
304	592	59	7484.363	6.723	66.3	DLI2	(MRI)	32	0000	BxxQHE	32	1042	839.7	678	1046	6.4
305	595	59	7490.659	6.690	109.9	DLI2	(MRI)	32	0000	BxxQHE	24	1090	805.13	706	926	4
306	597	59	7490.659	6.690	109.9	DLI1	(HRI)	32	0000	BxxQHE	1451	2830	1923.91	1678	2266	3.9
307	601	59	7525.484	6.509	338.5	DLI2	(MRI)	33	0000	BxxQHE	28	1228	1002.29	754	1254	6.8
308	603	59	7525.484	6.509	338.5	DLI1	(HRI)	33	0000	BxxQHE	1587	2530	2084.72	1980	2208	5.7
309	605	59	7534.411	6.463	39.7	SLI	(SLI)	31	0000	BxxQHE	14	2306	1168.04	0	0	12
310	606	59	7534.411	6.463	39.7	DLI1	(HRI)	31	0000	BxxQHE	1451	2578	1926.34	1693	2255	5.2
311	608	60	7719.469	5.509	25.4	SLI	(SLI)	36	0000	BxxQHE	14	2530	1314.79	0	0	11.2
312	609	60	7719.469	5.509	25.4	DLI1	(HRI)	36	0000	BxxQHE	1426	2857	2149.89	1927	2437	5.7
313	611	60	7735.427	5.429	137.6	SLI	(SLI)	30	0000	BxxQHE	10	2577	1143.38	0	0	9.5
314	613	60	7741.798	5.396	181.4	DLI2	(MRI)	37	0000	BxxQHE	24	1218	898.96	762	1086	7.9
315	615	60	7741.798	5.396	181.4	DLI1	(HRI)	37	0000	BxxQHE	1531	2752	2062.02	1923	2213	8.9
316	617	60	7751.383	5.348	245.8	SLI	(SLI)	33	0000	BxxQHE	12	2263	1221.24	0	0	5.4
317	619	60	7760.960	5.300	309.4	DLI2	(MRI)	34	0000	BxxQHE	24	1277	972.89	730	1274	9.3
318	620	60	7760.960	5.300	309.4	SLI	(SLI)	34	0000	BxxQHE	14	2269	1348.99	639	2425	6.7
319	621	60	7760.960	5.300	309.4	DLI1	(HRI)	34	0000	BxxQHE	1531	2626	2076.15	1988	2172	5.7
320	624	60	7776.914	5.218	55.8	DLI1	(HRI)	35	0000	BxxQHE	1377	2911	1983.29	1806	2218	7.8
321	626	60	7786.491	5.170	121.7	SLI	(SLI)	34	0000	BxxQHE	14	2993	1285.13	0	0	10.1
322	627	60	7786.491	5.170	121.7	DLI1	(HRI)	34	0000	BxxQHE	1451	2857	1897.27	1696	2188	5.5
323	629	60	7802.449	5.089	223.2	SLI	(SLI)	33	0000	BxxQHE	12	2222	1162.94	0	0	10.3
324	630	60	7802.449	5.089	223.2	DLI1	(HRI)	33	0000	BxxQHE	1294	2394	1889.33	1789	1999	5.6
325	634	60	7821.778	4.993	355.2	DLI2	(MRI)	34	0000	BxxQHE	20	1234	932.53	704	1240	5.8
326	636	60	7821.778	4.993	355.2	DLI1	(HRI)	34	0000	BxxQHE	1426	2830	2003.77	1828	2232	6.2
327	638	60	7831.476	4.945	64.5	SLI	(SLI)	35	0000	BxxQHE	12	2726	1239.48	0	0	11.1
328	639	60	7831.476	4.945	64.5	DLI1	(HRI)	35	0000	BxxQHE	1451	2938	1958.37	1762	2246	6.4
329	641	60	7844.366	4.881	159.2	SLI	(SLI)	35	0000	BxxQHE	14	2530	1196.23	0	0	8.6
330	644	63	8229.464	2.993	308.0	SLI	(SLI)	43	0000	BxxQHE	11	2461	1436.82	644	2588	10.2
331	646	64	8242.120	2.932	35.8	DLI2	(MRI)	43	0000	BxxQHE	40	1531	999.69	777	1295	7.8
332	650	65	8278.271	2.757	250.2	SLI	(SLI)	45	0000	BxxQHE	14	2777	1450.71	0	0	12.1
333	651	65	8278.271	2.757	250.2	DLI1	(HRI)	45	0000	BxxQHE	1784	3169	2425.93	2298	2562	7.7
334	653	66	8290.810	2.697	333.6	SLI	(SLI)	45	0000	BxxQHE	14	2530	1470.9	0	0	10.5
335	654	66	8290.810	2.697	333.6	DLI1	(HRI)	45	0000	BxxQHE	1720	3051	2463.43	2350	2586	8.2
336	656	67	8327.392	2.523	209.6	SLI	(SLI)	44	0000	BxxQHE	12	2675	1297.17	0	0	10.1
337	657	67	8327.392	2.523	209.6	DLI1	(HRI)	44	0000	BxxQHE	1559	2884	2287.36	2152	2424	7.5
338	659	68	8339.957	2.462	295.6	SLI	(SLI)	44	0000	BxxQHE	14	2626	1478.48	0	0	8.8

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
339	660	68	8339.957	2.462	295.6	DLI1	(HRI)	44	0000	BxxQHE	1850	2938	2414.69	2304	2532	8.5
340	662	69	8375.888	2.292	185.6	SLI	(SLI)	44	0000	BxxQHE	14	2830	1323.73	0	0	10
341	663	69	8375.888	2.292	185.6	DLI1	(HRI)	44	0000	BxxQHE	1517	3139	2227.44	2078	2386	8
342	664	70	8388.434	2.232	256.0	DLI2	(MRI)	44	0000	BxxQHE	28	1438	1052.18	940	1168	8.4
343	668	71	8424.239	2.065	117.6	SLI	(SLI)	45	0000	BxxQHE	14	2938	1301.64	0	0	8.6
344	669	71	8424.239	2.065	117.6	DLI1	(HRI)	45	0000	BxxQHE	1545	3051	2215.49	2044	2404	6.9
345	671	72	8436.756	2.005	205.0	SLI	(SLI)	45	0000	BxxQHE	10	2393	1213.14	0	0	10.4
346	672	72	8436.756	2.005	205.0	DLI1	(HRI)	45	0000	BxxQHE	1645	3109	2290.65	2153	2451	7.1
347	674	73	8474.132	1.828	99.8	SLI	(SLI)	47	0000	BxxQHE	10	2938	1306.75	0	0	8.6
348	675	73	8474.132	1.828	99.8	DLI1	(HRI)	47	0000	BxxQHE	1616	3109	2302.05	2132	2492	8.4
349	676	74	8486.639	1.770	182.5	DLI2	(MRI)	47	0000	BxxQHE	0	2102	988.98	926	1058	8.4
350	680	75	8523.303	1.598	84.6	SLI	(SLI)	48	0000	BxxQHE	12	3483	1471.01	0	0	9.3
351	681	75	8523.303	1.598	84.6	DLI1	(HRI)	48	0000	BxxQHE	1477	2778	2322.44	2157	2499	7.8
352	683	76	8535.215	1.543	170.5	SLI	(SLI)	48	0000	BxxQHE	12	3109	1395.62	0	0	10.1
353	684	76	8535.215	1.543	170.5	DLI1	(HRI)	48	0000	BxxQHE	1690	3051	2360.12	2228	2500	8.1
354	686	77	8572.335	1.372	54.5	SLI	(SLI)	49	0000	BxxQHE	16	3050	1432.06	0	0	10.1
355	687	77	8572.335	1.372	54.5	DLI1	(HRI)	49	0000	BxxQHE	1675	3169	2389.82	2218	2586	7.5
356	689	78	8584.864	1.313	132.3	SLI	(SLI)	49	0000	BxxQHE	14	2993	1324.73	0	0	10.6
357	690	78	8584.864	1.313	132.3	DLI1	(HRI)	49	0000	BxxQHE	1630	3354	2332.89	2149	2535	7.9
358	692	79	8621.211	1.142	33.7	SLI	(SLI)	49	0000	BxxQHE	12	2577	1348.4	0	0	9
359	693	79	8621.211	1.142	33.7	DLI1	(HRI)	49	0000	BxxQHE	1752	3418	2437.6	2297	2595	8
360	695	80	8633.560	1.084	121.0	SLI	(SLI)	49	0000	BxxQHE	14	3109	1354	0	0	10.1
361	696	80	8633.560	1.084	121.0	DLI1	(HRI)	49	0000	BxxQHE	1587	3291	2343.98	2159	2537	7.7
362	698	81	8670.850	0.911	355.1	SLI	(SLI)	50	0000	BxxQHE	12	2675	1420.65	0	0	9.9
363	699	81	8670.850	0.911	355.1	DLI1	(HRI)	50	0000	BxxQHE	1784	2994	2503.66	2385	2639	8.2
364	700	82	8683.373	0.852	75.8	DLI2	(MRI)	50	0000	BxxQHE	20	2182	1001.58	925	1091	8.3
365	704	83	8719.110	0.686	304.8	SLI	(SLI)	49	0000	BxxQHE	12	2577	1405.01	0	0	12.5
366	705	83	8719.110	0.686	304.8	DLI1	(HRI)	49	0000	BxxQHE	1884	3051	2504.07	2405	2615	8.5
367	707	84	8731.522	0.629	26.1	SLI	(SLI)	49	0000	BxxQHE	7	2388	1281.11	521	2491	9.5
368	708	84	8731.522	0.629	26.1	DLI1	(HRI)	49	0000	BxxQHE	1752	2884	2401.34	2270	2550	7.7
369	710	85	8769.390	0.455	274.3	SLI	(SLI)	49	0001	BxxQHE	12	2577	1386.98	0	0	13.8
370	711	85	8769.390	0.455	274.3	DLI1	(HRI)	49	0001	BxxQHE	2122	3868	3092.15	2250	4010	8.9
371	713	86	8782.124	0.397	7.9	SLI	(SLI)	49	0001	BxxQHE	14	2530	1326.22	0	0	10.6
372	714	86	8782.124	0.397	7.9	DLI1	(HRI)	49	0001	BxxQHE	2166	3813	3011.65	2139	3969	10.7
373	716	87	8810.557	0.268	192.5	Half DLI1	(Half HRI)	35	0001	BxxQHE	1490	2845	2296.57	1394	2890	8.8

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
374	718	88	8813.559	0.255	211.0	Half DLI1	(Half HRI)	35	0001	BxxQHE	1499	2726	2314.86	1423	2901	9.9
375	719	89	8817.588	0.237	235.6	Half DLI1	(Half HRI)	35	0001	BxxQHE	1531	2507	1944.54	1459	2849	7
376	721	90	8822.467	0.215	265.0	Half DLI1	(Half HRI)	35	0001	BxxQHE	1558	2253	1997.19	1548	2832	8.7
377	723	151	9008.472	0.000	180.0	DLI2	(MRI)	50	0001	BxxQHE	139	4056	3646.22	0	0	7.6
378	724	151	9008.472	0.000	180.0	SLI	(SLI)	50	0001	BxxQHE	82	4056	1583.93	0	0	10.2
379	725	151	9008.472	0.000	180.0	DLI1	(HRI)	50	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
380	727	152	9015.432	0.000	180.0	SLI	(SLI)	39	0001	BxxQHE	64	4056	1248.26	0	0	8
381	728	152	9015.432	0.000	180.0	DLI1	(HRI)	39	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
382	730	152	9025.663	0.000	180.0	SLI	(SLI)	36	0001	BxxQHE	70	3904	1170.6	0	0	5.6
383	732	152	9046.121	0.000	180.0	DLI2	(MRI)	37	0001	BxxQHE	121	4056	3200.08	0	0	8.8
384	734	152	9046.121	0.000	180.0	DLI1	(HRI)	37	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
385	736	152	9059.747	0.000	180.0	SLI	(SLI)	37	0001	BxxQHE	55	4056	1184.26	0	0	7.9
386	738	152	9069.987	0.000	180.0	DLI2	(MRI)	37	0001	BxxQHE	121	4056	3222.14	0	0	7
387	740	152	9069.987	0.000	180.0	DLI1	(HRI)	37	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
388	742	152	9076.801	0.000	180.0	SLI	(SLI)	36	0001	BxxQHE	91	3831	1168.75	0	0	3.7
389	744	152	9090.442	0.000	180.0	DLI2	(MRI)	37	0001	BxxQHE	121	4056	3199.03	0	0	9
390	746	152	9090.442	0.000	180.0	DLI1	(HRI)	37	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
391	748	152	9104.607	0.000	180.0	SLI	(SLI)	38	0001	BxxQHE	76	4056	1231.1	0	0	5.5
392	750	152	9114.304	0.000	180.0	DLI2	(MRI)	38	0001	BxxQHE	121	4056	3241.13	0	0	7
393	752	152	9114.304	0.000	180.0	DLI1	(HRI)	38	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
394	754	152	9121.119	0.000	180.0	SLI	(SLI)	38	0001	BxxQHE	70	4056	1229.7	0	0	5.5
395	756	152	9165.386	0.000	180.0	DLI2	(MRI)	37	0001	BxxQHE	127	4056	3219.92	0	0	7.2
396	758	152	9165.386	0.000	180.0	DLI1	(HRI)	37	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
397	760	152	9175.653	0.000	180.0	SLI	(SLI)	39	0001	BxxQHE	67	4056	1260.56	0	0	7.3
398	762	153	9378.506	0.000	180.0	DLI2	(MRI)	40	0001	BxxQHE	136	4056	3338.61	0	0	9.6
399	764	153	9378.506	0.000	180.0	DLI1	(HRI)	40	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
400	767	153	9385.318	0.000	180.0	DLI1	(HRI)	41	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
401	769	153	9398.958	0.000	180.0	SLI	(SLI)	41	0001	BxxQHE	91	4056	1306.22	0	0	3.8
402	770	153	9398.958	0.000	180.0	DLI1	(HRI)	41	0001	BxxQHE	3748	4086	4003.82	3704	4095	3.8
403	773	153	9416.770	0.000	180.0	DLI1	(HRI)	43	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
404	775	153	9422.825	0.000	180.0	SLI	(SLI)	39	0001	BxxQHE	64	4056	1243.58	0	0	8
405	777	153	9433.484	0.000	180.0	DLI2	(MRI)	40	0001	BxxQHE	133	4056	3321.96	0	0	7.4
406	779	153	9433.484	0.000	180.0	DLI1	(HRI)	40	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
407	781	153	9443.278	0.000	180.0	SLI	(SLI)	40	0001	BxxQHE	167	4056	1290.68	0	0	5.6
408	783	153	9453.506	0.000	180.0	DLI2	(MRI)	42	0001	BxxQHE	127	4056	3417.12	0	0	6
409	785	153	9453.506	0.000	180.0	DLI1	(HRI)	42	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
410	787	153	9470.538	0.000	180.0	SLI	(SLI)	42	0001	BxxQHE	70	4056	1336.14	0	0	7.3
411	789	153	9477.369	0.000	180.0	DLI2	(MRI)	39	0001	BxxQHE	124	4056	3301.98	0	0	7.4
412	791	153	9477.369	0.000	180.0	DLI1	(HRI)	39	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
413	793	153	9487.596	0.000	180.0	SLI	(SLI)	39	0001	BxxQHE	76	4056	1244.07	0	0	5.6
414	795	153	9531.863	0.000	180.0	DLI2	(MRI)	40	0001	BxxQHE	127	4056	3322.64	0	0	5.9
415	798	154	9693.854	0.000	180.0	DLI2	(MRI)	23	0001	BxxQHE	97	4056	2488.7	0	0	5.8
416	800	154	9693.854	0.000	180.0	DLI1	(HRI)	23	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
417	802	154	9697.268	0.000	180.0	SLI	(SLI)	22	0001	BxxQHE	48	2438	734.15	0	0	5.5
418	804	154	9707.563	0.000	180.0	DLI2	(MRI)	23	0001	BxxQHE	106	4056	2517.24	0	0	8.9
419	806	154	9707.563	0.000	180.0	DLI1	(HRI)	23	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
420	808	154	9731.356	0.000	180.0	SLI	(SLI)	22	0001	BxxQHE	64	2349	718.95	0	0	3.8
421	809	154	9731.356	0.000	180.0	DLI1	(HRI)	22	0001	BxxQHE	3748	4086	4003.82	3704	4095	3.8
422	813	154	9744.995	0.000	180.0	DLI2	(MRI)	22	0001	BxxQHE	103	4056	2428.66	0	0	8.9
423	815	154	9744.995	0.000	180.0	DLI1	(HRI)	22	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
424	817	154	9755.379	0.000	180.0	SLI	(SLI)	22	0001	BxxQHE	52	2438	717.78	0	0	7.6
425	819	154	9768.854	0.000	180.0	DLI2	(MRI)	23	0001	BxxQHE	100	4056	2489.96	0	0	6.4
426	821	154	9768.854	0.000	180.0	DLI1	(HRI)	23	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
427	823	154	9792.715	0.000	180.0	SLI	(SLI)	23	0001	BxxQHE	55	2626	765.51	0	0	7.8
428	825	154	9799.534	0.000	180.0	DLI2	(MRI)	23	0001	BxxQHE	103	4056	2491.14	0	0	5.9
429	828	154	9806.361	0.000	180.0	DLI2	(MRI)	22	0001	BxxQHE	100	4056	2461.72	0	0	6
430	830	154	9806.361	0.000	180.0	DLI1	(HRI)	22	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
431	832	154	9843.830	0.000	180.0	SLI	(SLI)	22	0001	BxxQHE	52	2438	718.69	0	0	5.5
432	834	155	10002.475	0.000	180.0	DLI2	(MRI)	25	0001	BxxQHE	106	4056	2608.95	0	0	7.8
433	835	155	10002.475	0.000	180.0	SLI	(SLI)	25	0001	BxxQHE	52	2830	813.44	0	0	9.1
434	837	155	10005.789	0.000	180.0	DLI2	(MRI)	24	0001	BxxQHE	103	4056	2550.57	0	0	6.1
435	839	155	10005.789	0.000	180.0	DLI1	(HRI)	24	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
436	841	155	10026.370	0.000	180.0	SLI	(SLI)	25	0001	BxxQHE	50	2830	829.55	0	0	5.8
437	843	155	10033.580	0.000	180.0	DLI2	(MRI)	24	0001	BxxQHE	112	4056	2578.43	0	0	9.2
438	845	155	10033.580	0.000	180.0	DLI1	(HRI)	24	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
439	847	155	10040.874	0.000	180.0	SLI	(SLI)	25	0001	BxxQHE	50	2777	814.26	0	0	7.4
440	849	155	10053.512	0.000	180.0	DLI2	(MRI)	24	0001	BxxQHE	100	4056	2579.95	0	0	4.6
441	851	155	10053.512	0.000	180.0	DLI1	(HRI)	24	0001	BxxQHE	3748	4086	4003.82	3704	4095	3.8
442	854	155	10063.742	0.000	180.0	DLI1	(HRI)	24	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
443	856	155	10091.310	0.000	180.0	SLI	(SLI)	23	0001	BxxQHE	55	2577	766.53	0	0	5.6
444	858	155	10097.828	0.000	180.0	DLI2	(MRI)	24	0001	BxxQHE	103	4056	2580.63	0	0	6.1
445	860	155	10097.828	0.000	180.0	DLI1	(HRI)	24	0001	BxxQHE	3755	4086	4003.6	3704	4095	5.8
446	862	155	10111.456	0.000	180.0	SLI	(SLI)	26	0001	BxxQHE	46	2830	845.78	0	0	7.4
447	864	155	10118.287	0.000	180.0	DLI2	(MRI)	23	0001	BxxQHE	115	4056	2522.45	0	0	9.1
448	866	155	10118.287	0.000	180.0	DLI1	(HRI)	23	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
449	868	155	10142.141	0.000	180.0	SLI	(SLI)	23	0001	BxxQHE	50	2626	768.22	0	0	5.6
450	870	156	10317.726	0.000	180.0	DLI2	(MRI)	13	0001	BxxQHE	85	4056	1844.74	0	0	8.6
451	872	156	10317.726	0.000	180.0	DLI1	(HRI)	13	0001	BxxQHE	3051	4086	4001.04	3704	4095	7.7
452	874	156	10321.135	0.000	180.0	SLI	(SLI)	14	0001	BxxQHE	38	1572	469.98	0	0	7.8
453	876	156	10331.363	0.000	180.0	DLI2	(MRI)	14	0001	BxxQHE	88	4056	1917.73	0	0	6.3
454	878	156	10331.363	0.000	180.0	DLI1	(HRI)	14	0001	BxxQHE	3755	4086	4002.98	3704	4095	5.8
455	881	156	10355.222	0.000	180.0	DLI1	(HRI)	13	0001	BxxQHE	3260	4086	4000.82	3704	4095	7.6
456	883	156	10365.447	0.000	180.0	SLI	(SLI)	14	0001	BxxQHE	40	1572	470.27	0	0	7.8
457	885	156	10368.864	0.000	180.0	DLI2	(MRI)	13	0001	BxxQHE	85	4056	1845.58	0	0	8.8
458	887	156	10368.864	0.000	180.0	DLI1	(HRI)	13	0001	BxxQHE	3169	4086	4001.05	3704	4095	7.7
459	889	156	10379.163	0.000	180.0	SLI	(SLI)	13	0001	BxxQHE	36	1490	455.01	0	0	5.7
460	891	156	10392.724	0.000	180.0	DLI2	(MRI)	13	0001	BxxQHE	85	4056	1883.04	0	0	6.6
461	893	156	10392.724	0.000	180.0	DLI1	(HRI)	13	0001	BxxQHE	3418	4086	4002.45	3704	4095	5.8
462	895	156	10416.584	0.000	180.0	SLI	(SLI)	13	0001	BxxQHE	42	1463	439.02	0	0	5.7
463	897	156	10423.411	0.000	180.0	DLI2	(MRI)	14	0001	BxxQHE	91	4056	1924.89	0	0	6.7
464	899	156	10423.411	0.000	180.0	DLI1	(HRI)	14	0001	BxxQHE	3755	4086	4002.96	3704	4095	5.8
465	901	156	10430.227	0.000	180.0	SLI	(SLI)	14	0001	BxxQHE	40	1572	470.48	0	0	5.5
466	903	156	10467.718	0.000	180.0	DLI2	(MRI)	13	0001	BxxQHE	82	4056	1846.01	0	0	4.1
467	905	156	10467.718	0.000	180.0	DLI1	(HRI)	13	0001	BxxQHE	3260	4086	4001.41	3704	4095	3.7
468	907	157	10612.608	0.000	180.0	SLI	(SLI)	15	0001	BxxQHE	40	1720	502.84	0	0	7.6
469	909	157	10616.208	0.000	180.0	DLI2	(MRI)	15	0001	BxxQHE	88	4056	1992.78	0	0	8.8
470	912	157	10636.478	0.000	180.0	DLI2	(MRI)	14	0001	BxxQHE	88	4056	1958.72	0	0	6.5
471	914	157	10636.478	0.000	180.0	DLI1	(HRI)	14	0001	BxxQHE	3755	4086	4003.45	3704	4095	5.8
472	916	157	10639.885	0.000	180.0	SLI	(SLI)	15	0001	BxxQHE	44	1783	519.41	0	0	6
473	918	157	10650.198	0.000	180.0	DLI2	(MRI)	14	0001	BxxQHE	88	4056	1923.35	0	0	7.7
474	919	157	10650.198	0.000	180.0	SLI	(SLI)	14	0001	BxxQHE	42	1601	471.63	0	0	8.9
475	921	157	10663.744	0.000	180.0	DLI2	(MRI)	14	0001	BxxQHE	79	4056	1922.08	0	0	6.5
476	923	157	10663.744	0.000	180.0	DLI1	(HRI)	14	0001	BxxQHE	3755	4086	4003.06	3704	4095	5.8
477	926	157	10673.973	0.000	180.0	DLI1	(HRI)	14	0001	BxxQHE	3755	4086	4003.05	3704	4095	5.8
478	928	157	10684.204	0.000	180.0	SLI	(SLI)	15	0001	BxxQHE	46	1751	519.69	0	0	7.6

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
479	929	157	10684.204	0.000	180.0	DLI1	(HRI)	15	0001	BxxQHE	3759	4086	4003.54	3704	4095	7.9
480	931	157	10701.235	0.000	180.0	SLI	(SLI)	14	0001	BxxQHE	40	1659	488.07	0	0	5.5
481	933	157	10708.133	0.000	180.0	DLI2	(MRI)	14	0001	BxxQHE	82	4056	1957.9	0	0	4.1
482	935	157	10708.133	0.000	180.0	DLI1	(HRI)	14	0001	BxxQHE	3748	4086	4003.69	3704	4095	3.8
483	939	157	10752.361	0.000	180.0	DLI2	(MRI)	14	0001	BxxQHE	91	4056	1957.2	0	0	6.6
484	941	157	10752.361	0.000	180.0	DLI1	(HRI)	14	0001	BxxQHE	3755	4086	4003.45	3704	4095	5.8
485	943	158	10910.911	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	28	923	282.37	60	552	5.6
486	944	158	10910.911	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2254	4086	3764.19	2206	4095	7.1
487	946	158	10914.321	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	28	954	298.24	65	583	5.5
488	948	158	10924.550	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	88	4056	1438.97	0	0	6.5
489	951	158	10938.178	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	97	4056	1482.35	0	0	7.9
490	952	158	10938.178	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	16	986	298.3	65	583	8.4
491	954	158	10958.636	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	73	4056	1438.51	0	0	4.5
492	956	158	10958.636	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2253	4086	3762.35	2200	4095	4.7
493	959	158	10962.481	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2328	4086	3827.44	2469	4095	7.5
494	961	158	10985.908	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	20	986	298.31	65	583	5.6
495	962	158	10985.908	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2202	4086	3824.7	2450	4095	5.6
496	965	158	10989.319	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2264	4086	3763.96	2200	4095	7.3
497	967	158	11009.755	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	32	938	282.6	60	552	7.9
498	968	158	11009.755	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2243	4086	3763.47	2194	4095	7.2
499	970	158	11013.183	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	28	923	282.8	60	552	7.2
500	972	158	11023.413	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	91	4056	1439.88	0	0	8.2
501	974	158	11023.413	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2254	4086	3763.63	2206	4095	7.1
502	976	158	11057.503	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	28	986	298.28	65	583	8
503	979	159	11185.340	0.000	180.0	SLI	(SLI)	9	0001	BxxQHE	19	1054	314.54	63	617	7.2
504	981	159	11188.751	0.000	180.0	DLI2	(MRI)	9	0001	BxxQHE	91	4056	1531	0	0	7.9
505	983	159	11188.751	0.000	180.0	DLI1	(HRI)	9	0001	BxxQHE	2285	4086	3882.81	2744	4095	7.5
506	985	159	11209.529	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	32	970	298.98	65	583	5.4
507	987	159	11212.615	0.000	180.0	DLI2	(MRI)	9	0001	BxxQHE	88	4056	1572.85	0	0	5.8
508	989	159	11212.615	0.000	180.0	DLI1	(HRI)	9	0001	BxxQHE	2507	4086	3920.25	3019	4095	6.1
509	991	159	11233.505	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	20	986	298.51	65	583	5.4
510	993	159	11236.478	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	82	4056	1487.61	0	0	5.8
511	996	159	11246.995	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	85	4056	1486.8	0	0	6.5
512	998	159	11246.995	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2162	4086	3831.09	2488	4095	7.5
513	1000	159	11260.339	0.000	180.0	SLI	(SLI)	8	0001	BxxQHE	24	986	299.04	65	583	7.9
514	1002	159	11280.861	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	76	4056	1486.17	0	0	4.5

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
515	1004	159	11280.861	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2328	4086	3829.94	2482	4095	3.6
516	1007	159	11284.207	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2243	4086	3831.57	2494	4095	7.5
517	1008	159	11338.678	0.000	180.0	DLI2	(MRI)	9	0001	BxxQHE	79	4056	1575.38	0	0	7.9
518	1011	159	11345.566	0.000	180.0	DLI2	(MRI)	8	0001	BxxQHE	88	4056	1488.3	0	0	8.7
519	1013	159	11345.566	0.000	180.0	DLI1	(HRI)	8	0001	BxxQHE	2243	4086	3831.66	2488	4095	7.5
520	1015	160	11463.292	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	26	619	186.84	44	360	7.6
521	1016	160	11463.292	0.000	180.0	DLI1	(HRI)	5	0001	BxxQHE	1490	4056	3169	0	0	14
522	1018	160	11466.595	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	21	619	186.97	44	360	7.7
523	1019	160	11466.595	0.000	180.0	DLI1	(HRI)	5	0001	BxxQHE	1490	4056	3169.9	0	0	14.3
524	1020	160	11476.822	0.000	180.0	DLI2	(MRI)	5	0001	BxxQHE	85	4056	1148.73	0	0	6.3
525	1024	160	11510.906	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	30	633	186.75	44	360	7.5
526	1027	160	11514.321	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	21	619	187.05	44	360	7.6
527	1028	160	11514.321	0.000	180.0	DLI1	(HRI)	5	0001	BxxQHE	1463	4056	3170.56	0	0	14.2
528	1029	160	11524.551	0.000	180.0	DLI2	(MRI)	5	0001	BxxQHE	88	4056	1147.37	0	0	6.3
529	1033	160	11534.777	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	30	619	186.89	44	360	5.7
530	1036	160	11562.414	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	21	633	187.17	44	360	5.8
531	1039	160	11568.868	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	34	619	186.98	44	360	5.7
532	1042	160	11579.879	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	21	619	186.83	44	360	5.7
533	1043	160	11579.879	0.000	180.0	DLI1	(HRI)	5	0001	BxxQHE	1463	4056	3169.72	0	0	14.2
534	1044	160	11613.175	0.000	180.0	DLI2	(MRI)	5	0001	BxxQHE	73	4056	1147.71	0	0	4.3
535	1048	160	11623.396	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	26	610	186.91	44	360	7.6
536	1051	161	11751.249	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	28	628	187.44	50	358	7.4
537	1052	161	11751.249	0.000	180.0	DLI1	(HRI)	5	0001	BxxQHE	1490	4056	3176.71	0	0	14.4
538	1054	161	11754.664	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	24	628	187.45	50	358	8.1
539	1055	161	11754.664	0.000	180.0	DLI1	(HRI)	5	0001	BxxQHE	1490	4056	3174.67	0	0	14.1
540	1056	161	11764.889	0.000	180.0	DLI2	(MRI)	5	0001	BxxQHE	88	4056	1152.42	0	0	6.5
541	1060	161	11785.346	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	24	696	203.78	49	391	5.7
542	1063	161	11798.981	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	20	656	203.72	49	391	7.4
543	1066	161	11802.389	0.000	180.0	SLI	(SLI)	5	0001	BxxQHE	1	696	177.21	49	391	8.2
544	1067	161	11802.389	0.000	180.0	DLI1	(HRI)	5	0001	BxxQHE	0	4056	1582.5	0	0	14.5
547	1092	162	12042.731	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	0	4056	901.91	0	0	8
548	1094	162	12042.731	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	953	4056	2623.14	0	0	12.5
549	1096	162	12056.366	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	32	417	121.82	34	226	6.2
550	1097	162	12056.366	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	953	4056	2623.98	0	0	12.4
551	1098	162	12066.593	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	73	4056	913.6	0	0	6
552	1102	162	12087.502	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	26	417	122.19	31	233	7.4

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
553	1104	162	12090.459	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	76	4056	914.56	0	0	6.2
554	1108	162	12100.702	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	33	408	122.04	31	233	5.6
555	1109	162	12100.702	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	953	4056	2624.16	0	0	12.4
556	1110	162	12114.319	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	88	4056	912.86	0	0	8.1
557	1113	162	12134.779	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	82	4056	912.61	0	0	6
558	1115	162	12134.779	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	953	4056	2627.27	0	0	12.7
559	1116	162	12144.994	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	73	4056	914.01	0	0	4.9
560	1120	162	12162.442	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	12	408	122.04	34	226	7.9
561	1123	163	12310.340	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	16	408	122.1	34	226	5.4
562	1124	163	12310.340	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	969	4056	2628.52	0	0	12.6
563	1125	163	12313.754	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	79	4056	915.17	0	0	6.3
564	1129	163	12324.124	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	29	417	122.2	31	233	7.3
565	1130	163	12324.124	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	969	4056	2627.67	0	0	12.4
566	1132	163	12334.402	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	26	483	138.98	36	264	7.4
567	1134	163	12358.689	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	76	4056	979.3	0	0	5.9
568	1138	163	12371.710	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	26	468	138.9	36	264	7.4
569	1140	163	12378.519	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	85	4056	913.18	0	0	6.3
570	1144	163	12388.752	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	35	417	122.29	31	233	5.6
571	1147	163	12402.378	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	17	477	138.92	36	264	7.3
572	1148	163	12402.378	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	1108	4056	2784.63	0	0	13
573	1150	163	12409.205	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	32	423	122.25	31	233	7.4
574	1151	163	12409.205	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	969	4056	2632.16	0	0	12.4
575	1153	163	12422.835	0.000	180.0	SLI	(SLI)	3	0001	BxxQHE	31	408	122.38	31	233	5.6
576	1154	163	12422.835	0.000	180.0	DLI1	(HRI)	3	0001	BxxQHE	953	4056	2631.54	0	0	12.5
577	1155	163	12467.102	0.000	180.0	DLI2	(MRI)	3	0001	BxxQHE	70	4056	914.61	0	0	4.8
578	1159	164	12591.696	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	24	363	88.4	24	164	6.2
579	1162	164	12595.540	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	27	363	88.26	24	164	3.6
580	1163	164	12595.540	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2296.66	0	0	10.6
581	1164	164	12608.640	0.000	180.0	DLI2	(MRI)	2	0001	BxxQHE	100	4056	769.33	0	0	8.5
582	1166	164	12608.640	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	675	4056	2297.14	0	0	10.6
583	1167	164	12615.742	0.000	180.0	DLI2	(MRI)	2	0001	BxxQHE	91	4056	767.94	0	0	8.4
584	1170	164	12629.954	0.000	180.0	DLI2	(MRI)	2	0001	BxxQHE	79	4056	768.6	0	0	7.1
585	1172	164	12629.954	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2295.71	0	0	10.8
586	1174	164	12652.962	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	30	355	88.81	24	164	8.1
587	1175	164	12652.962	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2302.56	0	0	10.6
588	1177	164	12659.770	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	31	355	88.61	24	164	8

1 Line #	2 Seq. #	2a Cycl	3 M_time	4 Altitude	5 ºE of N	6 Type	7 Type	8 Exp.	9 Lamps	10 Process	11 Min.	12 Max.	13 Ave.	14 sqrt min	15 sqrt max	16 C-Ratio
589	1178	164	12659.770	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2298.18	0	0	10.7
590	1180	164	12666.597	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	28	363	88.3	24	164	6.1
591	1183	164	12680.227	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	33	373	88.67	24	164	6.1
592	1184	164	12680.227	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2299.4	0	0	10.7
593	1186	164	12687.123	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	27	348	88.18	24	164	8.1
594	1187	164	12687.123	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2297.2	0	0	10.6
595	1189	164	12704.850	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	30	373	88.72	24	164	5.9
596	1191	164	12724.545	0.000	180.0	DLI2	(MRI)	2	0001	BxxQHE	82	4056	769.26	0	0	7.2
597	1195	165	12866.286	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	29	355	88.43	24	164	8.1
598	1196	165	12866.286	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2296.9	0	0	10.7
599	1198	165	12869.438	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	27	380	88.57	24	164	6
600	1201	165	12889.894	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	27	348	88.48	24	164	6
601	1202	165	12889.894	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	675	4056	2300.69	0	0	10.8
602	1204	165	12896.707	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	33	340	88.72	24	164	8
603	1205	165	12896.707	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2299.21	0	0	10.7
604	1207	165	12903.531	0.000	180.0	SLI	(SLI)	2	0001	BxxQHE	29	348	88.65	24	164	8.2
605	1209	165	12927.388	0.000	180.0	DLI2	(MRI)	2	0001	BxxQHE	0	4056	515.66	0	0	7.1
606	1211	165	12927.388	0.000	180.0	DLI1	(HRI)	2	0001	BxxQHE	665	4056	2299.61	0	0	10.6
607	1212	165	12941.297	0.000	180.0	DLI2	(MRI)	2	0001	BxxQHE	0	4056	188.43	0	0	8.4
608	1215	165	12954.665	0.000	180.0	DLI2	(MRI)	2	0001	BxxQHE	0	280	60.74	0	0	7.1

Appendix 21 - Location of Sun for Upward Looking Violet measurements.

seq# - Sequence number of the measurement (corresponds to number in file name)
Azimuth - Azimuth of the observation relative to the Sun, CW + from above.
Sun? - Location of the sun relative to the exposure:

- Sun - Sun squarely in the field of view.
- ns - Sun not in the field of view
- 90, -90 - Sun on the shoulders of the Spatial Response Curve (75ºto 90º from center)
- SB - Observation at least partially obscured by shadow bar.
- NG - Observation not consistent with calculate azimuth.
- Lamps - Calibration lamps on during measurement.

seq#	Azimuth	Sun?		seq#	Azimuth	Sun?		seq#	Azimuth	Sun?
3	43.38	Sun		135	329.32	Sun		264	88.44	90
4	177.69	ns		136	4.20	Sun		265	119.70	ns
5	238.02	ns		137	130.70	ns		267	241.16	ns
6	277.62	-90		138	255.93	ns		269	281.90	-90
7	133.90	ns		140	136.26	ns		270	33.08	Sun
9	354.90	SB		141	240.68	ns		271	137.12	ns
11	59.08	Sun		143	276.72	-90		272	159.63	ns
12	223.31	ns		144	18.91	Sun		274	249.91	ns
13	259.71	NG		145	347.44	SB		276	282.87	Sun
14	304.32	Sun		147	191.43	ns		277	40.04	-90
16	142.91	ns		148	293.79	Sun		278	175.97	ns
17	77.87	90		149	322.88	Sun		279	204.58	ns
19	60.79	Sun		151	74.48	90		281	312.88	Sun
20	356.58	SB		152	232.13	ns		283	347.45	SB
21	162.73	ns		154	309.81	Lamps		284	5.28	Sun
23	158.37	ns		156	69.19	Sun		286	31.98	Sun
24	150.12	ns		158	353.49	Lamps		287	156.25	ns
26	149.71	ns		159	238.47	ns		289	261.38	ns
27	157.44	ns		161	273.83	-90		290	274.71	-90
28	137.35	ns		162	15.21	Sun		291	51.89	Sun
30	319.98	Lamps		163	43.20	Sun		292	287.47	Sun
32	333.93	Sun		165	325.99	Sun		294	68.60	Sun
34	168.96	Lamps		166	114.98	ns		296	239.15	ns
35	301.17	Sun		167	146.49	ns		297	60.78	Sun
37	186.64	ns		169	266.08	NG		298	30.49	Sun
39	350.06	SB		171	305.50	Sun		300	35.54	Sun
40	171.42	ns		172	162.64	ns		301	169.86	ns
41	71.66	Sun		174	130.73	ns		303	173.91	ns
43	172.18	ns		175	238.99	ns		304	265.25	NG
45	162.48	ns		176	268.72	NG		305	283.63	-90
46	306.90	Sun		178	22.58	Sun		306	329.00	Sun
47	191.35	ns		179	235.11	ns		308	89.93	90

seq#	Azimuth	Sun?		seq#	Azimuth	Sun?		seq#	Azimuth	Sun?
48	99.53	NG		180	161.62	ns		310	241.62	ns
50	206.88	ns		182	299.28	Sun		311	76.43	90
52	22.61	Sun		184	344.52	Sun		312	310.83	Sun
53	62.74	Sun		185	150.22	ns		313	287.98	Sun
54	216.32	ns		186	181.56	ns		315	72.99	Sun
55	4.69	Sun		188	204.86	ns		317	19.84	Sun
56	298.62	Sun		190	281.09	-90		318	198.49	ns
58	132.38	ns		191	319.58	Sun		319	357.90	SB
60	183.32	ns		192	135.86	ns		320	111.94	ns
61	14.95	Sun		193	240.87	ns		322	264.80	ns
62	30.01	Sun		194	143.64	ns		324	89.92	90
65	137.91	ns		196	172.17	ns		325	226.04	ns
66	174.29	ns		198	143.66	ns		326	218.11	ns
67	314.48	Sun		199	167.98	ns		328	46.09	Sun
68	359.58	SB		200	122.61	ns		329	183.68	ns
69	320.01	Sun		201	333.78	Sun		331	293.84	Sun
71	130.27	ns		203	92.71	NG		332	68.48	Sun
72	163.31	ns		205	123.57	ns		333	201.78	ns
74	6.58	Sun		206	114.00	ns		335	189.94	ns
75	311.73	Sun		207	67.42	Sun		337	317.98	Sun
76	157.15	ns		208	195.14	ns		338	352.55	SB
79	266.48	NG		210	227.93	ns		339	124.95	ns
80	207.64	ns		211	317.25	Sun		340	249.61	ns
81	40.37	Sun		212	341.78	Sun		342	10.62	Sun
82	265.42	NG		214	206.00	ns		343	109.27	ns
83	145.49	ns		215	24.94	Sun		345	241.16	ns
86	326.19	Sun		216	53.75	Sun		346	50.81	Sun
87	157.75	ns		218	164.89	ns		347	63.91	Sun
88	301.23	Sun		220	200.56	ns		348	328.55	Sun
89	170.63	ns		221	196.71	ns		350	3.72	Sun
90	203.42	ns		222	216.45	ns		351	100.45	ns
91	116.72	NG		223	244.85	ns		353	234.28	ns
92	146.91	ns		225	355.83	SB		354	28.52	Sun
94	263.42	NG		227	289.20	Sun		356	147.83	NG
96	302.27	Sun		228	92.99	ns		360	91.97	ns
97	15.22	Sun		229	337.78	Sun		362	150.15	ns
98	233.76	ns		231	9.79	Sun		366	110.13	ns
100	354.48	SB		232	100.69	ns		370	83.88	90
102	33.81	Sun		233	126.39	ns		372	315.40	NG
103	71.03	Sun		235	84.59	90		374	18.81	Sun
104	87.83	90		237	228.87	ns		380	278.60	-90
106	174.79	ns		239	10.84	Sun		382	344.80	Sun
108	216.29	ns		240	314.37	Sun		386	313.63	Sun
109	247.07	ns		241	269.21	NG		390	294.29	Sun

seq#	Azimuth	Sun?		seq#	Azimuth	Sun?		seq#	Azimuth	Sun?
110	6.64	Sun		242	229.15	ns		394	255.07	ns
111	196.31	ns		243	13.82	Sun		396	143.14	NG
113	260.38	Lamps		245	131.64	ns		398	204.33	ns
115	16.16	Sun		246	154.76	ns		402	176.09	ns
117	270.08	Lamps		248	286.19	Sun		404	163.68	ns
118	191.17	ns		249	75.53	90		412	278.83	-90
120	336.12	Sun		250	293.06	Sun		414	289.83	Sun
122	22.09	Sun		252	317.64	Sun		418	311.63	Sun
123	91.64	NG		253	31.60	Sun		420	322.48	Sun
124	215.80	ns		254	53.39	Sun		424	344.08	Sun
127	55.43	Sun		256	45.61	Sun		428	5.39	Sun
128	313.60	Sun		257	171.47	ns		432	25.93	Sun
129	120.44	ns		258	206.88	ns		436	48.08	Sun
130	162.67	ns		260	349.60	SB		440	68.24	Sun
131	219.22	ns		262	33.65	Sun		442	72.57	Sun
132	288.24	Sun		263	304.90	Sun				

Appendix 22 - Relative Spatial Response of ULV and DLV

The relative spatial responses of the ULV and DLV systems were measured at room temperature. An 8-inch diameter spherical mirror was used to produce a collimated beam of light. The DISR sensor head was mounted on an altitude-azimuth adjustable mount with either the ULV or DLV window centered on the axes of rotation of the mount.

We turned the mount under computer control and collected data from the violet photometers at a wide range of angles relative to the outward normal of the ULV and DLV diffusers. The coordinates of the altitude-azimuth mount were converted to local azimuth and zenith angle in the sensor head coordinate system. The resulting measurements were interpolated to fill in the grid to one degree spacing in azimuth and zenith angle. A small amount of smoothing was done during the interpolation to remove artifacts caused by non-uniform stepping of the altitude-azimuth mount.

The resulting relative spatial response of the ULV and DLV (each normalized to unity at the direction of peak response) are plotted in Figs. 24 and 25 of the calibration report. This appendix contains the measurements in a tabular format, normalized to 10,000 maximum.

AZ is the azimuth relative to the center of the Sensor Head (+Z axis), positive being Counter-Clockwise as viewed from above.

ZA is the Zenith Angle (from SH +X axis).

Table 1a
Relative Spatial Response of ULV

AZ	ZA =1	ZA =2	ZA =3	ZA =4	ZA = 5	ZA = 6	ZA = 7	ZA = 8	ZA = 9	ZA = 10	ZA = 11	ZA = 12	ZA = 13	ZA = 14	ZA = 15
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	0	0	0	0	0	0	0	1	12	28	5	1	0	4	0
-88	0	0	0	0	0	0	0	1	17	46	17	5	0	5	0
-87	0	0	0	0	0	0	0	1	23	113	62	20	3	9	0
-86	0	0	0	0	0	0	0	2	45	131	75	24	4	10	0
-85	0	0	0	0	0	6	0	2	50	147	89	39	6	13	0
-84	0	0	0	0	0	7	0	2	55	213	136	44	7	14	0
-83	0	0	0	0	0	9	0	2	75	228	150	49	10	16	0
-82	0	0	0	0	0	10	0	3	79	244	200	66	11	16	44
-81	0	0	0	0	0	11	0	3	83	304	215	72	39	93	131
-80	0	0	0	0	0	19	0	3	100	318	231	122	105	173	387
-79	0	0	0	0	0	20	0	3	103	330	309	173	310	413	474
-78	0	0	0	0	0	22	0	3	106	382	346	336	374	491	730
-77	0	0	0	0	0	24	0	3	120	396	459	386	438	728	818
-76	0	0	0	0	0	26	0	3	131	409	495	436	638	804	1074
-75	0	0	0	0	0	35	0	9	143	475	530	593	700	1037	1191
-74	0	0	0	0	0	38	0	18	154	487	637	640	875	1078	1450
-73	0	0	0	0	0	40	4	27	212	497	671	793	930	1301	1541
-72	0	0	0	0	0	43	8	36	222	560	750	833	1113	1367	1800
-71	0	0	0	0	0	46	11	76	231	499	846	873	1164	1584	1891
-70	0	0	0	0	0	59	15	84	229	509	875	1009	1340	1647	2151
-69	0	0	0	0	0	61	26	81	234	571	903	1046	1388	1855	2172
-68	0	0	0	0	0	63	24	113	239	579	991	1173	1436	1850	2405

AZ	ZA =1	ZA =2	ZA =3	ZA =4	ZA = 5	ZA = 6	ZA = 7	ZA = 8	ZA = 9	ZA = 10	ZA = 11	ZA = 12	ZA = 13	ZA = 14	ZA = 15
-67	0	0	0	0	0	65	24	117	281	587	1017	1206	1546	2044	2470
-66	0	0	0	0	0	28	24	122	284	646	1096	1203	1584	2094	2744
-65	0	0	0	0	0	24	24	126	286	652	1002	1310	1734	2284	2853
-64	0	0	0	0	0	21	26	151	287	589	1004	1332	1767	2357	3084
-63	0	0	0	0	0	18	24	153	319	644	1061	1429	1800	2331	3167
-62	0	0	0	0	0	15	23	155	303	648	1060	1446	1867	2569	3472
-61	0	0	0	0	1	12	22	122	310	651	1058	1427	1901	2620	3544
-60	0	0	0	0	1	9	17	137	349	702	1109	1511	2063	2836	3661
-59	0	0	0	0	2	6	29	134	354	703	1027	1537	2090	2740	3709
-58	0	0	0	0	2	3	30	132	359	593	1028	1562	1999	2926	3950
-57	0	0	0	0	2	0	32	129	364	584	1085	1678	2130	2948	3985
-56	0	0	1	0	2	0	33	125	336	612	1086	1540	2140	2968	3998
-55	0	0	1	0	3	0	30	129	331	599	997	1531	2252	2953	4011
-54	0	0	1	0	3	0	31	72	326	586	1040	1590	2172	2956	4021
-53	0	0	1	0	3	0	31	64	320	569	1031	1573	2186	3080	3964
-52	0	0	1	0	2	0	32	56	333	567	1022	1436	2295	2886	3954
-51	0	0	1	0	2	0	11	47	251	564	1012	1484	2303	2870	4085
-50	0	0	1	0	2	0	7	36	240	562	854	1468	2065	2958	3823
-49	0	0	1	0	2	0	5	25	228	580	817	1450	2100	2933	3792
-48	0	0	1	0	1	4	3	18	224	476	779	1344	2051	2807	3880
-47	0	0	1	0	1	5	1	17	208	457	753	1318	1833	2899	3592
-46	0	0	1	0	1	5	0	12	104	438	700	1291	1860	2890	3675
-45	0	0	1	0	0	6	0	10	85	427	694	1060	1822	2529	3626
-44	0	0	1	0	0	7	0	8	66	307	689	995	1610	2521	3435
-43	0	0	1	0	0	8	0	0	46	283	585	929	1614	2238	3506
-42	0	0	2	0	0	8	0	0	25	259	554	809	1567	2191	3139
-41	0	0	1	0	0	5	0	0	9	237	523	823	1231	2230	3049
-40	0	0	1	0	0	4	6	0	6	111	491	815	1169	1967	3060
-39	0	0	1	0	0	3	7	0	4	83	349	806	1075	1912	2738
-38	0	0	1	2	0	2	9	0	1	56	314	647	945	1926	2665
-37	0	0	1	2	0	1	11	0	0	13	279	601	941	1463	2429
-36	0	0	1	2	0	1	12	0	0	10	130	555	986	1332	2347
-35	0	0	1	2	0	0	14	0	0	6	96	376	794	1203	2263
-34	0	0	1	3	0	0	6	8	0	2	60	330	739	1200	1731
-33	0	0	0	3	0	0	5	10	0	0	14	290	682	1196	1544
-32	0	0	0	3	0	0	3	12	0	0	9	123	482	949	1409
-31	0	0	0	3	0	0	2	14	0	0	4	77	418	904	1405
-30	0	0	0	2	3	0	0	7	8	0	0	17	198	621	1185
-29	0	0	0	2	3	0	0	6	10	0	0	11	136	537	1080
-28	0	0	0	2	3	0	0	4	12	0	0	4	71	453	739
-27	0	0	0	2	4	0	0	2	14	0	0	0	19	186	633
-26	0	0	0	1	4	0	0	0	6	9	0	0	9	98	536
-25	0	0	0	1	5	0	0	0	4	11	0	0	0	23	205
-24	0	0	0	1	6	4	0	0	2	14	7	0	0	10	95
-23	0	0	0	0	3	5	0	0	0	6	10	0	0	0	23
-22	0	0	0	0	2	6	0	0	0	3	13	11	0	0	6
-21	0	0	0	0	2	7	0	0	0	1	7	16	0	0	0
-20	0	0	0	0	1	8	6	0	0	0	5	21	18	0	0
-19	0	0	0	0	1	4	7	0	0	0	2	10	26	0	0
-18	0	0	0	0	0	3	8	6	0	0	0	6	17	29	0
-17	0	0	0	0	0	2	9	7	0	0	0	0	10	39	32
-16	0	0	0	0	0	1	4	9	6	0	0	0	2	15	44

AZ	ZA =1	ZA =2	ZA =3	ZA =4	ZA = 5	ZA = 6	ZA = 7	ZA = 8	ZA = 9	ZA = 10	ZA = 11	ZA = 12	ZA = 13	ZA = 14	ZA = 15
-15	0	0	0	0	0	1	3	10	8	0	0	0	0	4	15
-14	0	1	0	0	0	0	2	5	10	8	0	0	0	0	4
-13	0	1	0	0	0	0	1	3	12	10	7	0	0	0	0
-12	0	1	0	0	0	0	0	2	5	12	9	6	0	0	0
-11	0	1	0	0	0	0	0	0	3	6	12	8	5	0	0
-10	0	1	0	0	0	0	0	0	1	3	5	10	7	4	0
-9	0	1	1	0	0	0	0	0	0	1	2	4	9	6	4
-8	0	1	1	0	0	0	0	0	0	0	0	1	2	3	6
-7	0	1	2	2	0	0	0	0	0	0	0	0	0	1	2
-6	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0
-5	0	1	2	3	4	0	0	0	0	0	0	0	0	0	0
-4	0	1	2	3	4	5	10	0	0	0	0	0	0	0	0
-3	0	1	2	4	5	6	13	24	33	0	0	0	0	0	0
-2	0	1	2	4	6	7	16	30	43	54	49	33	19	6	0
-1	0	1	3	4	6	8	19	37	54	70	64	44	25	7	1
0	0	1	3	5	7	9	30	51	72	92	69	55	23	0	2
1	0	1	2	2	3	4	12	19	25	31	20	12	5	0	1
2	0	1	1	2	3	3	9	13	15	16	6	2	0	0	0
3	0	1	1	2	2	2	6	6	5	0	0	0	0	0	0
4	0	1	1	1	1	1	3	0	0	0	0	0	0	0	16
5	0	1	1	1	1	0	0	0	0	0	0	0	0	0	28
6	0	0	1	1	0	0	0	0	0	0	0	0	0	0	125
7	0	0	1	0	0	0	0	0	0	0	0	0	92	94	166
8	0	0	0	0	0	0	0	0	0	0	111	123	127	125	736
9	0	0	0	0	0	0	0	0	0	112	150	160	556	727	977
10	0	0	0	0	0	0	0	0	87	148	189	561	735	945	1487
11	0	0	0	0	0	0	0	57	112	184	534	703	912	1402	1636
12	0	0	0	0	0	0	0	74	138	461	643	844	1314	1537	2071
13	0	0	0	0	0	0	38	90	334	540	752	1205	1431	1944	2214
14	0	0	0	0	0	0	47	107	388	619	1080	1306	1802	2072	2432
15	0	0	0	0	0	22	56	242	442	897	1166	1643	1913	2238	2490
16	0	0	0	0	0	26	65	275	495	965	1471	1738	2052	2220	2998
17	0	0	0	0	0	30	130	307	709	1032	1551	1790	2023	2736	3212
18	0	0	0	0	16	35	146	339	757	1285	1590	1828	2038	2935	3647
19	0	0	0	0	19	39	161	495	805	1270	1642	1834	2637	3367	3769
20	0	0	0	0	21	71	176	526	930	1324	1638	2316	2813	3470	4141
21	0	0	0	0	24	76	272	495	967	1339	1635	2471	3158	3572	4256
22	0	0	0	0	26	82	237	521	1004	1324	2110	2625	3244	3899	4602
23	0	0	0	11	29	87	251	655	1009	1310	2245	2912	3465	3914	4738
24	0	0	0	12	50	84	264	677	991	1674	2379	2914	3539	4260	5023
25	0	0	0	14	53	145	277	698	972	1774	2513	3166	3612	4359	5075
26	0	0	0	15	49	154	359	719	954	1874	2555	3225	3873	4618	5341
27	0	0	0	16	52	164	368	651	1269	1988	2596	3283	3940	4670	5316
28	0	0	0	18	54	173	377	629	1233	2015	2794	3464	4192	4813	5391
29	0	0	0	15	56	183	386	608	1298	2040	2827	3503	4148	4872	5658
30	0	0	0	16	58	192	395	497	1360	2064	2858	3426	4201	4930	5723
31	0	0	5	24	98	250	306	757	1491	2214	2800	3694	4408	5157	6058
32	0	0	5	25	103	258	278	798	1503	2231	2799	3745	4451	5086	6181
33	0	0	6	26	108	265	263	838	1514	2102	2796	3936	4530	5462	6239
34	0	0	4	26	112	247	248	878	1485	2145	3012	3788	4560	5560	6206
35	0	0	4	27	117	252	399	965	1487	2130	3039	3796	4588	5655	6192
36	0	0	4	27	121	218	431	841	1487	2114	2896	3928	4918	5486	6216

AZ	ZA =1	ZA =2	ZA =3	ZA =4	ZA = 5	ZA = 6	ZA = 7	ZA = 8	ZA = 9	ZA = 10	ZA = 11	ZA = 12	ZA = 13	ZA = 14	ZA = 15
37	0	0	5	28	135	208	463	838	1487	2098	3016	3927	4857	5444	6238
38	0	0	5	28	137	198	494	833	1481	2121	3011	3924	4922	5544	6229
39	0	0	5	44	139	188	478	887	1456	2133	3006	3953	4878	5402	6235
40	0	0	5	45	141	178	503	878	1271	2144	2913	3976	4832	5404	6401
41	0	0	6	47	143	168	561	869	1240	2231	2897	3996	4565	5507	6263
42	0	0	3	34	144	242	563	808	1364	2040	2879	3794	4629	5335	6274
43	0	0	2	34	146	255	565	810	1366	2021	2860	3731	4600	5321	6148
44	0	0	2	34	147	268	567	781	1201	2001	2821	3667	4352	5548	5940
45	0	0	1	34	125	280	517	765	1199	2049	2814	3602	4397	5337	5931
46	0	0	1	34	100	292	556	749	1195	1836	2804	3425	4355	5271	5901
47	0	0	1	35	95	303	554	682	1230	1807	2785	3384	4088	5176	5751
48	0	0	0	35	91	314	551	667	1203	1776	2518	3343	4263	4849	5726
49	0	1	1	41	86	302	548	761	1117	1850	2458	3148	4247	4814	5445
50	0	1	1	40	81	299	545	769	1111	1620	2397	3097	4004	4748	5358
51	0	1	1	39	76	295	484	777	1104	1589	2186	3045	3879	4446	5252
52	0	1	1	16	71	292	468	713	1145	1556	2137	2770	3780	4376	4931
53	0	1	1	14	66	288	456	716	1061	1523	2087	2911	3450	4315	4834
54	0	1	0	12	73	284	443	719	1051	1425	2035	2883	3348	4000	4463
55	0	2	0	10	73	229	430	761	1041	1404	1766	2629	3322	3914	4355
56	0	2	0	8	72	223	367	679	1030	1383	1753	2596	3015	3610	4246
57	0	2	0	6	71	233	355	669	981	1288	1694	2449	2939	3520	3924
58	0	2	0	4	71	226	342	659	967	1269	1592	2121	2627	3429	3830
59	0	2	0	2	70	219	330	648	952	1295	1576	2020	2579	3116	3538
60	0	2	0	0	69	212	368	636	937	1280	1724	1919	2495	3027	3444
61	0	1	0	0	21	149	298	550	826	1187	1646	1760	2181	2724	3136
62	0	1	0	1	18	140	290	578	807	1171	1649	1746	2096	2633	3041
63	0	1	0	1	14	132	282	565	864	1155	1650	1716	1921	2339	2755
64	0	1	0	1	11	123	273	551	766	1061	1562	1580	1877	2278	2660
65	0	1	0	1	7	114	191	462	752	1093	1559	1546	1833	2193	2375
66	0	1	0	1	0	46	180	448	737	1076	1431	1401	1661	1994	2282
67	0	1	0	1	0	45	169	433	722	982	1297	1364	1614	1939	2060
68	0	1	0	1	0	35	158	418	631	964	1250	1322	1450	1743	1994
69	0	1	0	1	0	25	175	326	617	945	1116	1165	1398	1680	1796
70	0	1	0	1	0	14	90	277	602	851	1069	1120	1345	1478	1665
71	0	1	0	1	0	5	76	253	557	832	1024	956	1158	1414	1459
72	0	1	0	1	0	6	61	142	539	925	889	910	1103	1212	1383
73	0	1	0	1	0	6	47	116	520	830	786	863	913	1146	1179
74	0	1	0	1	0	6	33	91	424	813	745	675	856	943	1105
75	0	1	0	1	0	6	33	65	404	797	604	623	665	898	902
76	0	0	0	0	0	5	34	51	385	694	561	449	606	700	820
77	0	0	0	0	0	5	34	46	364	675	519	396	409	637	625
78	0	0	0	0	0	5	26	41	301	655	373	344	348	439	558
79	0	0	0	0	0	5	26	36	291	544	330	165	287	376	364
80	0	0	0	0	0	5	26	30	280	524	270	112	87	178	296
81	0	0	0	0	0	3	26	26	218	504	248	75	25	114	103
82	0	0	0	0	0	3	16	22	207	390	226	67	7	42	35
83	0	0	0	0	0	3	16	19	195	367	178	54	6	42	0
84	0	0	0	0	0	3	15	16	131	344	158	46	5	31	0
85	0	0	0	0	0	3	14	13	118	224	114	40	3	30	0
86	0	0	0	0	0	1	4	10	105	199	95	28	3	18	0
87	0	0	0	0	0	0	3	8	39	174	77	22	2	17	0
88	0	0	0	0	0	0	2	5	26	52	35	12	2	4	0

AZ	ZA =1	ZA =2	ZA =3	ZA =4	ZA = 5	ZA = 6	ZA = 7	ZA = 8	ZA = 9	ZA = 10	ZA = 11	ZA = 12	ZA = 13	ZA = 14	ZA = 15
89	0	0	0	0	0	0	1	3	13	26	18	6	1	2	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1b
Relative Spatial Response of ULV

AZ	ZA= 16	ZA= 1 7	ZA= 18	ZA= 19	ZA= 20	ZA= 21	ZA= 22	ZA= 23	ZA= 24	ZA= 25	ZA= 26	ZA= 27	ZA= 28	ZA= 29	ZA= 30
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0
-88	1	0	2	0	2	0	0	0	1	0	0	0	1	0	0
-87	1	0	3	0	2	0	0	0	2	0	0	0	1	0	0
-86	4	0	4	0	2	0	0	0	2	0	0	4	17	27	35
-85	6	0	5	0	3	0	2	24	45	61	75	169	169	170	166
-84	9	0	5	15	48	71	95	225	236	245	250	334	322	314	298
-83	0	39	81	108	271	287	304	317	428	429	425	500	477	458	492
-82	61	130	319	338	365	504	513	518	621	614	601	667	633	603	626
-81	290	373	411	569	588	597	722	720	711	800	778	834	791	750	761
-80	370	617	648	662	812	814	933	923	906	986	955	1003	951	897	922
-79	630	708	884	893	905	1032	1026	1126	1103	1174	1155	1195	1137	1131	1134
-78	728	952	976	1125	1129	1251	1255	1350	1321	1374	1338	1381	1378	1536	1537
-77	993	1043	1212	1252	1371	1373	1470	1446	1521	1465	1587	1804	1795	1942	1940
-76	1095	1155	1319	1494	1600	1599	1687	1655	1760	1764	2015	2227	2212	2348	2345
-75	1374	1394	1561	1738	1697	1826	1783	1932	2196	2200	2444	2652	2671	2824	2797
-74	1628	1471	1804	1840	1928	2063	2089	2369	2398	2680	2911	2904	3094	3249	3401
-73	1720	1710	1899	2087	2178	2257	2557	2839	2868	3119	3345	3334	3520	3675	3816
-72	1976	1799	2143	2355	2387	2723	2997	3039	3308	3558	3780	3765	3947	4157	4270
-71	2068	2108	2427	2534	2823	3160	3191	3479	3748	3996	4272	4247	4429	4591	4716
-70	2325	2338	2592	2962	3259	3341	3632	3921	4231	4480	4493	4685	4867	5042	5161
-69	2445	2631	3017	3384	3438	3770	4159	4403	4675	4692	4944	5124	5369	5552	5709
-68	2733	3050	3181	3544	3973	4239	4628	4848	4882	5135	5441	5615	5813	6003	6177
-67	2878	3213	3605	3996	4443	4679	4844	5048	5375	5623	5865	6050	6256	6454	6704
-66	3286	3691	3933	4166	4650	4865	5323	5539	5811	6036	6276	6483	6756	6964	7161
-65	3486	3843	4059	4596	5131	5345	5734	5976	6211	6448	6736	7072	7197	7414	7682
-64	3921	4258	4430	5026	5520	5786	6151	6361	6656	6907	7156	7562	7694	7923	8077
-63	4081	4409	4718	5230	5666	5971	6326	6702	6838	7099	7408	7961	8132	8330	8289
-62	4531	4854	5175	5658	6064	6571	6691	7142	7230	7550	7824	8127	8765	8523	8435
-61	4509	5003	5371	5824	6519	6976	7052	7505	7663	7951	8237	8567	8881	8652	8631
-60	4849	5413	5833	6133	6653	7175	7246	7620	8048	8392	8693	8887	8935	8778	8767
-59	4918	5559	6289	6506	6978	7419	7600	7933	8442	8786	9064	9032	8986	8900	8946
-58	5226	6155	6443	6621	7142	7501	7951	8308	8913	8965	9156	9127	9111	9103	9073
-57	5042	6346	6853	7175	7459	7803	8353	8668	9214	9299	9238	9257	9212	9198	9185
-56	5302	6829	6991	7310	7895	8129	8782	8850	9290	9367	9351	9307	9344	9300	9294
-55	5326	6615	7267	7595	8107	8258	8971	9200	9480	9683	9425	9423	9396	9453	9281
-54	5288	6853	7571	7702	8617	8598	9023	9801	9531	9643	9493	9501	9514	9541	9348
-53	5287	6829	7914	7985	8483	8910	9314	9908	9581	9622	9679	9601	9596	9556	9335
-52	5468	6664	8081	8104	8687	9250	9440	9786	9626	9652	9746	9660	9678	9530	9316
-51	5146	6625	8034	8375	8762	9322	9670	9712	9848	9678	9738	9724	9645	9479	9330
-50	5124	6438	8005	8703	9041	9298	9646	9686	9931	9737	9740	9759	9629	9448	9281
-49	5306	6388	7816	9063	9143	9621	9420	9691	9824	9777	9805	9746	9590	9452	9252
-48	4949	6500	7751	9247	9409	9647	9327	9619	9792	9914	9838	9730	9596	9398	9220
-47	5026	6260	7682	9125	9727	9515	9378	9555	9738	9953	9824	9668	9622	9360	9223

AZ	ZA= 16	ZA= 1 7	ZA= 18	ZA= 19	ZA= 20	ZA= 21	ZA= 22	ZA= 23	ZA= 24	ZA= 25	ZA= 26	ZA= 27	ZA= 28	ZA= 29	ZA= 30
-46	4664	6255	7436	9089	10000	9423	9313	9344	9722	9863	9813	9649	9527	9434	9169
-45	4607	5978	7356	8825	9755	9242	9178	9261	9523	9769	9765	9596	9438	9506	9139
-44	4680	5844	7337	8726	9398	9304	9001	9100	9309	9683	9699	9568	9419	9309	9323
-43	4332	5831	7358	8335	8837	9117	8797	8773	9248	9441	9577	9558	9368	9211	9264
-42	4386	5430	6946	8102	8456	8751	8567	8555	8847	9253	9533	9468	9323	9218	9146
-41	4083	5342	6725	7793	7890	8396	8437	8244	8594	9185	9353	9382	9299	9205	9136
-40	4018	5069	6163	7721	7553	7881	7901	7970	8521	8962	9198	9310	9252	9240	9149
-39	3721	4970	6111	6841	7347	7531	7701	7695	8367	8796	9107	9272	9248	9227	9213
-38	3618	4687	5583	6416	7199	7047	7112	7458	8313	8810	9093	9073	9239	9204	9216
-37	3513	4574	5347	5871	6450	6781	6915	7469	8382	8681	9054	9147	9046	9210	9161
-36	3237	4139	4841	5622	6101	6756	6433	7114	8056	8855	9076	9197	8897	9205	9163
-35	3134	4107	4662	5139	5512	6052	6428	6791	7679	8983	9094	9030	8918	8833	9177
-34	2755	3635	4155	4662	5333	5630	6432	6637	7489	8564	9621	8878	8687	8715	9027
-33	2722	3475	3991	4447	4885	5180	5720	6486	6975	7948	8985	8792	8243	8368	8771
-32	2054	2999	3533	3998	4399	4727	5200	5900	6610	7384	8141	8250	8024	7759	7949
-31	1820	2845	3348	3832	4231	4573	5028	5599	6442	7116	7575	7659	7272	7289	7291
-30	1614	2043	2902	3365	3805	4173	4594	5100	5746	6520	6810	6899	6892	6790	6694
-29	1635	1712	2743	3202	3612	3981	4152	4610	5166	5812	6087	6028	6185	6091	6553
-28	1326	1500	1686	2766	3188	3560	3942	4383	4929	5117	5389	5640	5366	5303	5820
-27	1188	1548	1244	1758	2764	3131	3490	3891	4362	4707	4650	4941	5175	4775	5263
-26	785	1239	1400	1227	2580	2921	3040	3406	3824	4107	4249	4040	4338	4856	4768
-25	636	1090	1517	1202	1183	2488	2818	3165	3304	3516	3688	3769	3527	4044	4781
-24	269	661	1102	1396	1093	1407	2378	2698	3028	2905	2975	3250	3271	3384	3983
-23	154	512	669	1104	1310	925	1541	2249	2536	2708	2535	2508	2727	2992	3440
-22	32	185	508	936	1075	1273	1252	1624	2078	2250	2155	2166	2070	2347	3058
-21	13	75	194	486	905	1022	1258	1452	1567	1771	1951	1836	1885	1916	2211
-20	0	18	92	185	472	857	952	1232	1149	1200	1506	1404	1649	2041	2010
-19	0	0	20	98	191	462	794	869	1034	884	781	757	1318	1709	1934
-18	0	0	0	21	97	187	445	544	732	852	663	295	494	1362	1566
-17	0	0	0	0	19	84	171	414	410	540	501	509	389	292	648
-16	28	0	0	0	0	14	35	134	168	270	242	337	436	549	441
-15	39	25	0	0	0	0	5	25	83	106	128	108	167	392	500
-14	13	33	22	0	0	0	0	0	11	28	69	61	42	95	160
-13	2	9	13	18	10	0	0	0	0	0	11	25	64	53	38
-12	0	0	5	8	15	7	2	0	0	0	0	0	7	18	29
-11	0	0	0	1	3	3	3	2	4	0	0	0	0	0	0
-10	0	0	0	0	0	0	0	2	7	9	10	0	0	0	0
-9	4	0	0	0	0	0	0	0	2	4	8	15	9	5	2
-8	6	5	5	0	0	0	0	0	0	0	0	2	2	2	0
-7	3	8	8	7	6	0	0	0	0	0	0	0	0	0	0
-6	1	2	3	4	9	9	8	8	8	0	0	0	0	0	0
-5	0	0	1	1	2	3	4	6	15	16	17	17	15	13	11
-4	0	0	0	0	0	0	0	1	2	4	6	7	8	9	11
-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1	2	26	65	68	47	27	8	9	26	42	57	54	38	22	7
0	4	61	118	89	59	30	0	29	57	86	115	86	57	29	0
1	1	17	27	13	7	2	0	6	8	10	10	1	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	110	107	102	146	241	347	464	516	514	510	502
4	55	103	158	183	179	172	161	256	442	642	856	897	837	768	693
5	84	151	390	404	342	265	173	276	1104	1365	1612	1666	1661	1658	1656

AZ	ZA= 16	ZA= 1 7	ZA= 18	ZA= 19	ZA= 20	ZA= 21	ZA= 22	ZA= 23	ZA= 24	ZA= 25	ZA= 26	ZA= 27	ZA= 28	ZA= 29	ZA= 30
6	236	356	487	492	977	1013	1060	1283	1543	2069	2278	2328	2297	2262	2224
7	293	952	1185	1288	1350	1729	1737	1882	2101	2322	2845	2901	2864	2822	2777
8	983	1233	1484	1904	1925	1942	1953	2383	2620	2860	3102	3457	3414	3368	3318
9	1243	1779	2004	2107	2431	2440	2443	2866	3120	3377	3636	3996	3950	3901	3849
10	1719	1955	2502	2614	2633	2925	2919	3070	3602	3875	4152	4518	4471	4421	4368
11	2176	2429	2687	3110	3121	3124	3382	3527	3810	4355	4647	4762	4975	4927	4876
12	2333	2599	3130	3302	3600	3593	3577	3966	4263	4814	5121	5292	5615	5627	5647
13	2635	2944	3299	3787	3791	4049	4056	4333	4644	4958	5642	5916	6060	5986	5903
14	2727	3453	3762	4296	4291	4274	4490	4506	5206	5566	6021	6263	6424	6392	6360
15	3212	3601	4217	4483	4748	4718	5042	5098	5553	5835	6356	6666	6641	6838	6817
16	3421	4046	4380	4949	4932	5294	5307	5347	5629	6178	6532	7085	7069	7197	7151
17	3856	4195	4814	5131	5522	5680	5545	5626	5981	6545	6909	7368	7428	7349	7234
18	3991	4607	4969	5725	5899	5779	5887	5836	6263	6811	7157	7504	7479	7317	7181
19	4382	4748	5523	6110	6065	6216	6335	6201	6584	6938	7309	7501	7428	7254	7121
20	4510	5273	5808	6149	6470	6620	6502	6547	6708	7132	7379	7460	7364	7197	7084
21	4945	5554	5895	6535	6890	6790	6852	6842	6964	7288	7437	7444	7349	7161	7025
22	5109	5630	6253	6928	7061	7143	7086	7016	7192	7442	7474	7450	7274	7133	6969
23	5358	5956	6383	7064	7419	7377	7221	7251	7450	7591	7548	7379	7203	7073	6936
24	5425	6073	6747	7380	7636	7421	7367	7461	7668	7651	7484	7336	7168	7039	6898
25	5751	6351	7100	7508	7628	7482	7491	7621	7724	7619	7444	7276	7144	7011	6826
26	5789	6458	7246	7523	7608	7525	7538	7658	7676	7556	7386	7254	7119	6952	6786
27	6107	6939	7356	7506	7609	7544	7595	7620	7602	7498	7392	7243	7060	6885	6728
28	6200	7098	7346	7542	7592	7542	7566	7554	7523	7505	7345	7170	6995	6826	6684
29	6748	7139	7437	7613	7571	7513	7524	7513	7493	7450	7282	7108	6964	6799	6649
30	6768	7137	7483	7638	7596	7475	7469	7454	7481	7383	7249	7078	6918	6741	6617
31	6825	7354	7646	7693	7532	7426	7416	7485	7384	7319	7195	7038	6905	6746	6582
32	6798	7425	7722	7709	7513	7404	7381	7514	7330	7288	7204	7059	6863	6693	6526
33	6994	7684	7797	7610	7486	7377	7511	7334	7260	7217	7183	6984	6809	6666	6530
34	6887	7771	7825	7589	7443	7483	7367	7240	7201	7174	7110	6953	6782	6636	6458
35	7087	7895	7710	7548	7431	7558	7267	7217	7176	7102	7031	6901	6745	6599	6421
36	7116	7756	7664	7502	7547	7381	7200	7157	7126	7065	7002	6912	6716	6537	6370
37	7094	7575	7614	7502	7604	7291	7161	7108	7063	6999	6937	6871	6693	6547	6354
38	7092	7471	7615	7587	7426	7243	7147	7080	6999	6941	6901	6807	6667	6498	6370
39	7089	7243	7565	7644	7354	7197	7140	7030	6976	6914	6833	6743	6643	6480	6311
40	6778	7188	7433	7501	7287	7190	7139	6979	6920	6913	6794	6716	6595	6430	6285
41	6691	6990	7470	7427	7281	7204	7062	6965	6899	6831	6732	6657	6583	6404	6238
42	6648	6934	7454	7345	7230	7237	7002	6917	6930	6786	6676	6612	6518	6417	6205
43	6484	6913	7101	7330	7222	7117	6988	6902	6836	6727	6654	6551	6460	6371	6208
44	6435	6756	6984	7130	7300	7074	6936	6492	6811	6675	6627	6522	6404	6301	6180
45	6269	6721	6727	7055	7352	7014	6921	6575	6723	6656	6562	6466	6381	6250	6162
46	6221	6401	6654	6921	7149	7000	6573	6694	6670	6649	6532	6414	6315	6236	6115
47	6174	6300	6413	6888	6947	6944	6436	6724	6646	6574	6478	6393	6268	6184	6095
48	5998	6157	6338	6586	6820	6928	6636	6702	6663	6530	6427	6336	6253	6132	6038
49	5853	5963	6262	6461	6607	6548	6736	6644	6685	6460	6395	6289	6203	6114	5986
50	5643	5890	6149	6209	6478	6455	6711	6620	6545	6429	6362	6274	6153	6060	5934
51	5556	5643	6109	6070	6261	6429	6689	6696	6484	6360	6354	6206	6134	6009	5917
52	5418	5567	5761	5857	6201	6279	6486	6728	6405	6335	6246	6165	6086	5994	5863
53	5118	5413	5642	5726	6034	6188	6386	6530	6373	6376	6184	6100	6009	5944	5780
54	5011	5370	5396	5510	5828	5960	6251	6456	6308	6407	6111	6020	5962	5892	5748
55	4668	5119	5260	5423	5588	5687	6199	6160	6274	6190	6042	5974	5876	5841	5729
56	4564	4896	5049	5093	5460	5589	5818	5918	6238	6077	5999	5888	5842	5780	5694
57	4270	4566	4915	4980	5186	5357	5533	5767	6180	6037	5914	5856	5751	5773	5607

AZ	ZA= 16	ZA= 1 7	ZA= 18	ZA= 19	ZA= 20	ZA= 21	ZA= 22	ZA= 23	ZA= 24	ZA= 25	ZA= 26	ZA= 27	ZA= 28	ZA= 29	ZA= 30
58	4194	4427	4624	4745	4959	5212	5344	5523	5739	5803	5868	5766	5698	5614	5529
59	3914	4062	4510	4667	4817	5147	5105	5347	5437	5682	5793	5715	5765	5499	5466
60	3828	3953	4069	4396	4588	4779	4865	5135	5254	5428	5559	5620	5805	5438	5362
61	3540	3660	3752	4085	4491	4642	4714	5059	5004	5131	5257	5425	5511	5356	5296
62	3339	3551	3611	3969	4251	4372	4473	4648	4711	4875	4998	5282	5410	5293	5187
63	3029	3222	3300	3678	3984	4046	4230	4366	4459	4579	4739	5205	5102	5185	5117
64	2910	3114	3257	3524	3887	3922	4172	4187	4341	4455	4571	4785	4837	4944	5004
65	2608	2824	2995	3237	3492	3637	3911	3939	4048	4159	4311	4467	4530	4634	4776
66	2466	2716	2906	2951	3184	3318	3544	3667	3796	3904	4089	4120	4266	4368	4465
67	2178	2326	2606	2835	3044	3196	3244	3354	3529	3648	3834	3859	3962	4062	4197
68	2074	2207	2321	2587	2742	2915	3100	3228	3220	3346	3567	3597	3699	3797	3956
69	1861	1932	2210	2487	2429	2660	2806	2954	3092	3079	3220	3299	3435	3532	3699
70	1764	1664	1926	2213	2312	2392	2498	2651	2822	2950	2945	3040	3137	3232	3363
71	1569	1640	1815	1936	2033	2284	2225	2382	2525	2672	2804	2782	2880	2969	3078
72	1498	1449	1604	1756	1755	2012	2104	2113	2260	2408	2513	2494	2594	2715	2801
73	1304	1385	1421	1556	1618	1678	1832	1990	1995	2142	2255	2240	2342	2437	2514
74	1233	1204	1349	1368	1437	1550	1542	1702	1710	1873	1998	1986	2092	2182	2268
75	1041	1148	1168	1286	1265	1369	1337	1438	1588	1591	1720	1835	1842	1924	1910
76	752	977	987	1103	1192	1195	1264	1248	1328	1332	1467	1584	1570	1658	1640
77	675	784	931	924	1022	1024	1103	1092	1158	1133	1214	1335	1324	1413	1398
78	493	715	753	839	865	935	942	1019	1006	1063	1042	1086	1078	1171	1157
79	421	532	684	667	697	772	772	853	837	906	900	944	913	932	915
80	282	463	503	495	628	610	701	699	690	762	748	796	746	736	765
81	221	281	322	425	458	448	544	546	544	619	610	662	620	616	635
82	92	100	252	254	289	378	387	394	474	476	472	530	497	496	523
83	36	31	68	83	218	216	230	242	329	333	335	398	376	377	411
84	17	0	8	13	47	55	74	172	185	191	198	267	256	259	251
85	5	0	8	0	10	0	3	20	42	49	61	136	139	142	141
86	3	0	6	0	7	0	0	0	5	0	0	5	22	24	32
87	1	0	3	0	7	0	0	0	4	0	0	0	5	0	0
88	1	0	3	0	4	0	0	0	2	0	0	0	4	0	0
89	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1c

Relative Spatial Response of ULV

AZ	ZA = 31	ZA = 32	ZA = 33	ZA = 34	ZA = 35	ZA = 36	ZA = 37	ZA = 38	ZA = 39	ZA = 40	ZA = 41	ZA = 42	ZA = 43	ZA = 44	ZA = 45
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0
-88	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0
-87	0	4	0	0	3	14	0	0	0	13	0	0	0	2	0
-86	41	47	82	71	56	62	0	0	0	23	0	0	0	3	0
-85	159	196	171	144	111	125	0	0	0	30	0	0	0	4	0
-84	332	301	261	249	191	165	0	0	0	31	0	0	0	3	0
-83	452	406	392	325	249	217	0	0	0	25	8	39	62	136	132
-82	573	513	485	402	334	247	0	52	97	242	253	349	336	374	341
-81	695	670	580	520	459	425	559	390	533	530	676	665	612	614	542
-80	846	858	815	921	855	926	935	868	972	929	1021	901	894	859	748
-79	1287	1244	1346	1292	1371	1284	1433	1215	1293	1334	1275	1228	1194	1145	1173

AZ	ZA = 31	ZA = 32	ZA = 33	ZA = 34	ZA = 35	ZA = 36	ZA = 37	ZA = 38	ZA = 39	ZA = 40	ZA = 41	ZA = 42	ZA = 43	ZA = 44	ZA = 45
-78	1682	1632	1715	1665	1737	1790	1793	1705	1789	1682	1683	1727	1618	1631	1639
-77	2079	2195	2083	2200	2155	2204	2260	2112	2154	2206	2231	2121	2131	2124	2103
-76	2522	2633	2531	2629	2683	2572	2621	2691	2745	2625	2646	2691	2718	2692	2647
-75	2926	3031	3096	3012	3078	3168	3240	3178	3242	3273	3285	3199	3251	3205	3150
-74	3332	3431	3511	3627	3596	3684	3757	3731	3847	3864	3708	3564	3723	3661	3613
-73	3740	3911	4037	4109	4247	4142	4210	4106	4290	4379	4353	4242	4208	4158	4121
-72	4442	4373	4500	4571	4709	4860	4922	4874	4982	4886	4805	4739	4723	4729	4703
-71	4902	4836	5031	5134	5245	5325	5385	5371	5289	5286	5218	5164	5081	5098	5273
-70	5426	5571	5701	5612	5714	5792	5860	5759	5558	5714	5662	5698	5671	5602	5378
-69	5889	6037	6169	6358	6441	6328	6230	6147	6154	6101	6062	6036	5924	5783	5570
-68	6351	6573	6712	6792	6678	6582	6573	6504	6470	6409	6558	6316	6087	5874	5753
-67	6840	7041	7125	7088	6988	6905	6835	6781	6913	7003	6615	6383	6240	6037	5846
-66	7287	7512	7401	7304	7219	7216	7258	7220	7149	7029	6735	6518	6311	6177	6016
-65	7786	7696	7600	7584	7514	7541	7510	7493	7248	7020	6883	6638	6448	6262	6112
-64	7969	7915	7860	7790	7818	7839	7761	7516	7334	7110	6907	6754	6563	6369	6242
-63	8198	8086	8049	8131	8094	8015	7820	7586	7361	7201	6975	6801	6658	6472	6295
-62	8357	8337	8292	8327	8319	8078	7809	7658	7440	7228	7083	6826	6696	6566	6398
-61	8566	8512	8516	8549	8312	8131	7872	7671	7512	7305	7109	6947	6781	6654	6491
-60	8765	8725	8692	8584	8354	8129	7942	7668	7519	7372	7181	7037	6835	6736	6519
-59	8908	8881	8817	8566	8391	8152	7942	7748	7578	7434	7240	7107	6930	6746	6537
-58	9089	9016	8794	8585	8377	8189	7985	7834	7561	7448	7302	7121	6985	6746	6554
-57	9200	9025	8811	8605	8403	8177	8023	7823	7651	7491	7359	7177	6997	6752	6563
-56	9200	8992	8822	8585	8412	8204	8063	7867	7730	7478	7412	7187	6979	6762	6575
-55	9195	8994	8829	8599	8379	8237	8061	7908	7734	7569	7373	7197	6990	6775	6570
-54	9188	8991	8795	8606	8418	8255	8096	7945	7775	7623	7330	7206	7001	6757	6567
-53	9134	8953	8794	8576	8446	8289	8128	7979	7813	7628	7385	7191	6973	6763	6490
-52	9155	8943	8787	8596	8469	8287	8153	7976	7833	7634	7396	7189	6983	6733	6460
-51	9119	8976	8754	8614	8490	8312	8185	8001	7806	7639	7403	7202	6978	6701	6428
-50	9094	8975	8767	8649	8479	8335	8210	8020	7841	7645	7411	7209	6981	6669	6396
-49	9069	8914	8836	8664	8498	8376	8195	8015	7876	7617	7420	7174	6947	6635	6362
-48	9057	8916	8841	8652	8515	8396	8197	8010	7880	7624	7420	7138	6911	6601	6327
-47	9037	8922	8819	8745	8532	8407	8199	8015	7858	7730	7383	7101	6875	6565	6304
-46	9039	8947	8805	8701	8632	8379	8202	8050	7865	7633	7417	7064	6838	6560	6310
-45	9042	8932	8815	8711	8621	8381	8206	8056	7873	7591	7316	7122	6800	6537	6316
-44	9060	8939	8825	8723	8576	8473	8241	8064	7870	7552	7268	7046	6771	6540	6350
-43	9047	8945	8853	8732	8552	8428	8318	8073	7830	7513	7285	7003	6735	6542	6351
-42	9248	8969	8863	8732	8582	8422	8277	8132	7789	7560	7246	6963	6736	6542	6352
-41	9122	9114	8873	8735	8586	8429	8265	8055	7843	7519	7235	6931	6734	6541	6351
-40	9073	9063	8989	8738	8592	8438	8303	8050	7779	7498	7194	6957	6732	6573	6382
-39	9079	9009	9027	8742	8599	8474	8293	8007	7721	7441	7154	6989	6791	6595	6404
-38	9172	9000	8890	8867	8633	8486	8250	7964	7679	7453	7186	6983	6784	6589	6397
-37	9258	9001	8905	8789	8683	8492	8207	7981	7696	7411	7178	6975	6776	6580	6387
-36	9141	9156	8911	8789	8660	8510	8223	7938	7653	7376	7168	6964	6765	6608	6413
-35	9122	9044	8959	8821	8695	8464	8181	7895	7611	7364	7197	6992	6791	6616	6423
-34	9105	8958	8948	8811	8702	8419	8196	7913	7629	7393	7183	7001	6798	6600	6405
-33	9072	8757	8753	8848	8633	8435	8153	7870	7593	7402	7191	6983	6780	6581	6426
-32	8371	8651	8478	8583	8657	8334	8110	7827	7646	7428	7214	7006	6801	6601	6405
-31	7681	7993	8121	8102	8371	8403	8091	7862	7627	7408	7193	6984	6779	6596	6398
-30	7082	7391	7595	7716	8033	8160	8085	7835	7605	7385	7215	7003	6815	6611	6412
-29	6752	6808	7027	7318	7764	7975	7971	7845	7583	7406	7189	6995	6786	6581	6381
-28	6306	6845	6570	6860	7293	7861	7944	7748	7439	7237	7065	7010	6800	6593	6405
-27	5725	6318	7122	6359	6744	6925	7512	7796	7346	7028	6836	6753	6764	6571	6367

AZ	ZA = 31	ZA = 32	ZA = 33	ZA = 34	ZA = 35	ZA = 36	ZA = 37	ZA = 38	ZA = 39	ZA = 40	ZA = 41	ZA = 42	ZA = 43	ZA = 44	ZA = 45
-26	5210	5367	6078	6744	6157	6264	6732	7003	7537	7130	6508	6446	6244	6269	6371
-25	4759	4936	5238	5505	6264	5849	5976	6198	6066	6390	6991	6282	5767	5720	5566
-24	4709	4689	4718	4815	4729	4970	5203	5414	5376	5514	5337	5528	5721	5181	5079
-23	3924	4214	4395	4321	4187	4337	4552	4488	4663	4798	4642	4695	4474	4438	4709
-22	3512	3725	3769	3851	3711	3756	3947	3899	4072	3974	4079	4141	3953	3930	4154
-21	3112	3292	3284	3284	3096	3133	3118	3311	3476	3394	3499	3367	3402	3214	3829
-20	1979	2284	2848	2827	2610	2637	2632	2817	2776	2915	2834	2916	2792	2896	3399
-19	2204	2000	1829	1900	2085	2185	2189	2364	2338	2473	2412	2499	2399	2531	2895
-18	1972	1948	1848	1602	1577	1593	1767	1765	1913	1884	1996	1936	2003	2139	2607
-17	1585	1548	1563	1373	1326	1253	1415	1420	1557	1541	1651	1608	1680	1835	2142
-16	319	612	1203	1043	991	954	1098	1111	1116	1238	1222	1311	1275	1542	1794
-15	654	484	352	506	666	690	709	831	839	949	944	934	1024	1119	1523
-14	402	412	508	411	372	476	496	601	613	621	714	710	717	905	975
-13	49	111	257	243	220	301	320	336	421	433	441	519	533	610	811
-12	56	51	37	81	109	166	181	195	263	276	287	295	364	353	370
-11	8	18	27	58	60	62	80	90	99	150	161	170	169	180	141
-10	0	0	0	4	12	19	25	51	52	52	63	70	67	53	52
-9	0	0	0	0	0	0	0	1	7	12	17	42	40	36	29
-8	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5
-7	0	0	0	0	2	4	6	7	8	8	0	0	0	0	0
-6	0	0	0	0	0	0	1	2	4	6	9	22	21	18	16
-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
-4	20	19	18	17	15	14	13	12	0	0	0	0	0	0	0
-3	1	2	3	4	5	6	7	8	9	10	10	22	21	21	20
-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	15	30	45
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	256	264	271	277	283	288	291	295	297	299	299	300	289	271	251
3	571	558	544	529	512	494	475	455	433	411	387	817	815	801	784
4	1184	1204	1221	1236	1256	1282	1306	1330	1579	1573	1567	1558	1520	1467	1413
5	1923	1910	1895	1878	1874	1875	2112	2106	2098	2088	2076	2063	2016	1951	2096
6	2474	2455	2434	2410	2401	2651	2655	2660	2665	2671	2678	2827	2740	2638	2539
7	3015	2992	2965	2936	3172	3166	3155	3138	3116	3088	3269	3237	3169	3079	2986
8	3547	3520	3490	3457	3678	3662	3644	3622	3811	3777	3740	3700	3626	3815	3751
9	4069	4039	4007	4213	4186	4165	4140	4442	4419	4388	4349	4412	4318	4200	4073
10	4581	4551	4518	4875	4877	4873	4859	4882	4802	4723	4842	4775	4683	4572	4627
11	5257	5271	5282	5322	5242	5193	5357	5306	5250	5383	5310	5232	5142	5135	4995
12	5700	5624	5780	5745	5710	5889	5834	5773	5828	5735	5642	5548	5383	5208	5035
13	6087	6062	6265	6235	6202	6290	6197	6097	5955	5814	5669	5496	5345	5171	4978
14	6560	6539	6667	6616	6563	6396	6247	6072	5921	5771	5598	5452	5304	5130	4960
15	6935	6891	6810	6677	6503	6350	6198	6020	5871	5704	5566	5433	5253	5076	4884
16	7072	6981	6806	6658	6480	6330	6143	5997	5856	5687	5542	5374	5233	5053	4887
17	7073	6929	6748	6601	6406	6256	6094	5951	5780	5637	5470	5330	5169	5016	4855
18	7014	6872	6669	6516	6360	6221	6046	5901	5731	5590	5425	5287	5128	4978	4794
19	6937	6782	6627	6489	6313	6171	6026	5856	5715	5549	5412	5252	5117	4957	4796
20	6914	6791	6614	6437	6292	6118	5975	5806	5667	5503	5367	5209	5076	4877	4719
21	6866	6738	6560	6383	6239	6066	5924	5757	5593	5457	5292	5143	4996	4878	4705
22	6809	6685	6507	6331	6218	6046	5876	5739	5592	5450	5280	5129	5001	4851	4706
23	6787	6660	6486	6311	6167	5995	5860	5727	5534	5371	5240	5087	4960	4812	4650
24	6726	6600	6435	6260	6117	6002	5795	5615	5512	5354	5225	5073	4924	4800	4650
25	6664	6546	6415	6305	6106	5934	5758	5597	5466	5310	5157	5031	4884	4739	4615

AZ	ZA = 31	ZA = 32	ZA = 33	ZA = 34	ZA = 35	ZA = 36	ZA = 37	ZA = 38	ZA = 39	ZA = 40	ZA = 41	ZA = 42	ZA = 43	ZA = 44	ZA = 45
26	6632	6515	6452	6220	6019	5878	5710	5550	5393	5266	5114	4993	4870	4743	4597
27	6602	6536	6335	6143	6001	5861	5693	5532	5376	5249	5099	4962	4816	4690	4547
28	6620	6439	6287	6125	5954	5785	5647	5486	5331	5184	5068	4939	4792	4651	4535
29	6525	6376	6235	6078	5937	5769	5631	5467	5316	5166	5015	4895	4752	4612	4475
30	6489	6344	6212	6062	5892	5724	5569	5422	5270	5120	4999	4855	4738	4598	4462
31	6434	6309	6153	6017	5876	5737	5551	5405	5252	5103	4957	4814	4674	4560	4424
32	6408	6261	6120	5986	5877	5679	5500	5337	5233	5086	4941	4799	4659	4522	4388
33	6353	6205	6068	6000	5836	5650	5486	5332	5163	5044	4900	4759	4620	4484	4374
34	6312	6172	6073	5923	5774	5608	5496	5315	5149	5000	4858	4743	4605	4470	4337
35	6258	6146	6001	5872	5746	5631	5441	5269	5110	4959	4841	4701	4565	4455	4328
36	6246	6099	5952	5822	5733	5596	5418	5257	5098	4942	4801	4662	4529	4417	4284
37	6193	6034	5918	5809	5681	5542	5379	5245	5086	4929	4784	4647	4512	4378	4248
38	6193	5999	5875	5767	5632	5512	5367	5207	5048	4918	4767	4630	4495	4363	4233
39	6144	6006	5840	5707	5584	5480	5356	5196	5038	4882	4728	4613	4479	4347	4218
40	6121	5957	5833	5673	5551	5433	5332	5185	5029	4872	4718	4575	4417	4307	4179
41	6089	5938	5781	5639	5517	5399	5285	5151	5017	4862	4709	4533	4401	4271	4143
42	6049	5916	5758	5621	5483	5366	5254	5139	4982	4853	4673	4523	4385	4255	4128
43	6031	5871	5737	5587	5435	5333	5219	5109	4973	4792	4665	4515	4369	4240	4113
44	6043	5850	5693	5562	5431	5286	5185	5076	4964	4783	4632	4501	4359	4224	4097
45	5999	5829	5672	5541	5398	5250	5138	5042	4936	4775	4615	4497	4351	4209	4082
46	5978	5841	5651	5481	5373	5215	5104	5007	4902	4756	4612	4467	4344	4199	4043
47	5957	5798	5663	5469	5330	5211	5069	4961	4868	4730	4609	4460	4337	4167	4028
48	5914	5777	5581	5457	5309	5184	5034	4927	4805	4704	4602	4454	4330	4161	4019
49	5891	5699	5585	5469	5289	5164	4999	4866	4793	4669	4572	4447	4324	4155	4013
50	5839	5659	5579	5448	5268	5124	5003	4842	4762	4661	4537	4441	4318	4149	4007
51	5740	5677	5558	5407	5278	5103	4943	4820	4717	4625	4501	4407	4286	4143	4002
52	5698	5639	5547	5385	5257	5055	4952	4796	4690	4589	4465	4359	4261	4137	3997
53	5702	5587	5494	5363	5235	5045	4938	4804	4660	4553	4406	4339	4225	4132	3992
54	5667	5569	5441	5347	5181	5064	4916	4781	4638	4516	4375	4305	4214	4100	4008
55	5647	5517	5423	5293	5147	5046	4892	4758	4614	4448	4354	4268	4177	4068	3983
56	5597	5465	5370	5222	5143	5023	4900	4734	4620	4449	4359	4230	4139	4030	3918
57	5546	5448	5317	5196	5094	4970	4876	4710	4553	4440	4333	4192	4107	3982	3903
58	5486	5396	5260	5161	5038	4947	4828	4730	4557	4426	4307	4164	4069	3948	3872
59	5381	5305	5244	5110	5016	4890	4769	4658	4542	4429	4279	4175	4037	3919	3833
60	5312	5231	5157	5090	4959	4831	4743	4616	4514	4401	4261	4145	4016	3912	3793
61	5202	5161	5075	5034	4901	4807	4688	4562	4481	4371	4230	4112	3984	3880	3761
62	5089	5122	4959	4918	4879	4747	4625	4533	4416	4309	4230	4090	3951	3854	3726
63	5015	4952	4836	4830	4762	4717	4591	4468	4349	4268	4181	4058	3954	3818	3695
64	4994	4845	4751	4669	4629	4645	4527	4398	4315	4198	4101	4023	3918	3787	3686
65	4975	4717	4623	4578	4499	4478	4403	4367	4240	4195	4046	3939	3847	3748	3695
66	4635	4635	4535	4444	4373	4328	4295	4236	4168	4219	3963	3860	3756	3692	3624
67	4320	4369	4403	4350	4274	4181	4109	4044	4066	4039	3884	3769	3707	3636	3512
68	3978	4100	4175	4212	4123	4034	3998	3928	3923	3810	3841	3722	3610	3518	3453
69	3712	3793	3866	3973	4018	3927	3845	3771	3796	3683	3630	3583	3509	3450	3345
70	3446	3526	3600	3556	3614	3666	3693	3612	3547	3516	3458	3445	3388	3341	3234
71	3145	3108	3221	3292	3352	3404	3448	3408	3372	3343	3278	3221	3161	3126	3171
72	2881	2846	2922	2992	3052	3143	3189	3160	3246	3171	3102	3000	3022	2975	2932
73	2477	2583	2660	2731	2793	2744	2793	2796	2865	2928	2920	2773	2791	2737	2689
74	2232	2302	2371	2439	2429	2488	2539	2561	2615	2640	2569	2527	2596	2536	2483
75	1988	2059	2126	2079	2141	2201	2185	2235	2273	2304	2326	2317	2346	2343	2286
76	1745	1816	1777	1835	1892	1847	1803	1953	1994	1937	1941	2014	2029	2033	2032
77	1477	1547	1506	1562	1542	1595	1564	1601	1659	1696	1706	1664	1680	1689	1661

AZ	ZA = 31	ZA = 32	ZA = 33	ZA = 34	ZA = 35	ZA = 36	ZA = 37	ZA = 38	ZA = 39	ZA = 40	ZA = 41	ZA = 42	ZA = 43	ZA = 44	ZA = 45
78	1237	1200	1263	1215	1266	1313	1212	1305	1401	1365	1402	1430	1370	1383	1364
79	996	960	1022	972	1019	959	956	934	1025	1096	1075	1098	1111	1079	1078
80	715	720	677	728	670	706	567	669	772	767	853	810	843	855	790
81	590	579	509	458	393	352	272	304	427	441	541	599	581	614	577
82	487	446	426	358	298	314	0	43	82	316	224	318	322	377	361
83	385	354	345	289	224	274	0	0	0	131	9	39	64	192	147
84	283	264	231	222	172	202	0	0	0	125	0	0	0	58	0
85	138	174	152	130	102	151	0	0	0	95	0	0	0	48	0
86	37	47	74	65	53	66	0	0	0	55	0	0	0	33	0
87	0	6	0	1	4	8	0	0	0	26	0	0	0	13	0
88	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
89	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1d
Relative Spatial Response of ULV

AZ	ZA = 46	ZA = 47	ZA = 48	ZA = 49	ZA = 50	ZA = 51	ZA = 52	ZA = 53	ZA = 54	ZA = 55	ZA = 56	ZA = 57	ZA = 58	ZA = 59	ZA = 60
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
-88	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0
-87	0	0	2	0	0	0	1	0	0	0	2	0	0	0	0
-86	0	0	2	0	0	0	1	0	0	0	1	0	0	0	1
-85	0	0	2	0	0	0	1	0	0	0	0	0	0	0	1
-84	12	20	45	34	28	8	0	0	0	0	0	0	0	0	0
-83	160	136	129	91	73	33	0	1	0	0	7	57	37	39	37
-82	332	275	239	189	116	53	9	37	86	108	112	291	96	95	107
-81	500	442	343	288	302	243	248	276	276	256	242	383	161	264	339
-80	699	714	629	627	651	626	591	510	472	415	409	532	825	648	663
-79	1171	1162	1048	1020	978	925	862	813	856	899	978	1009	1175	1092	1051
-78	1611	1577	1528	1381	1313	1329	1347	1371	1379	1518	1528	1524	1510	1501	1425
-77	2148	2064	1994	1979	1960	1978	1986	1996	1958	2063	2015	1958	1843	1829	1753
-76	2644	2551	2528	2515	2465	2576	2578	2579	2515	2447	2332	2288	2242	2074	2130
-75	3158	3152	3132	3121	3098	3114	3067	2981	2890	2732	2658	2611	2574	2513	2492
-74	3583	3555	3666	3659	3698	3467	3363	3265	3138	3066	3027	2915	2860	2875	2925
-73	4171	4155	4148	4080	3901	3670	3697	3564	3445	3365	3310	3241	3195	3122	3087
-72	4687	4599	4488	4336	4168	4008	3918	3850	3804	3625	3645	3518	3456	3261	3130
-71	5053	4861	4659	4519	4427	4284	4146	4029	3991	3954	3841	3809	3528	3352	3218
-70	5193	5069	4966	4728	4611	4510	4386	4259	4227	4156	3950	3849	3602	3422	3262
-69	5373	5216	5190	4952	4808	4657	4602	4474	4382	4212	4011	3810	3684	3454	3270
-68	5567	5395	5247	5195	4995	4854	4805	4657	4430	4263	4058	3873	3689	3456	3273
-67	5749	5563	5389	5269	5153	5041	4911	4695	4490	4309	4106	3857	3660	3431	3251
-66	5820	5709	5545	5402	5270	5128	4894	4731	4518	4366	4090	3844	3648	3423	3261
-65	5952	5783	5691	5548	5343	5152	4939	4761	4542	4333	4070	3866	3633	3463	3260
-64	6007	5915	5816	5603	5361	5147	4964	4782	4307	4296	4053	3843	3600	3466	3264
-63	6132	6030	5860	5615	5397	5203	4979	4747	4501	4221	4045	3864	3655	3448	3268
-62	6286	5950	5820	5645	5408	5219	4939	4742	4477	4260	4037	3865	3695	3468	3295
-61	6318	6066	5847	5650	5416	5209	4931	4700	4438	4246	4073	3866	3697	3495	3308
-60	6295	6091	5807	5677	5404	5161	4884	4654	4455	4244	4072	3867	3698	3532	3334
-59	6288	6112	5873	5640	5351	5146	4908	4650	4474	4265	4093	3923	3721	3534	3370

AZ	ZA = 46	ZA = 47	ZA = 48	ZA = 49	ZA = 50	ZA = 51	ZA = 52	ZA = 53	ZA = 54	ZA = 55	ZA = 56	ZA = 57	ZA = 58	ZA = 59	ZA = 60
-58	6307	6105	5876	5616	5334	5091	4858	4646	4471	4263	4092	3923	3755	3557	3382
-57	6325	6114	5815	5556	5342	5072	4876	4664	4490	4317	4113	3945	3756	3592	3414
-56	6311	6091	5793	5539	5286	5047	4870	4694	4486	4314	4144	3943	3778	3619	3452
-55	6330	6022	5807	5515	5278	5059	4887	4712	4505	4334	4164	3997	3771	3622	3473
-54	6262	6016	5736	5448	5268	5115	4894	4730	4557	4330	4161	3994	3828	3655	3472
-53	6232	5971	5712	5463	5283	5105	4896	4705	4550	4380	4212	4010	3842	3658	3490
-52	6155	5939	5692	5510	5297	5120	4945	4739	4544	4398	4228	4051	3855	3692	3497
-51	6159	5861	5705	5523	5311	5135	4960	4787	4616	4408	4207	4030	3859	3692	3513
-50	6126	5872	5689	5536	5357	5149	4974	4802	4631	4425	4239	4059	3860	3684	3474
-49	6100	5882	5700	5519	5341	5166	4992	4790	4619	4425	4238	4056	3879	3666	3487
-48	6109	5924	5710	5530	5352	5177	5003	4832	4645	4449	4233	4051	3869	3655	3476
-47	6116	5931	5749	5539	5362	5187	5014	4841	4638	4441	4250	4064	3847	3665	3486
-46	6123	5938	5756	5577	5400	5225	5024	4832	4628	4429	4238	4051	3834	3652	3473
-45	6129	5944	5762	5582	5407	5232	5057	4846	4640	4440	4243	4052	3840	3658	3482
-44	6162	5949	5767	5588	5410	5238	5041	4830	4623	4422	4230	4040	3798	3642	3488
-43	6164	5980	5798	5619	5442	5237	5023	4811	4626	4424	4234	4047	3862	3638	3453
-42	6165	5980	5799	5620	5444	5245	5026	4812	4603	4405	4216	4029	3843	3648	3472
-41	6163	6012	5830	5651	5475	5265	5002	4787	4577	4386	4216	4028	3843	3664	3453
-40	6195	6010	5828	5649	5487	5262	5041	4824	4576	4384	4194	4006	3823	3661	3483
-39	6215	6030	5848	5668	5458	5233	5012	4794	4593	4400	4189	4001	3819	3639	3461
-38	6208	6023	5841	5657	5438	5202	4980	4783	4588	4394	4203	3978	3812	3631	3452
-37	6199	6013	5831	5624	5416	5202	4994	4758	4562	4368	4193	4007	3824	3606	3441
-36	6224	6059	5875	5658	5428	5201	4982	4764	4566	4357	4165	3981	3812	3631	3452
-35	6233	6044	5853	5621	5392	5182	4961	4761	4565	4375	4151	3968	3784	3616	3439
-34	6215	6030	5815	5601	5371	5143	4931	4731	4548	4352	4163	3993	3811	3586	3424
-33	6234	6063	5843	5612	5380	5102	4915	4714	4515	4333	4146	3961	3777	3611	3440
-32	6230	6033	5801	5569	5355	5129	4925	4723	4537	4341	4114	3941	3757	3578	3415
-31	6204	5990	5757	5542	5311	5094	4904	4700	4500	4320	4134	3948	3775	3597	3395
-30	6216	6011	5779	5548	5318	5117	4911	4707	4472	4286	4111	3925	3741	3577	3402
-29	6195	5964	5733	5517	5288	5079	4884	4679	4478	4302	4116	3941	3758	3544	3380
-28	6199	5969	5752	5522	5296	5098	4889	4636	4451	4265	4089	3904	3734	3560	3395
-27	6149	5933	5704	5474	5267	5055	4856	4648	4455	4278	4093	3917	3739	3535	3361
-26	6163	5935	5707	5491	5272	5070	4813	4612	4424	4239	4062	3878	3713	3540	3375
-25	5818	5895	5679	5441	5206	5001	4798	4612	4438	4257	4064	3890	3717	3553	3348
-24	5435	5518	5573	5448	5170	4906	4702	4507	4366	4203	4034	3859	3695	3525	3353
-23	5016	5352	5486	5332	4999	4720	4441	4340	4249	4161	4023	3826	3613	3452	3281
-22	4767	5130	5451	5292	4908	4546	4263	4150	4157	4093	4012	3780	3462	3220	2993
-21	4260	4893	5318	5111	4731	4486	4112	4012	4027	4042	3988	3637	3329	3023	2824
-20	4143	4550	4791	4506	4335	3962	3753	3894	4097	4052	3959	3565	3182	2861	2597
-19	3479	4026	5061	4516	4036	3651	3421	3599	3699	3811	3908	3341	2940	2528	2377
-18	2951	3480	3575	3421	3428	3182	3244	3362	3436	3457	3287	3050	2657	2248	2210
-17	2640	2962	3136	3029	2904	2876	2810	2931	3014	3153	3382	2882	2415	2018	1971
-16	2055	2510	2596	2805	2712	2597	2527	2498	2474	2589	2413	2169	1991	1708	1765
-15	1748	1977	2129	2104	2068	2165	2136	2096	2211	2116	1956	1809	1594	1390	1481
-14	959	1094	1192	1744	1735	1717	1656	1718	1657	1588	1586	1463	1343	1240	1457
-13	930	1042	1141	1061	969	741	808	861	900	1254	1158	1055	944	935	995
-12	610	677	711	886	913	924	871	909	777	655	551	346	351	368	425
-11	97	100	210	304	382	571	532	489	442	399	468	431	390	368	448
-10	23	10	10	23	46	64	72	68	121	112	119	120	115	150	125
-9	20	0	0	0	0	0	0	0	0	0	0	2	8	10	10
-8	8	11	14	30	27	23	20	17	14	0	0	0	0	0	0
-7	0	0	0	0	0	0	0	2	4	6	7	8	10	11	20

AZ	ZA = 46	ZA = 47	ZA = 48	ZA = 49	ZA = 50	ZA = 51	ZA = 52	ZA = 53	ZA = 54	ZA = 55	ZA = 56	ZA = 57	ZA = 58	ZA = 59	ZA = 60
-6	13	12	11	0	0	0	0	0	0	0	0	0	0	0	0
-5	2	3	4	5	7	8	9	10	20	18	17	15	14	13	12
-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-3	19	18	17	16	15	14	13	13	12	11	10	0	0	0	0
-2	0	0	0	0	1	1	2	2	2	3	3	3	4	4	4
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	59	45	30	15	0	0	0	0	0	6	12	18	24	79	134
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	230	213	198	191	174	153	133	113	94	81	67	53	39	35	35
3	763	760	771	782	792	782	756	726	694	658	619	704	646	621	611
4	1356	1338	1337	1511	1503	1458	1397	1334	1271	1202	1131	1058	985	953	938
5	1998	1941	1901	1855	1803	1717	1616	1512	1666	1611	1551	1488	1419	1369	1337
6	2444	2395	2369	2497	2452	2376	2287	2197	2105	2018	1934	1967	1884	1821	1763
7	3069	2997	2934	2867	2796	2706	2876	2797	2717	2642	2563	2480	2393	2317	2227
8	3691	3638	3577	3483	3337	3194	3060	2924	2786	2783	2729	2677	2627	2534	2405
9	3936	3967	3819	3663	3499	3359	3326	3206	3086	3014	2983	3027	2996	2882	2708
10	4508	4356	4162	4042	3821	3651	3528	3404	3341	3258	3203	3142	3076	2942	2787
11	4851	4675	4454	4241	4036	3914	3786	3658	3529	3413	3312	3193	3069	2937	2802
12	4843	4663	4482	4326	4177	4042	3912	3779	3640	3503	3365	3212	3073	2938	2817
13	4807	4637	4484	4342	4202	4045	3903	3761	3619	3464	3326	3188	3051	2906	2786
14	4760	4590	4447	4290	4151	4013	3871	3716	3577	3438	3285	3156	3030	2908	2762
15	4717	4551	4394	4256	4118	3961	3819	3677	3529	3395	3264	3117	2984	2852	2735
16	4722	4546	4402	4240	4101	3964	3813	3676	3540	3392	3259	3126	2983	2852	2705
17	4671	4508	4341	4205	4069	3918	3782	3633	3500	3368	3222	3091	2961	2821	2702
18	4633	4454	4308	4172	4021	3887	3737	3605	3472	3327	3197	3056	2928	2800	2672
19	4601	4448	4288	4154	4020	3871	3739	3592	3462	3332	3191	3033	2895	2770	2652
20	4577	4427	4255	4122	3972	3841	3694	3564	3421	3293	3167	3028	2904	2768	2648
21	4549	4375	4223	4073	3942	3794	3665	3521	3395	3255	3130	3006	2871	2748	2618
22	4531	4379	4209	4072	3924	3795	3650	3523	3383	3259	3122	3000	2838	2718	2598
23	4498	4328	4179	4023	3894	3752	3623	3480	3357	3220	3099	2965	2845	2729	2619
24	4479	4330	4172	4030	3878	3749	3606	3482	3316	3196	3073	2959	2819	2698	2568
25	4462	4287	4136	3972	3846	3703	3578	3450	3334	3188	3053	2935	2806	2691	2550
26	4448	4280	4117	3974	3828	3708	3538	3412	3278	3146	3029	2900	2786	2660	2547
27	4392	4249	4087	3927	3798	3657	3535	3397	3264	3148	3019	2905	2779	2640	2517
28	4392	4229	4088	3930	3777	3656	3518	3355	3238	3109	2996	2869	2758	2634	2525
29	4359	4197	4038	3901	3748	3610	3490	3356	3223	3110	2984	2873	2749	2603	2495
30	4328	4197	4039	3884	3731	3608	3472	3339	3198	3071	2961	2837	2716	2608	2489
31	4291	4145	3989	3855	3704	3562	3445	3313	3183	3072	2948	2826	2719	2600	2471
32	4278	4144	3989	3839	3707	3559	3426	3295	3183	3056	2910	2804	2685	2567	2464
33	4243	4135	3995	3837	3687	3513	3399	3269	3141	3032	2910	2791	2675	2576	2457
34	4212	4082	3937	3808	3660	3514	3378	3250	3140	3016	2894	2793	2676	2538	2437
35	4193	4065	3936	3787	3640	3515	3375	3247	3117	2997	2872	2755	2640	2540	2428
36	4156	4051	3926	3785	3639	3496	3348	3210	3096	2975	2856	2740	2640	2528	2417
37	4120	3994	3871	3736	3612	3462	3328	3200	3077	2957	2854	2739	2626	2494	2398
38	4105	3980	3857	3733	3588	3449	3311	3195	3073	2954	2837	2702	2604	2494	2386
39	4091	3966	3843	3722	3588	3448	3310	3176	3051	2933	2813	2700	2589	2480	2373
40	4053	3929	3807	3687	3585	3446	3309	3175	3025	2908	2794	2682	2572	2479	2373
41	4018	3914	3792	3673	3555	3423	3264	3130	3002	2886	2790	2678	2570	2463	2339
42	4003	3880	3759	3640	3522	3396	3258	3129	3000	2880	2768	2658	2551	2442	2338
43	3988	3865	3744	3625	3508	3369	3238	3108	2998	2874	2762	2653	2547	2416	2320
44	3973	3827	3707	3587	3471	3359	3235	3105	2977	2852	2738	2622	2503	2406	2319
45	3934	3813	3691	3574	3459	3345	3231	3101	2974	2850	2718	2621	2502	2401	2301

AZ	ZA = 46	ZA = 47	ZA = 48	ZA = 49	ZA = 50	ZA = 51	ZA = 52	ZA = 53	ZA = 54	ZA = 55	ZA = 56	ZA = 57	ZA = 58	ZA = 59	ZA = 60
46	3919	3796	3678	3561	3445	3331	3197	3077	2948	2824	2707	2598	2479	2379	2282
47	3904	3783	3664	3524	3409	3295	3183	3072	2946	2824	2704	2588	2471	2372	2276
48	3890	3769	3627	3510	3395	3281	3169	3059	2942	2820	2681	2565	2460	2347	2252
49	3875	3731	3612	3495	3380	3267	3156	3025	2916	2795	2677	2560	2449	2338	2244
50	3868	3716	3598	3498	3383	3248	3136	3027	2919	2790	2671	2556	2425	2324	2218
51	3863	3702	3600	3484	3346	3234	3122	3013	2905	2778	2646	2532	2420	2312	2220
52	3833	3718	3586	3470	3333	3220	3109	2978	2870	2764	2657	2543	2414	2305	2190
53	3849	3702	3579	3433	3319	3206	3073	2964	2857	2751	2646	2517	2406	2281	2188
54	3826	3705	3574	3420	3305	3208	3075	2966	2858	2717	2613	2509	2399	2297	2170
55	3827	3704	3590	3434	3307	3172	3061	2952	2823	2717	2613	2510	2373	2265	2160
56	3835	3719	3561	3430	3300	3159	3048	2939	2810	2704	2600	2477	2376	2271	2152
57	3803	3714	3556	3425	3315	3165	3050	2918	2811	2705	2580	2477	2363	2263	2140
58	3763	3683	3570	3439	3286	3160	3037	2905	2798	2671	2566	2464	2363	2243	2131
59	3723	3647	3540	3435	3282	3173	3049	2907	2799	2671	2567	2464	2342	2230	2133
60	3687	3606	3499	3431	3295	3168	3021	2900	2786	2658	2554	2430	2329	2230	2112
61	3673	3545	3464	3389	3290	3181	3033	2911	2769	2659	2554	2430	2329	2208	2091
62	3638	3518	3422	3349	3250	3176	3027	2922	2779	2642	2532	2429	2328	2181	2096
63	3587	3490	3409	3305	3208	3134	3038	2916	2705	2669	2535	2429	2287	2190	2076
64	3564	3448	3368	3264	3160	3092	2998	2926	2730	2665	2528	2417	2282	2193	2074
65	3524	3409	3325	3221	3139	3047	2952	2884	2790	2679	2534	2423	2292	2191	2071
66	3484	3393	3280	3196	3096	3002	2905	2837	2751	2679	2540	2404	2296	2168	2076
67	3470	3349	3233	3153	3047	2951	2883	2788	2698	2632	2544	2408	2299	2169	2067
68	3363	3279	3263	3106	2993	2893	2829	2738	2644	2579	2493	2408	2312	2181	2077
69	3250	3179	3272	3043	2934	2830	2765	2673	2592	2526	2435	2373	2292	2180	2075
70	3149	3092	3036	2928	2872	2795	2692	2601	2546	2471	2378	2319	2233	2154	2072
71	3066	3037	2877	2815	2773	2705	2622	2526	2468	2387	2380	2259	2187	2086	2033
72	2894	2874	2780	2712	2631	2541	2516	2478	2463	2295	2274	2169	2111	2019	1965
73	2684	2655	2614	2572	2486	2392	2393	2329	2271	2285	2151	2071	2006	1937	1962
74	2413	2393	2407	2375	2373	2282	2210	2166	2103	2163	2047	1958	1888	1854	1812
75	2214	2226	2185	2149	2087	2090	2048	2007	1964	1914	1846	1825	1795	1742	1665
76	2003	1971	1926	1886	1833	1856	1828	1804	1688	1723	1662	1639	1486	1573	1526
77	1722	1715	1703	1659	1614	1586	1556	1530	1464	1518	1480	1449	1322	1375	1330
78	1390	1385	1376	1308	1288	1302	1269	1240	1203	1242	1221	1200	1130	1176	1127
79	1094	1092	1019	1055	1000	989	975	970	943	919	930	911	864	919	892
80	771	771	699	731	712	700	671	640	652	639	611	685	610	607	591
81	569	542	460	443	394	317	296	359	397	410	420	547	339	327	315
82	381	342	324	298	200	114	14	53	128	178	204	264	188	148	53
83	190	176	213	145	128	72	0	0	0	0	16	80	73	58	16
84	17	30	83	56	54	16	2	0	0	0	52	0	0	0	2
85	0	0	11	0	0	3	4	0	0	0	31	0	0	0	11
86	0	0	8	0	0	0	3	0	0	0	6	0	0	0	3
87	0	0	5	0	0	0	2	0	0	0	4	0	0	0	0
88	0	0	2	0	0	0	1	0	0	0	1	0	0	0	0
89	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1e
Relative Spatial Response of ULV

AZ	ZA = 61	ZA = 62	ZA = 63	ZA = 64	ZA = 65	ZA = 66	ZA = 67	ZA = 68	ZA = 69	ZA = 70	ZA = 71	ZA = 72	ZA = 73	ZA = 74	ZA = 75

AZ	ZA = 61	ZA = 62	ZA = 63	ZA = 64	ZA = 65	ZA = 66	ZA = 67	ZA = 68	ZA = 69	ZA = 70	ZA = 71	ZA = 72	ZA = 73	ZA = 74	ZA = 75
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
-88	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0
-87	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
-86	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
-85	0	0	0	0	0	4	0	0	3	0	0	0	0	0	0
-84	5	4	0	0	2	2	0	0	4	6	0	0	0	3	0
-83	4	1	0	1	52	30	0	0	0	3	0	0	0	0	0
-82	8	83	126	140	195	114	7	76	74	38	0	85	90	0	61
-81	307	330	354	315	316	404	302	279	245	270	282	354	324	299	285
-80	674	673	633	635	594	616	554	615	634	682	639	633	600	527	448
-79	990	980	972	960	944	950	972	986	1020	948	874	822	753	670	584
-78	1405	1341	1324	1323	1376	1387	1318	1284	1232	1167	1057	978	874	729	627
-77	1783	1687	1696	1710	1718	1660	1558	1481	1424	1261	1155	1058	917	834	660
-76	2104	1998	2080	2067	1928	1774	1750	1612	1500	1359	1207	1078	927	855	690
-75	2474	2435	2355	2262	2086	2007	1836	1676	1569	1397	1259	1092	973	834	844
-74	2754	2588	2482	2400	2192	2055	1890	1730	1579	1402	1266	1108	984	953	963
-73	2862	2703	2602	2424	2339	2097	1917	1772	1588	1444	1277	1150	1099	1103	1006
-72	2994	2805	2643	2450	2261	2175	1920	1777	1594	1451	1286	1251	1237	1204	982
-71	3043	2831	2658	2470	2319	2116	2029	1779	1629	1456	1400	1357	1290	1135	1003
-70	3043	2836	2679	2470	2315	2115	1968	1827	1630	1533	1501	1459	1295	1115	1032
-69	3055	2851	2674	2480	2310	2126	1965	1810	1697	1655	1616	1436	1271	1164	1072
-68	3043	2879	2682	2508	2320	2155	1976	1863	1810	1739	1606	1433	1302	1180	1094
-67	3049	2885	2690	2516	2329	2164	2038	1943	1890	1763	1601	1425	1323	1220	1127
-66	3054	2892	2715	2524	2355	2185	2109	2044	1916	1749	1587	1467	1352	1256	1161
-65	3115	2898	2721	2532	2368	2280	2175	2098	1926	1758	1614	1480	1374	1271	1174
-64	3100	2958	2728	2572	2428	2346	2263	2106	1908	1744	1625	1512	1397	1309	1150
-63	3105	2944	2747	2612	2511	2419	2265	2087	1914	1776	1655	1540	1423	1323	1195
-62	3110	2950	2796	2660	2557	2430	2270	2092	1910	1782	1660	1546	1439	1312	1174
-61	3144	2961	2836	2729	2622	2431	2248	2072	1936	1805	1682	1566	1457	1323	1166
-60	3153	3027	2880	2763	2619	2439	2258	2095	1972	1839	1714	1595	1458	1315	1174
-59	3194	3054	2936	2786	2620	2407	2226	2108	1968	1835	1710	1590	1452	1324	1171
-58	3245	3117	2953	2784	2593	2430	2271	2122	1981	1848	1735	1608	1442	1299	1188
-57	3276	3130	2973	2782	2615	2416	2261	2131	1989	1854	1740	1597	1451	1308	1189
-56	3312	3145	2944	2755	2588	2452	2290	2138	1995	1876	1740	1594	1461	1322	1201
-55	3332	3139	2967	2771	2600	2434	2315	2161	2016	1875	1728	1599	1452	1338	1216
-54	3308	3134	2935	2769	2598	2452	2277	2163	2016	1888	1736	1586	1444	1334	1221
-53	3296	3124	2952	2796	2629	2453	2315	2154	2013	1880	1728	1592	1455	1325	1228
-52	3289	3096	2948	2770	2622	2475	2340	2173	2020	1884	1728	1585	1464	1332	1223
-51	3307	3132	2943	2789	2637	2467	2305	2173	2012	1894	1741	1595	1459	1338	1228
-50	3298	3126	2940	2784	2625	2478	2313	2175	2018	1886	1746	1603	1465	1361	1233
-49	3310	3143	2954	2797	2619	2472	2294	2172	2023	1891	1738	1609	1469	1354	1236
-48	3301	3108	2966	2807	2628	2480	2309	2171	2025	1893	1744	1613	1493	1357	1237
-47	3312	3110	2956	2798	2617	2484	2311	2176	2017	1898	1749	1603	1494	1360	1238
-46	3324	3126	2954	2789	2621	2470	2314	2179	2020	1888	1751	1628	1494	1360	1247
-45	3311	3113	2949	2807	2619	2466	2303	2181	2021	1891	1752	1627	1485	1382	1248
-44	3316	3115	2951	2792	2606	2467	2330	2168	2047	1892	1765	1625	1507	1380	1246
-43	3300	3130	2951	2790	2632	2455	2331	2169	2035	1891	1763	1621	1506	1378	1264
-42	3297	3129	2933	2786	2626	2456	2318	2194	2034	1914	1759	1633	1503	1388	1260
-41	3279	3126	2961	2765	2621	2482	2317	2192	2032	1900	1779	1630	1522	1383	1277
-40	3274	3106	2954	2757	2606	2479	2313	2177	2054	1895	1773	1626	1517	1400	1271
-39	3267	3098	2931	2779	2604	2464	2337	2172	2047	1914	1756	1645	1502	1393	1286

AZ	ZA = 61	ZA = 62	ZA = 63	ZA = 64	ZA = 65	ZA = 66	ZA = 67	ZA = 68	ZA = 69	ZA = 70	ZA = 71	ZA = 72	ZA = 73	ZA = 74	ZA = 75
-38	3279	3123	2920	2757	2628	2459	2321	2194	2031	1906	1775	1638	1519	1384	1277
-37	3272	3112	2954	2753	2611	2482	2314	2186	2050	1923	1768	1655	1510	1398	1285
-36	3257	3086	2919	2784	2615	2477	2334	2196	2039	1904	1785	1645	1524	1412	1275
-35	3266	3070	2901	2758	2625	2483	2323	2183	2055	1891	1775	1652	1512	1400	1287
-34	3251	3079	2924	2749	2615	2473	2342	2173	2043	1907	1788	1635	1519	1407	1273
-33	3236	3061	2904	2769	2625	2460	2320	2188	2050	1895	1776	1652	1535	1392	1282
-32	3241	3078	2894	2757	2611	2477	2336	2173	2033	1909	1783	1636	1518	1403	1293
-31	3221	3050	2912	2765	2629	2457	2321	2179	2046	1921	1766	1646	1523	1386	1275
-30	3238	3069	2897	2749	2611	2467	2333	2192	2027	1899	1777	1655	1505	1394	1282
-29	3205	3054	2904	2764	2616	2448	2306	2172	2039	1909	1757	1633	1512	1399	1286
-28	3221	3071	2886	2744	2596	2460	2318	2182	2019	1889	1764	1635	1518	1379	1266
-27	3197	3044	2899	2748	2607	2464	2295	2159	2023	1896	1770	1640	1496	1383	1267
-26	3205	3058	2912	2725	2584	2441	2304	2167	2031	1903	1746	1614	1500	1385	1269
-25	3184	3035	2880	2733	2587	2449	2311	2169	2007	1877	1744	1618	1504	1391	1251
-24	3197	3039	2890	2740	2594	2423	2285	2143	2011	1880	1746	1619	1503	1357	1242
-23	3147	3045	2859	2705	2567	2428	2286	2148	2015	1879	1747	1591	1474	1356	1240
-22	2991	2911	2818	2710	2571	2428	2290	2152	1984	1847	1713	1589	1472	1354	1237
-21	2820	2802	2783	2713	2574	2398	2259	2121	1982	1846	1710	1586	1467	1350	1232
-20	2644	2727	2748	2681	2540	2401	2262	2123	1981	1843	1706	1581	1463	1315	1198
-19	2507	2567	2622	2617	2502	2381	2255	2119	1979	1839	1700	1546	1427	1308	1191
-18	2294	2374	2452	2480	2407	2328	2245	2115	1936	1793	1652	1539	1419	1299	1182
-17	2066	2158	2308	2269	2156	2079	2103	1969	1830	1688	1582	1483	1381	1276	1173
-16	1899	2166	2277	2114	1955	1797	1686	1624	1554	1535	1439	1353	1266	1179	1092
-15	1648	1742	1813	1658	1602	1479	1366	1359	1336	1402	1314	1225	1137	1050	966
-14	1466	1492	1496	1423	1263	1102	973	990	1074	1078	1066	1001	916	849	830
-13	1058	1123	1240	1092	938	781	667	755	793	833	822	769	715	659	659
-12	490	864	868	754	603	480	495	523	551	579	569	529	487	502	463
-11	413	377	322	251	189	86	103	126	149	174	182	183	303	270	244
-10	101	79	68	67	122	97	80	67	54	41	30	52	32	15	8
-9	6	1	5	13	19	25	23	15	9	3	0	0	0	0	0
-8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
-7	19	17	16	14	13	12	11	10	0	0	0	0	0	0	0
-6	0	0	0	0	0	0	0	1	2	3	3	4	4	5	5
-5	11	10	9	9	0	0	0	0	0	0	0	0	0	0	0
-4	0	1	1	2	2	3	3	4	4	4	4	5	5	5	5
-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-2	5	5	5	6	6	6	6	5	5	5	4	4	3	3	2
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	189	244	188	133	77	22	17	11	6	0	0	0	0	0	4
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	35	34	34	34	33	33	32	32	31	30	30	29	28	27	26
3	600	588	562	528	494	459	435	417	398	380	354	326	297	267	238
4	922	919	872	833	795	759	728	693	657	620	584	552	521	490	454
5	1307	1277	1240	1189	1214	1153	1104	1059	1013	965	913	858	802	746	687
6	1703	1640	1576	1513	1450	1386	1452	1386	1318	1247	1176	1102	1027	951	872
7	2117	2004	1908	1831	1758	1687	1606	1516	1479	1382	1297	1220	1142	1063	980
8	2272	2198	2102	2048	1995	1942	1851	1734	1616	1525	1424	1337	1249	1161	1068
9	2531	2352	2285	2217	2146	2072	1963	1839	1717	1595	1508	1411	1314	1217	1116
10	2636	2489	2375	2278	2185	2073	1961	1854	1749	1644	1541	1435	1330	1225	1121
11	2677	2554	2434	2313	2193	2062	1949	1843	1738	1633	1528	1422	1312	1206	1104
12	2696	2566	2445	2322	2169	2047	1928	1824	1720	1617	1512	1408	1304	1196	1094
13	2667	2547	2419	2299	2178	2058	1942	1833	1729	1601	1498	1395	1292	1189	1085

AZ	ZA = 61	ZA = 62	ZA = 63	ZA = 64	ZA = 65	ZA = 66	ZA = 67	ZA = 68	ZA = 69	ZA = 70	ZA = 71	ZA = 72	ZA = 73	ZA = 74	ZA = 75
14	2640	2520	2402	2275	2157	2039	1924	1821	1713	1610	1508	1406	1280	1178	1070
15	2609	2493	2377	2260	2140	2027	1916	1810	1703	1591	1489	1389	1290	1190	1092
16	2590	2466	2352	2237	2122	2001	1888	1787	1685	1578	1477	1378	1279	1180	1082
17	2588	2475	2353	2240	2100	1988	1870	1769	1668	1567	1462	1364	1266	1168	1071
18	2559	2447	2335	2216	2105	1995	1879	1776	1651	1551	1451	1349	1253	1157	1061
19	2530	2420	2310	2192	2083	1975	1867	1760	1660	1560	1460	1335	1240	1145	1050
20	2538	2419	2284	2176	2061	1955	1849	1747	1641	1543	1444	1348	1249	1132	1039
21	2509	2401	2284	2177	2071	1934	1830	1729	1624	1526	1429	1334	1235	1142	1050
22	2480	2374	2267	2152	2048	1937	1835	1734	1613	1510	1413	1319	1226	1130	1038
23	2512	2376	2242	2127	2026	1924	1815	1716	1619	1516	1420	1304	1213	1117	1026
24	2458	2344	2240	2136	2026	1903	1803	1697	1601	1506	1404	1310	1220	1104	1015
25	2430	2326	2214	2111	2002	1904	1806	1701	1583	1489	1388	1294	1204	1113	1000
26	2425	2323	2221	2087	1988	1884	1787	1689	1587	1494	1378	1279	1191	1103	1011
27	2407	2296	2198	2088	1987	1882	1765	1670	1570	1477	1384	1285	1177	1090	998
28	2404	2302	2169	2070	1962	1868	1766	1673	1558	1459	1367	1270	1182	1076	991
29	2376	2274	2165	2067	1961	1845	1744	1653	1561	1463	1351	1260	1168	1081	993
30	2383	2269	2149	2042	1946	1843	1752	1655	1543	1446	1356	1266	1152	1068	984
31	2355	2241	2145	2041	1948	1823	1731	1633	1544	1455	1338	1249	1156	1054	971
32	2351	2248	2119	2024	1919	1826	1728	1620	1525	1437	1341	1234	1146	1059	977
33	2332	2220	2113	2019	1916	1803	1706	1619	1525	1419	1331	1237	1151	1045	964
34	2325	2215	2118	1994	1901	1800	1712	1598	1512	1413	1327	1220	1136	1048	950
35	2317	2199	2092	1989	1897	1796	1685	1593	1510	1401	1316	1224	1120	1039	954
36	2299	2192	2088	1996	1873	1783	1685	1592	1491	1400	1316	1214	1124	1041	940
37	2291	2185	2091	1968	1868	1779	1662	1579	1488	1406	1298	1215	1108	1026	943
38	2279	2186	2063	1962	1873	1755	1658	1574	1467	1386	1298	1198	1110	1011	934
39	2261	2157	2055	1966	1848	1750	1664	1550	1470	1383	1280	1199	1094	1014	937
40	2249	2147	2057	1939	1841	1754	1640	1547	1467	1363	1285	1181	1101	1016	922
41	2236	2148	2047	1931	1845	1749	1636	1552	1446	1359	1282	1180	1102	1000	924
42	2233	2135	2018	1933	1838	1725	1631	1547	1440	1363	1262	1178	1085	1001	909
43	2220	2121	2019	1923	1829	1718	1635	1525	1430	1338	1258	1168	1084	992	910
44	2218	2103	2006	1911	1802	1721	1616	1515	1438	1337	1253	1164	1082	991	895
45	2201	2087	1992	1911	1788	1708	1605	1523	1417	1331	1242	1160	1064	990	896
46	2198	2085	1979	1894	1791	1702	1608	1517	1411	1324	1236	1155	1068	971	893
47	2178	2065	1974	1883	1778	1701	1600	1510	1405	1327	1229	1134	1064	971	886
48	2160	2050	1971	1880	1776	1689	1589	1492	1399	1321	1223	1138	1059	967	884
49	2153	2060	1953	1863	1761	1670	1568	1503	1402	1315	1216	1132	1040	963	881
50	2128	2040	1935	1846	1758	1671	1575	1494	1394	1308	1218	1125	1034	966	878
51	2118	2031	1929	1841	1754	1656	1561	1481	1386	1310	1212	1117	1028	947	873
52	2095	2006	1922	1821	1735	1639	1570	1478	1388	1289	1203	1110	1029	942	868
53	2091	1993	1912	1828	1730	1634	1553	1450	1379	1294	1197	1112	1022	935	870
54	2058	1975	1884	1806	1709	1624	1531	1457	1370	1295	1199	1105	1014	940	863
55	2058	1960	1881	1794	1713	1620	1540	1451	1365	1281	1191	1110	1017	939	857
56	2051	1938	1849	1774	1691	1610	1520	1432	1348	1275	1194	1100	1020	933	849
57	2039	1927	1842	1758	1686	1588	1499	1423	1339	1258	1190	1102	1012	924	842
58	2030	1931	1807	1733	1654	1586	1500	1416	1331	1251	1182	1104	1003	916	842
59	2015	1904	1810	1714	1643	1555	1479	1402	1319	1240	1163	1089	1005	928	834
60	2004	1907	1794	1691	1615	1585	1471	1392	1319	1239	1163	1089	1004	918	834
61	2003	1889	1783	1692	1594	1511	1442	1376	1295	1217	1141	1069	1000	919	825
62	1982	1888	1784	1674	1575	1489	1426	1362	1279	1201	1127	1055	987	907	825
63	1980	1885	1764	1673	1574	1479	1393	1329	1269	1197	1123	1051	976	911	834
64	1977	1873	1760	1670	1572	1482	1378	1310	1235	1178	1105	1034	960	921	819
65	2000	1860	1757	1647	1554	1456	1357	1272	1214	1159	1098	1019	949	878	812

AZ	ZA = 61	ZA = 62	ZA = 63	ZA = 64	ZA = 65	ZA = 66	ZA = 67	ZA = 68	ZA = 69	ZA = 70	ZA = 71	ZA = 72	ZA = 73	ZA = 74	ZA = 75
66	1951	1856	1753	1643	1545	1441	1351	1264	1175	1121	1071	1008	934	871	805
67	1947	1852	1738	1638	1529	1435	1344	1240	1158	1096	1047	984	918	850	786
68	1944	1848	1733	1632	1523	1428	1326	1239	1157	1062	1007	960	908	827	768
69	1950	1830	1727	1614	1516	1410	1318	1230	1129	1051	978	918	875	820	757
70	1945	1824	1729	1607	1517	1401	1316	1220	1124	1028	954	888	846	794	735
71	1948	1824	1720	1606	1516	1399	1403	1204	1119	1020	946	855	800	762	721
72	1892	1814	1717	1600	1499	1451	1281	1198	1093	1012	917	843	778	765	681
73	1811	1737	1693	1591	1504	1385	1274	1190	1083	1001	905	833	747	684	644
74	1730	1652	1606	1636	1456	1368	1262	1158	1071	968	891	800	730	653	595
75	1613	1523	1515	1461	1386	1348	1239	1147	1058	956	877	780	713	632	574
76	1467	1297	1330	1344	1274	1109	1190	1122	1026	913	835	760	672	672	536
77	1348	1259	1207	1183	1150	1116	1022	1019	990	888	801	736	662	580	504
78	1112	1033	1055	1007	998	966	908	880	855	824	749	688	613	525	467
79	844	816	817	807	790	735	719	696	703	664	623	597	542	476	422
80	586	619	577	564	524	471	488	489	465	476	446	451	441	388	325
81	281	313	343	309	349	270	244	254	211	188	197	241	219	210	218
82	9	81	125	139	208	82	9	70	65	19	1	58	52	0	51
83	3	10	0	2	37	14	0	0	2	1	0	0	0	0	0
84	1	25	0	0	0	19	0	0	4	7	0	0	0	18	0
85	0	0	0	3	0	5	0	0	1	0	0	0	1	0	0
86	0	0	0	2	0	0	0	4	0	0	0	2	0	0	0
87	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 1f
Relative Spatial Response of ULV

AZ	ZA = 76	ZA = 77	ZA = 78	ZA = 79	ZA = 80	ZA = 81	ZA = 82	ZA = 83	ZA = 84	ZA = 85	ZA = 86	ZA = 87	ZA = 88	ZA = 89	ZA = 90
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-88	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
-87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-85	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
-84	0	0	6	0	0	0	9	0	0	0	2	0	0	0	0
-83	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
-82	58	38	0	24	32	17	0	11	0	0	0	0	0	0	0
-81	261	218	132	95	95	117	104	69	67	47	32	5	0	0	0
-80	404	300	250	201	231	194	153	140	125	78	29	8	0	0	0
-79	465	368	319	343	313	243	221	205	145	105	53	9	1	1	0
-78	513	443	445	442	348	292	269	228	155	110	56	14	3	2	0
-77	575	573	573	447	388	354	330	237	180	116	42	18	4	3	0
-76	706	716	595	491	447	413	330	250	193	116	56	19	6	4	0
-75	834	710	601	548	488	437	333	270	200	118	56	24	8	5	0
-74	854	719	639	585	541	441	343	281	198	118	57	28	11	6	0
-73	836	753	691	637	567	437	361	283	193	115	61	32	13	7	0
-72	874	803	758	668	563	451	373	286	192	111	69	33	15	8	0
-71	902	830	768	674	542	453	383	287	190	119	70	38	19	9	0

AZ	ZA = 76	ZA = 77	ZA = 78	ZA = 79	ZA = 80	ZA = 81	ZA = 82	ZA = 83	ZA = 84	ZA = 85	ZA = 86	ZA = 87	ZA = 88	ZA = 89	ZA = 90
-70	949	877	806	677	552	470	376	286	193	123	75	41	21	9	0
-69	989	915	808	664	569	482	377	284	187	130	80	42	24	10	0
-68	1012	930	793	658	583	483	385	289	191	136	86	45	26	11	0
-67	1048	929	788	672	583	493	382	276	200	140	89	49	28	12	0
-66	1072	927	790	693	587	490	388	279	201	140	92	52	29	12	0
-65	1054	908	801	702	597	489	382	281	209	144	94	57	31	13	0
-64	1049	904	798	708	595	485	386	285	213	149	101	58	33	15	0
-63	1040	913	816	707	603	491	390	293	225	153	102	65	33	16	0
-62	1035	931	820	704	610	496	392	300	229	163	103	66	35	17	0
-61	1040	935	833	712	602	500	387	306	231	166	109	70	37	18	0
-60	1058	938	842	719	599	504	391	311	233	167	107	71	34	17	0
-59	1057	951	836	725	604	507	398	315	245	176	114	75	36	18	0
-58	1073	960	830	731	608	509	403	328	244	176	121	79	38	19	0
-57	1085	954	839	736	613	518	420	336	246	185	122	77	40	20	0
-56	1083	960	845	740	629	512	423	330	257	183	129	81	42	21	0
-55	1075	966	849	735	630	510	426	342	257	191	128	84	41	22	0
-54	1082	965	855	737	632	527	427	341	267	188	134	88	43	23	0
-53	1104	966	856	739	632	530	440	354	266	195	140	83	45	24	0
-52	1109	987	876	758	631	531	440	354	275	201	137	86	47	25	0
-51	1113	990	877	758	649	547	452	366	272	196	143	89	49	26	0
-50	1112	997	870	757	651	546	449	365	281	204	148	92	51	27	0
-49	1108	992	870	775	661	561	462	371	290	211	153	94	52	28	0
-48	1109	1011	887	772	660	558	457	368	284	208	147	86	49	25	0
-47	1129	1011	886	770	658	571	470	378	292	215	152	89	52	26	0
-46	1125	1008	903	786	673	567	466	388	299	221	156	91	53	27	0
-45	1126	1019	900	786	693	585	482	382	291	228	160	93	55	28	0
-44	1144	1015	894	799	682	572	489	391	298	221	164	95	57	29	0
-43	1140	1032	910	788	695	583	483	400	305	227	156	97	58	29	0
-42	1156	1026	903	802	688	594	493	391	311	233	159	98	60	30	0
-41	1144	1041	916	793	699	585	499	399	300	238	162	87	62	31	0
-40	1160	1034	932	808	691	596	490	408	309	245	166	89	63	31	0
-39	1152	1048	924	821	702	607	499	395	313	234	168	91	65	32	0
-38	1166	1038	931	811	712	598	507	402	319	238	171	93	66	33	0
-37	1154	1047	915	817	696	604	496	408	310	242	174	95	68	34	0
-36	1168	1037	932	832	709	616	502	413	313	244	160	97	63	35	0
-35	1155	1048	942	819	718	601	510	420	320	250	163	99	64	35	0
-34	1165	1054	929	828	726	608	517	405	325	253	166	101	65	36	0
-33	1173	1037	936	835	712	616	523	410	330	240	168	103	66	37	0
-32	1158	1048	946	820	719	623	508	414	334	243	169	105	68	37	0
-31	1165	1056	930	827	726	607	513	419	321	246	171	99	69	38	0
-30	1167	1039	936	834	733	613	518	423	324	248	173	101	70	39	0
-29	1141	1041	940	839	714	618	522	404	327	251	174	103	71	39	0
-28	1152	1049	947	821	719	622	526	407	330	253	176	104	72	40	0
-27	1155	1053	927	825	724	627	506	411	333	255	159	105	73	40	0
-26	1158	1032	931	829	728	607	509	414	335	257	160	107	74	41	0
-25	1142	1036	932	830	731	610	512	416	337	258	161	108	75	41	0
-24	1136	1035	935	832	710	611	513	419	340	242	163	110	76	42	0
-23	1135	1035	936	811	712	614	515	420	340	242	162	110	76	42	0
-22	1133	1011	912	812	714	615	516	421	322	243	163	111	77	43	0
-21	1106	1008	911	813	714	615	516	403	323	243	164	112	77	43	0
-20	1102	1006	909	812	713	615	516	403	323	244	164	113	78	43	0
-19	1096	1002	907	812	713	614	491	403	324	244	165	114	79	44	0

AZ	ZA = 76	ZA = 77	ZA = 78	ZA = 79	ZA = 80	ZA = 81	ZA = 82	ZA = 83	ZA = 84	ZA = 85	ZA = 86	ZA = 87	ZA = 88	ZA = 89	ZA = 90
-18	1090	997	904	810	711	589	490	403	323	244	165	115	79	44	0
-17	1083	992	900	783	685	587	489	402	323	244	165	115	80	44	0
-16	1041	957	853	763	669	574	478	394	318	241	164	115	80	44	0
-15	908	836	764	684	598	512	425	352	288	224	159	115	80	44	0
-14	772	712	652	584	512	439	366	304	250	196	141	103	71	39	0
-13	612	565	516	460	399	337	274	226	187	146	106	77	53	29	0
-12	429	394	357	313	265	215	164	132	107	81	56	39	27	15	0
-11	222	199	175	151	126	100	74	55	39	22	5	2	1	1	0
-10	10	12	13	14	14	15	14	14	13	13	12	9	6	3	0
-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-8	3	4	6	7	7	8	8	6	4	2	0	0	0	0	0
-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-6	6	6	6	6	7	7	7	7	7	7	7	5	3	2	0
-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-4	6	6	6	6	6	6	6	6	6	6	5	4	3	1	0
-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-2	1	1	0	1	1	2	3	4	4	5	6	4	3	1	0
-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	9	13	18	29	40	51	61	50	39	27	16	12	8	4	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	26	25	24	22	19	16	13	10	7	4	1	0	0	0	0
3	209	180	150	127	107	86	65	51	38	26	13	7	5	3	0
4	416	377	338	305	272	239	206	173	139	105	70	50	35	20	0
5	625	563	501	448	400	351	302	252	201	151	100	70	49	27	0
6	792	712	630	563	502	440	378	316	253	191	128	91	63	35	0
7	894	809	723	649	581	513	444	372	298	223	149	105	73	41	0
8	974	880	785	704	628	553	477	397	316	235	154	108	75	41	0
9	1015	913	810	721	639	557	474	394	316	238	159	113	78	43	0
10	1018	914	811	721	640	559	478	398	317	236	155	108	75	41	0
11	1003	902	801	711	629	546	464	385	308	232	155	109	76	42	0
12	994	895	795	706	623	541	458	380	305	229	153	108	75	41	0
13	986	888	789	700	618	535	453	376	301	226	151	106	73	41	0
14	973	877	781	693	608	524	439	362	291	221	150	106	74	41	0
15	969	873	777	688	606	524	443	366	293	221	148	103	71	40	0
16	983	888	770	682	601	519	437	362	291	219	148	104	72	40	0
17	977	880	786	676	595	513	432	357	286	215	145	100	69	38	0
18	968	872	779	689	608	508	427	352	282	213	143	99	68	38	0
19	958	866	772	682	602	521	422	347	279	210	141	98	68	37	0
20	948	857	762	673	594	514	435	343	275	208	141	97	67	37	0
21	938	848	756	668	589	510	430	338	271	205	138	95	66	36	0
22	949	839	751	661	582	504	425	349	268	202	137	94	65	36	0
23	938	851	764	654	576	498	419	344	280	200	136	92	64	35	0
24	927	841	755	664	566	488	409	334	271	194	132	90	62	34	0
25	914	830	746	659	580	485	409	334	272	210	133	90	62	34	0
26	925	821	738	654	573	479	403	329	268	207	131	89	61	34	0
27	913	830	728	646	565	490	398	324	264	204	130	88	61	33	0
28	901	820	738	638	558	484	410	319	260	202	144	88	61	34	0
29	886	807	728	649	550	477	404	314	256	198	141	85	59	33	0
30	896	798	719	640	562	470	398	326	252	196	139	84	58	32	0
31	889	805	709	631	554	464	392	321	248	193	138	83	57	32	0
32	877	793	716	622	546	473	386	316	257	190	136	88	57	31	0
33	883	782	706	630	538	466	396	312	252	187	134	87	56	31	0

AZ	ZA = 76	ZA = 77	ZA = 78	ZA = 79	ZA = 80	ZA = 81	ZA = 82	ZA = 83	ZA = 84	ZA = 85	ZA = 86	ZA = 87	ZA = 88	ZA = 89	ZA = 90
34	870	787	695	621	547	458	390	307	248	196	133	86	55	30	0
35	857	779	701	611	538	451	384	317	244	193	131	85	55	30	0
36	862	767	690	618	530	461	376	311	239	190	130	84	54	30	0
37	848	770	677	607	520	453	371	307	235	187	138	82	58	29	0
38	852	760	683	598	528	446	379	301	241	184	136	81	58	29	0
39	839	764	676	602	519	451	372	296	236	180	134	80	57	28	0
40	842	752	679	592	510	443	368	310	241	194	135	77	55	27	0
41	829	758	672	582	515	435	371	299	227	183	130	78	55	28	0
42	836	742	655	584	505	440	367	293	235	180	128	86	54	27	0
43	822	744	658	573	509	431	359	299	230	176	126	85	54	27	0
44	823	731	646	580	499	423	364	294	226	172	132	83	52	26	0
45	809	733	651	574	503	428	356	287	221	177	130	83	52	26	0
46	809	726	651	569	491	418	348	292	228	172	127	82	51	26	0
47	809	726	639	557	480	421	351	285	223	168	125	81	51	25	0
48	795	727	640	559	482	412	342	278	218	164	121	79	48	24	0
49	793	713	628	561	482	413	345	281	223	167	126	86	53	29	0
50	792	713	628	549	475	404	337	277	217	162	123	84	52	28	0
51	795	711	633	551	475	405	339	279	212	158	120	83	51	28	0
52	791	709	633	551	463	394	331	271	215	162	118	82	51	28	0
53	786	694	620	540	465	394	332	271	209	158	120	80	50	27	0
54	772	692	619	539	466	393	323	263	211	154	116	83	49	26	0
55	764	693	616	538	466	382	323	264	204	157	113	81	48	26	0
56	768	687	612	542	466	385	323	257	210	155	114	79	49	25	0
57	769	681	607	541	461	400	319	259	198	154	110	77	49	25	0
58	762	688	603	537	454	385	311	257	197	149	110	79	48	24	0
59	755	676	602	532	452	385	309	249	198	150	106	76	47	23	0
60	755	669	603	527	450	384	306	248	190	144	101	75	49	25	0
61	746	669	595	520	453	383	305	246	190	143	103	74	48	25	0
62	745	669	587	512	455	381	309	244	190	142	99	71	47	24	0
63	742	660	587	511	448	378	308	240	188	135	99	71	45	24	0
64	743	658	578	508	440	375	307	236	181	136	100	66	46	23	0
65	740	656	585	508	438	375	304	235	179	129	94	66	44	22	0
66	745	662	582	509	428	373	309	233	175	127	92	63	42	21	0
67	730	659	581	496	425	369	305	232	176	128	90	61	42	23	0
68	709	650	573	492	429	359	303	240	172	126	86	52	38	22	0
69	697	642	575	495	425	353	293	237	169	123	83	56	39	21	0
70	676	622	566	494	420	349	288	238	173	119	79	54	36	20	0
71	649	596	546	484	412	343	287	234	169	118	75	52	35	20	0
72	637	583	576	474	416	349	268	227	170	112	62	43	32	19	0
73	601	555	506	459	409	339	277	218	169	113	69	45	30	18	0
74	562	538	476	430	389	330	271	211	167	114	66	40	27	18	0
75	507	483	456	411	359	317	261	209	160	112	65	35	24	16	0
76	484	439	418	377	338	302	212	200	149	108	44	22	20	15	0
77	457	395	359	330	301	268	239	189	141	99	57	28	17	12	0
78	399	362	307	280	269	228	202	171	127	88	57	23	14	10	0
79	350	293	266	236	204	196	172	152	117	82	50	16	9	8	0
80	293	229	201	170	153	130	123	107	92	64	32	7	3	5	0
81	192	156	81	83	82	71	70	53	49	37	21	3	0	2	0
82	11	29	0	21	27	1	0	3	0	0	0	0	0	0	0
83	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
84	0	4	5	0	0	0	4	0	0	0	9	0	0	0	0
85	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0

AZ	ZA = 76	ZA = 77	ZA = 78	ZA = 79	ZA = 80	ZA = 81	ZA = 82	ZA = 83	ZA = 84	ZA = 85	ZA = 86	ZA = 87	ZA = 88	ZA = 89	ZA = 90
86	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
87	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
88	2	0	3	0	0	0	0	0	0	0	2	0	0	0	0
89	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2a
Relative Spatial Response of DLV

AZ	ZA= 91	ZA= 92	ZA= 93	ZA= 94	ZA= 95	ZA= 96	ZA= 97	ZA= 98	ZA= 99	ZA= 100	ZA= 101	ZA= 102	ZA= 103	ZA= 104	ZA= 105
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	0	0	1	2	2	3	4	5	6	5	5	4	3	3	3
-88	0	0	1	4	2	1	3	5	6	7	8	9	7	5	5
-87	2	1	1	2	33	70	2	2	1	3	4	5	6	7	6
-86	2	2	1	3	30	66	109	137	75	28	2	2	3	4	4
-85	0	4	4	3	63	67	102	137	180	213	169	120	10	132	3
-84	1	2	10	23	104	136	135	132	175	223	212	239	57	192	327
-83	0	1	3	24	135	214	224	229	274	364	326	260	265	307	440
-82	0	0	1	25	136	231	320	312	323	425	646	598	595	602	576
-81	3	0	0	34	148	265	341	405	399	407	578	758	903	903	872
-80	2	1	0	50	168	282	382	449	472	487	569	733	904	1121	1146
-79	1	2	1	52	197	303	409	492	553	555	600	734	861	1053	1266
-78	6	1	1	60	170	315	418	516	584	637	638	739	893	1024	1205
-77	11	6	1	69	145	324	447	539	631	693	704	777	907	1059	1182
-76	17	12	7	80	154	285	450	573	662	741	782	801	954	1076	1197
-75	20	18	14	84	168	272	422	571	675	763	848	863	975	1095	1244
-74	17	23	19	75	185	256	399	544	676	798	879	921	1028	1153	1271
-73	14	29	32	81	197	262	379	521	650	789	914	989	1062	1178	1330
-72	13	25	48	94	199	279	371	500	638	764	878	1011	1126	1241	1356
-71	13	26	67	95	210	296	368	492	608	732	854	975	1107	1278	1420
-70	12	31	81	102	211	307	380	477	600	722	843	962	1109	1262	1439
-69	11	43	89	120	208	311	399	474	595	715	826	968	1102	1240	1403
-68	12	52	96	138	206	312	412	483	591	710	817	961	1093	1224	1375
-67	21	65	108	152	206	310	403	490	600	699	830	973	1103	1233	1360
-66	31	74	117	159	201	298	400	507	605	716	858	987	1115	1243	1364
-65	43	86	129	167	207	298	398	491	614	747	875	1002	1113	1239	1353
-64	44	87	126	170	209	295	393	484	589	738	870	991	1121	1250	1363
-63	43	81	124	163	201	302	388	478	576	736	864	994	1108	1236	1363
-62	42	80	118	156	209	299	384	473	566	723	854	984	1112	1224	1340
-61	42	79	117	154	207	297	381	465	558	692	840	990	1102	1217	1328
-60	37	74	111	148	206	296	379	461	551	674	829	981	1098	1222	1331
-59	37	73	110	146	217	305	377	458	545	665	818	951	1094	1214	1322
-58	37	73	109	150	217	300	386	455	540	657	809	933	1082	1212	1328
-57	37	73	103	148	228	300	385	454	537	650	801	923	1053	1200	1320
-56	37	72	103	159	229	310	384	462	534	663	794	915	1043	1181	1308
-55	37	67	102	161	241	310	394	461	529	659	780	908	1035	1153	1297
-54	36	67	109	174	243	322	394	461	538	655	775	902	1020	1145	1288
-53	36	67	110	187	255	323	405	471	537	652	770	896	1013	1156	1279
-52	35	66	123	190	268	334	406	471	536	649	785	910	1026	1149	1264
-51	35	71	136	204	270	336	417	482	549	666	783	906	1022	1144	1258

AZ	ZA= 91	ZA= 92	ZA= 93	ZA= 94	ZA= 95	ZA= 96	ZA= 97	ZA= 98	ZA= 99	ZA= 100	ZA= 101	ZA= 102	ZA= 103	ZA= 104	ZA= 105
-50	35	80	149	217	283	348	418	483	546	666	781	896	1018	1131	1252
-49	35	93	161	229	296	361	426	494	566	676	798	893	1015	1127	1247
-48	31	95	162	229	297	363	427	496	566	677	797	910	1031	1124	1246
-47	42	108	175	241	308	375	440	507	584	678	797	909	1029	1140	1246
-46	55	121	187	253	319	386	452	509	587	698	817	928	1027	1138	1260
-45	66	132	199	265	331	385	451	520	608	718	813	921	1030	1122	1254
-44	66	133	199	266	320	386	452	520	597	705	816	905	1013	1129	1237
-43	66	132	198	252	318	380	441	506	606	710	798	909	1015	1114	1245
-42	65	131	196	247	308	367	416	515	615	696	803	894	1000	1121	1229
-41	65	127	176	235	294	342	423	522	607	705	789	898	1003	1101	1238
-40	56	115	163	222	281	339	434	515	616	697	794	902	988	1111	1224
-39	43	103	151	209	257	348	428	525	626	706	803	888	995	1098	1233
-38	42	90	138	196	264	360	440	536	619	716	795	891	982	1109	1220
-37	42	84	125	198	277	355	451	530	630	708	804	883	986	1090	1216
-36	42	76	121	190	285	363	457	535	630	707	802	879	969	1083	1185
-35	41	75	127	190	284	361	455	532	609	704	780	878	973	1066	1179
-34	41	77	136	189	283	360	436	530	606	700	777	860	975	1070	1162
-33	41	84	144	194	265	359	435	528	604	680	775	865	958	1075	1166
-32	45	93	153	203	264	358	433	509	602	677	757	870	964	1059	1171
-31	53	102	151	211	264	339	432	507	582	675	762	855	969	1065	1155
-30	62	111	160	220	269	338	431	505	580	678	769	862	954	1067	1160
-29	69	120	169	229	277	338	412	504	578	660	776	868	960	1052	1166
-28	69	125	179	238	286	338	411	503	579	668	762	875	967	1058	1151
-27	69	125	180	235	295	343	410	484	584	676	770	861	974	1065	1154
-26	69	124	180	235	303	351	410	483	572	684	778	869	959	1072	1160
-25	68	124	179	234	302	358	410	491	581	693	783	877	967	1057	1146
-24	68	123	178	233	288	356	414	499	589	679	790	882	972	1061	1149
-23	68	123	178	232	285	349	416	506	595	685	775	888	976	1064	1152
-22	68	122	175	227	277	327	424	513	602	692	781	871	959	1067	1155
-21	66	118	168	217	267	324	410	520	609	698	786	873	962	1050	1158
-20	59	109	158	208	257	329	418	528	616	703	790	877	966	1053	1140
-19	50	100	149	198	254	337	426	513	621	708	795	882	970	1057	1144
-18	50	90	139	189	257	345	432	519	605	713	800	886	973	1061	1148
-17	50	90	130	185	265	352	438	525	611	697	784	891	977	1066	1152
-16	50	89	129	183	271	358	444	531	617	703	789	875	982	1068	1156
-15	49	89	136	199	266	355	445	533	621	708	794	880	966	1052	1161
-14	49	91	149	215	282	348	438	527	615	704	793	882	970	1057	1143
-13	49	100	166	232	298	364	431	520	608	697	786	874	963	1051	1140
-12	56	117	183	249	315	381	446	513	601	690	778	867	955	1044	1132
-11	69	134	200	266	331	397	463	529	595	683	771	860	948	1036	1124
-10	86	152	217	283	348	414	479	545	611	676	764	853	941	1029	1117
-9	82	156	231	299	365	430	496	561	627	693	758	846	934	1022	1110
-8	81	147	218	296	373	446	513	578	643	709	774	839	927	1015	1103
-7	81	146	212	281	358	435	512	589	660	725	791	856	921	1008	1096
-6	81	146	211	276	343	420	497	574	651	728	803	872	938	1002	1090
-5	81	146	211	276	341	406	482	559	636	713	790	867	943	1018	1084
-4	60	137	211	276	341	406	471	545	622	698	775	852	929	1005	1082
-3	87	107	185	262	338	406	471	536	607	684	761	837	914	991	1071
-2	74	114	155	232	309	386	464	535	600	669	746	823	900	980	1063
-1	60	101	141	203	280	357	434	511	588	663	732	808	889	972	1055
0	40	81	121	161	238	315	393	470	547	624	701	779	862	945	1029
1	50	91	139	210	287	364	441	519	596	664	725	793	876	959	1042

AZ	ZA= 91	ZA= 92	ZA= 93	ZA= 94	ZA= 95	ZA= 96	ZA= 97	ZA= 98	ZA= 99	ZA= 100	ZA= 101	ZA= 102	ZA= 103	ZA= 104	ZA= 105
2	50	93	162	239	317	394	468	534	600	659	716	786	869	952	1035
3	50	115	192	269	339	406	471	535	593	650	708	779	863	946	1029
4	69	143	210	276	341	406	469	527	583	640	700	772	856	940	1023
5	81	146	211	276	341	403	461	517	574	630	693	766	850	933	1017
6	81	146	211	276	337	394	451	507	564	620	687	760	844	927	1011
7	81	146	212	271	328	384	441	497	554	613	680	754	838	921	1005
8	81	146	204	261	318	374	431	488	544	605	674	748	832	916	1000
9	80	138	194	251	308	364	421	478	535	598	668	742	826	910	994
10	71	128	184	241	298	355	411	468	525	592	662	736	821	905	989
11	60	117	174	231	288	345	402	459	518	586	656	731	815	900	984
12	46	106	164	221	278	335	392	449	511	580	650	726	810	895	979
13	46	89	151	211	268	326	383	440	505	575	645	721	805	890	974
14	46	82	135	197	259	316	373	431	499	569	639	716	800	885	970
15	46	83	120	181	243	306	364	424	493	564	634	711	796	877	980
16	46	83	120	165	227	290	352	417	488	558	629	702	800	876	959
17	46	83	130	190	252	308	366	435	505	575	637	709	785	865	941
18	46	93	153	210	261	316	384	454	523	597	655	713	771	852	928
19	56	111	162	212	265	333	404	469	542	600	658	716	774	839	916
20	62	112	162	213	282	353	414	487	545	603	662	720	778	836	904
21	62	113	163	230	299	359	418	490	549	607	665	724	782	840	911
22	63	113	178	244	303	362	435	493	552	611	669	727	786	858	917
23	63	126	187	247	306	379	438	497	556	614	673	746	804	863	921
24	71	131	190	249	309	382	441	500	559	618	691	750	809	868	926
25	72	131	189	248	321	379	438	497	557	630	689	751	810	869	928
26	56	115	173	232	305	365	424	483	542	615	679	738	797	871	930
27	53	98	157	217	290	349	409	468	541	601	665	724	798	857	917
28	53	96	141	215	274	334	394	467	527	587	651	725	785	845	909
29	53	96	139	199	259	319	379	453	513	573	651	711	772	832	911
30	53	97	140	193	243	304	378	438	499	577	638	698	759	834	900
31	50	97	141	194	238	289	363	424	485	564	625	685	760	827	891
32	37	87	150	195	239	292	349	410	485	550	611	687	749	817	896
33	37	75	138	189	240	294	338	410	471	537	612	674	739	822	887
34	37	67	126	177	240	292	340	396	458	538	600	664	744	813	879
35	37	67	113	165	229	281	345	396	443	525	589	669	738	802	877
36	37	68	105	156	220	272	336	388	452	513	591	655	724	800	861
37	38	75	113	176	229	281	344	396	453	503	580	644	725	789	868
38	38	76	122	186	239	303	355	407	446	510	574	652	705	790	867
39	38	81	132	197	250	313	353	398	445	503	582	649	702	769	864
40	38	88	142	207	268	308	352	388	436	497	576	647	690	763	843
41	39	98	152	214	261	298	342	387	427	504	570	635	687	742	839
42	42	107	167	206	251	296	333	381	432	498	574	623	676	745	819
43	50	112	158	196	241	286	331	372	426	507	563	620	673	726	815
44	56	102	148	193	231	277	322	371	420	501	564	609	662	722	796
45	46	91	137	183	229	267	313	362	428	504	553	606	660	709	794
46	35	81	127	173	219	266	312	354	423	492	550	605	654	708	791
47	30	71	116	163	210	257	303	353	430	480	539	594	653	707	781
48	27	66	108	153	200	248	295	345	421	478	537	592	652	698	780
49	31	68	110	152	199	246	294	352	420	476	536	582	642	698	780
50	32	63	106	149	191	238	289	347	408	469	525	581	642	698	780
51	32	60	102	145	188	231	289	349	406	467	524	585	642	703	781
52	32	60	97	141	191	235	281	338	395	457	524	585	642	704	782
53	33	61	95	141	185	229	283	338	396	456	514	576	634	705	792

AZ	ZA= 91	ZA= 92	ZA= 93	ZA= 94	ZA= 95	ZA= 96	ZA= 97	ZA= 98	ZA= 99	ZA= 100	ZA= 101	ZA= 102	ZA= 103	ZA= 104	ZA= 105
54	33	63	104	139	178	230	277	334	402	462	520	580	637	698	790
55	33	66	107	142	183	223	281	340	399	469	526	586	645	700	778
56	34	75	111	152	188	229	276	343	405	469	529	584	644	693	763
57	36	78	114	156	197	231	275	332	401	458	527	583	643	683	753
58	38	81	123	165	200	229	271	328	398	455	525	582	633	670	753
59	41	84	125	167	197	223	258	324	395	453	524	583	618	659	744
60	42	85	127	161	190	211	254	321	393	452	523	573	603	661	748
61	48	92	128	157	186	199	250	319	392	456	516	558	595	654	742
62	49	90	120	149	179	187	247	322	391	464	502	544	586	657	747
63	50	82	115	145	167	178	245	320	390	456	492	534	572	663	763
64	43	77	107	141	155	163	243	320	391	442	484	521	568	670	760
65	34	69	103	134	143	161	242	320	388	432	475	518	575	678	770
66	25	60	95	126	131	159	242	329	380	418	466	510	593	697	790
67	20	56	91	114	123	167	242	322	371	409	454	502	604	709	803
68	16	48	84	103	111	167	257	312	358	407	446	508	616	722	802
69	17	43	81	91	100	168	254	299	350	400	446	530	639	732	795
70	17	36	73	79	88	178	246	291	342	393	444	545	656	721	781
71	19	36	61	67	89	179	237	289	335	387	448	570	641	704	776
72	19	37	49	56	92	171	229	283	340	392	478	575	641	703	765
73	20	39	38	44	104	163	222	281	335	393	492	563	628	692	771
74	22	33	29	33	102	162	220	280	335	407	480	553	629	701	752
75	23	25	21	26	94	160	222	293	338	405	489	564	637	679	732
76	22	18	13	24	96	174	251	302	339	422	498	573	618	635	700
77	15	10	7	37	125	212	256	275	347	431	509	546	559	620	687
78	8	5	6	66	157	211	229	271	358	453	472	485	524	594	678
79	3	4	6	95	173	191	211	293	386	400	423	437	499	587	661
80	2	4	5	130	145	164	217	315	328	350	361	424	496	526	459
81	2	5	3	107	118	140	245	269	275	286	333	407	375	326	312
82	2	4	8	84	92	170	198	201	221	243	300	204	152	190	242
83	2	4	89	60	94	126	126	143	154	127	46	10	69	120	197
84	2	1	61	31	58	56	72	84	48	17	56	142	163	181	198
85	2	1	28	13	40	62	70	38	4	109	134	149	168	177	173
86	2	36	1	32	53	54	21	71	99	119	139	135	127	123	88
87	1	15	24	40	32	38	68	92	93	82	73	66	64	31	5
88	13	16	30	5	36	54	31	15	7	5	5	3	3	3	3
89	8	2	14	1	1	2	2	2	2	2	2	1	1	1	2
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2b
Relative Spatial Response of DLV

AZ	ZA= 106	ZA= 107	ZA= 108	ZA= 109	ZA= 110	ZA= 111	ZA= 112	ZA= 113	ZA= 114	ZA= 115	ZA= 116	ZA= 117	ZA= 118	ZA= 119	ZA= 120
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-89	4	5	5	5	4	4	4	3	3	5	8	8	7	7	8
-88	6	7	8	9	9	8	8	7	7	9	12	14	15	16	15
-87	5	6	7	7	8	8	8	7	7	8	10	13	40	36	24
-86	5	5	5	6	6	7	6	6	6	6	8	29	58	75	59
-85	2	3	182	35	5	5	5	5	5	10	37	50	78	107	100
-84	459	276	343	444	617	597	681	659	738	654	555	461	371	286	181
-83	542	683	792	817	886	934	959	979	1007	1068	1075	915	816	721	630

AZ	ZA= 106	ZA= 107	ZA= 108	ZA= 109	ZA= 110	ZA= 111	ZA= 112	ZA= 113	ZA= 114	ZA= 115	ZA= 116	ZA= 117	ZA= 118	ZA= 119	ZA= 120
-82	656	796	940	1086	1095	1142	1213	1235	1258	1311	1349	1394	1322	1216	1122
-81	906	955	1052	1150	1295	1399	1446	1488	1509	1526	1557	1618	1658	1635	1537
-80	1176	1212	1254	1287	1406	1546	1670	1688	1728	1746	1796	1829	1889	1927	1922
-79	1433	1456	1453	1495	1575	1662	1755	1900	1960	1991	2010	2032	2064	2098	2160
-78	1384	1579	1751	1748	1792	1847	1904	2007	2149	2227	2218	2241	2270	2326	2359
-77	1359	1535	1727	1886	2021	2065	2092	2174	2276	2352	2430	2450	2476	2520	2533
-76	1346	1497	1688	1847	2035	2221	2295	2363	2454	2500	2604	2661	2758	2846	2971
-75	1363	1511	1653	1855	2012	2198	2339	2522	2630	2676	2765	2939	3042	3189	3308
-74	1389	1530	1647	1824	1981	2166	2320	2503	2671	2809	2958	3141	3261	3448	3612
-73	1440	1557	1702	1814	1996	2150	2334	2473	2655	2792	2981	3174	3333	3527	3719
-72	1472	1616	1725	1840	1986	2138	2321	2459	2641	2777	2963	3151	3311	3504	3696
-71	1534	1648	1756	1899	2007	2159	2311	2492	2629	2809	2952	3132	3307	3500	3692
-70	1570	1711	1824	1931	2038	2174	2304	2484	2621	2800	2943	3133	3289	3482	3674
-69	1575	1731	1859	1993	2099	2205	2340	2479	2628	2793	2950	3126	3290	3483	3674
-68	1526	1712	1864	2033	2140	2274	2379	2491	2655	2804	2979	3136	3314	3470	3677
-67	1514	1681	1830	1995	2144	2292	2413	2546	2667	2816	2991	3148	3322	3475	3666
-66	1511	1654	1819	1965	2109	2256	2419	2563	2690	2850	3006	3180	3335	3483	3674
-65	1498	1629	1792	1955	2099	2241	2384	2528	2673	2835	3020	3198	3351	3529	3697
-64	1494	1611	1792	1935	2076	2216	2375	2517	2647	2803	3007	3164	3321	3527	3704
-63	1477	1593	1775	1939	2079	2219	2357	2495	2644	2797	2975	3132	3334	3487	3662
-62	1451	1580	1739	1906	2065	2204	2361	2498	2622	2768	2945	3126	3304	3454	3653
-61	1452	1565	1722	1884	2055	2210	2346	2483	2620	2768	2942	3098	3274	3446	3615
-60	1440	1552	1729	1889	2053	2226	2353	2489	2624	2767	2917	3094	3269	3418	3605
-59	1444	1544	1700	1859	2018	2185	2355	2477	2611	2770	2918	3094	3243	3413	3599
-58	1424	1533	1710	1868	2005	2162	2332	2500	2636	2755	2919	3071	3264	3411	3568
-57	1431	1547	1702	1859	1998	2154	2317	2462	2625	2780	2924	3095	3242	3410	3565
-56	1434	1559	1699	1855	2010	2143	2298	2465	2631	2769	2928	3075	3243	3412	3566
-55	1422	1555	1714	1848	2002	2156	2309	2469	2611	2773	2923	3101	3247	3414	3567
-54	1404	1517	1680	1853	2008	2150	2304	2436	2595	2730	2896	3057	3250	3396	3572
-53	1376	1511	1660	1823	1995	2151	2279	2429	2569	2726	2890	3046	3207	3396	3559
-52	1368	1505	1634	1803	1974	2123	2272	2421	2552	2710	2844	3022	3181	3340	3532
-51	1364	1491	1629	1785	1955	2091	2255	2380	2545	2710	2842	2992	3172	3331	3525
-50	1382	1488	1625	1769	1927	2072	2251	2375	2537	2686	2827	2973	3151	3307	3470
-49	1371	1486	1622	1747	1911	2054	2242	2359	2517	2667	2829	2973	3150	3302	3467
-48	1370	1506	1620	1744	1896	2038	2213	2357	2512	2661	2831	2974	3107	3282	3447
-47	1371	1505	1608	1742	1882	2011	2197	2354	2509	2643	2818	2960	3108	3276	3435
-46	1372	1506	1629	1741	1864	1997	2182	2338	2494	2640	2815	2957	3095	3264	3409
-45	1392	1497	1629	1741	1863	1985	2169	2312	2493	2631	2795	2931	3070	3240	3400
-44	1375	1506	1620	1751	1863	2004	2145	2323	2472	2601	2764	2913	3057	3230	3392
-43	1358	1489	1602	1732	1844	1977	2119	2294	2436	2608	2747	2895	3061	3210	3371
-42	1360	1472	1602	1714	1851	1962	2122	2260	2411	2588	2730	2868	3047	3197	3345
-41	1345	1479	1585	1722	1831	1948	2097	2236	2417	2568	2704	2881	3026	3161	3310
-40	1353	1464	1569	1709	1819	1959	2068	2213	2391	2531	2686	2862	2996	3136	3315
-39	1339	1444	1582	1691	1831	1940	2049	2215	2354	2505	2698	2834	2976	3115	3281
-38	1326	1457	1564	1693	1799	1903	2053	2180	2324	2515	2670	2816	2986	3116	3264
-37	1320	1425	1554	1659	1793	1909	2033	2151	2331	2483	2646	2828	2959	3098	3238
-36	1312	1416	1521	1652	1767	1891	2035	2158	2308	2461	2653	2803	2944	3083	3243
-35	1281	1383	1511	1632	1749	1899	2016	2136	2304	2459	2609	2762	2915	3089	3228
-34	1274	1379	1493	1640	1756	1875	1991	2137	2267	2422	2571	2758	2905	3057	3209
-33	1258	1380	1497	1616	1731	1873	1992	2106	2232	2415	2569	2716	2867	3018	3199
-32	1262	1354	1474	1615	1734	1849	1967	2110	2235	2379	2532	2679	2863	3010	3161
-31	1245	1355	1474	1593	1737	1851	1965	2085	2206	2379	2527	2677	2822	2973	3123

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-29	1255	1342	1447	1568	1715	1832	1945	2062	2187	2342	2492	2637	2786	2930	3083
-28	1239	1347	1446	1569	1690	1811	1950	2068	2192	2311	2459	2603	2786	2931	3084
-27	1244	1331	1448	1571	1691	1811	1928	2047	2194	2317	2457	2605	2748	2896	3043
-26	1250	1337	1423	1544	1692	1812	1932	2049	2166	2284	2423	2606	2749	2892	3043
-25	1255	1341	1427	1542	1663	1782	1925	2043	2160	2277	2422	2568	2717	2860	3009
-24	1235	1344	1430	1542	1662	1781	1893	2010	2126	2277	2422	2568	2713	2862	3006
-23	1238	1326	1412	1542	1660	1780	1889	2004	2121	2241	2384	2533	2713	2862	2999
-22	1242	1329	1414	1514	1631	1751	1886	2000	2116	2242	2386	2534	2679	2823	2956
-21	1245	1330	1418	1514	1632	1749	1857	1968	2083	2243	2388	2532	2680	2804	2945
-20	1227	1334	1421	1516	1633	1747	1855	1964	2080	2208	2355	2499	2668	2791	2935
-19	1231	1318	1402	1517	1634	1746	1852	1962	2077	2211	2355	2502	2622	2743	2890
-18	1234	1321	1406	1493	1608	1719	1850	1958	2077	2215	2359	2488	2601	2732	2880
-17	1238	1325	1410	1494	1610	1718	1823	1928	2044	2184	2354	2471	2584	2725	2873
-16	1242	1329	1415	1499	1610	1718	1822	1927	2045	2190	2310	2423	2535	2681	2829
-15	1247	1333	1419	1503	1611	1717	1822	1927	2050	2180	2290	2402	2528	2674	2822
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-13	1227	1315	1403	1491	1586	1717	1821	1922	2032	2144	2256	2370	2509	2656	2802
-12	1220	1307	1395	1484	1582	1686	1790	1893	1987	2099	2239	2357	2498	2643	2789
-11	1212	1301	1387	1478	1577	1680	1784	1878	1974	2083	2195	2314	2449	2595	2742
-10	1205	1293	1381	1473	1572	1675	1779	1864	1958	2070	2181	2303	2437	2583	2729
-9	1198	1286	1375	1470	1567	1671	1766	1849	1942	2054	2171	2295	2426	2572	2716
-8	1191	1279	1370	1466	1563	1666	1754	1835	1927	2039	2161	2285	2417	2561	2703
-7	1184	1273	1367	1462	1559	1658	1740	1821	1912	2028	2151	2275	2407	2551	2693
-6	1177	1269	1363	1458	1556	1648	1729	1810	1898	2018	2142	2266	2397	2540	2681
-5	1172	1265	1360	1455	1549	1634	1716	1797	1889	2011	2134	2257	2387	2529	2670
-4	1164	1259	1353	1448	1539	1621	1702	1783	1878	2001	2125	2249	2374	2510	2651
-3	1155	1245	1339	1434	1525	1607	1688	1770	1866	1990	2114	2236	2359	2495	2636
-2	1147	1231	1326	1420	1512	1593	1675	1758	1855	1979	2102	2223	2344	2481	2616
-1	1139	1222	1312	1407	1498	1580	1662	1748	1844	1968	2091	2209	2330	2466	2603
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1	1125	1209	1292	1384	1476	1557	1643	1730	1826	1950	2069	2185	2307	2443	2579
2	1118	1202	1285	1372	1463	1546	1633	1720	1817	1939	2056	2172	2294	2430	2565
3	1112	1195	1278	1361	1451	1536	1623	1711	1808	1926	2043	2160	2281	2417	2550
4	1106	1189	1272	1355	1440	1527	1614	1702	1797	1914	2031	2147	2268	2406	2539
5	1100	1183	1266	1349	1434	1521	1608	1696	1791	1907	2026	2142	2258	2390	2523
6	1095	1178	1261	1344	1428	1516	1603	1690	1788	1904	2021	2133	2241	2374	2506
7	1089	1173	1256	1339	1424	1511	1600	1687	1783	1899	2016	2120	2225	2358	2491
8	1084	1168	1251	1334	1419	1508	1595	1681	1778	1895	2008	2103	2209	2347	2480
9	1078	1162	1246	1330	1416	1504	1591	1677	1774	1891	1994	2086	2199	2332	2461
10	1073	1157	1242	1327	1412	1499	1586	1672	1771	1883	1983	2075	2185	2318	2442
11	1068	1153	1239	1323	1408	1495	1581	1667	1767	1875	1967	2059	2170	2299	2423
12	1064	1150	1234	1319	1404	1491	1577	1663	1767	1859	1974	2066	2187	2318	2442
13	1061	1145	1230	1311	1398	1506	1592	1683	1774	1866	1958	2051	2176	2300	2424
14	1057	1137	1236	1321	1408	1494	1583	1664	1754	1847	1940	2039	2155	2280	2404
15	1058	1138	1223	1309	1394	1483	1568	1645	1734	1827	1927	2019	2132	2257	2389
16	1040	1123	1208	1293	1378	1468	1553	1624	1715	1815	1908	2001	2111	2242	2367
17	1023	1108	1193	1278	1368	1453	1533	1603	1702	1796	1912	2010	2127	2250	2375
18	1006	1092	1177	1267	1352	1438	1530	1606	1706	1800	1893	1999	2111	2228	2354
19	992	1076	1161	1273	1358	1439	1510	1594	1688	1782	1875	1983	2095	2207	2341
20	981	1081	1172	1258	1344	1419	1496	1576	1670	1764	1864	1967	2106	2226	2351
21	987	1066	1157	1243	1327	1399	1476	1558	1652	1775	1870	1978	2097	2210	2332

AZ	ZA= 106	ZA= 107	ZA= 108	ZA= 109	ZA= 110	ZA= 111	ZA= 112	ZA= 113	ZA= 114	ZA= 115	ZA= 116	ZA= 117	ZA= 118	ZA= 119	ZA= 120
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23	980	1046	1128	1233	1306	1383	1454	1546	1647	1742	1837	1955	2096	2215	2322
24	985	1056	1135	1215	1293	1364	1435	1535	1630	1748	1855	1969	2082	2196	2297
25	1004	1063	1122	1196	1274	1345	1439	1541	1637	1732	1841	1955	2069	2171	2280
26	994	1053	1114	1188	1276	1347	1429	1525	1621	1724	1828	1966	2067	2169	2276
27	981	1042	1121	1196	1267	1336	1411	1507	1626	1730	1830	1939	2042	2154	2251
28	969	1047	1113	1188	1259	1326	1416	1512	1616	1713	1821	1923	2055	2150	2258
29	974	1037	1108	1180	1261	1322	1403	1495	1599	1720	1829	1931	2038	2130	2231
30	964	1028	1117	1186	1244	1305	1409	1507	1605	1712	1814	1923	2042	2139	2226
31	955	1034	1109	1171	1245	1310	1396	1491	1589	1720	1823	1928	2023	2119	2215
32	961	1029	1098	1167	1229	1297	1389	1498	1603	1706	1814	1910	2033	2121	2217
33	952	1035	1094	1156	1212	1304	1397	1484	1588	1713	1818	1914	2015	2111	2219
34	955	1020	1076	1152	1209	1298	1386	1498	1598	1704	1800	1926	2017	2113	2209
35	942	999	1074	1139	1202	1302	1391	1488	1603	1708	1805	1910	2007	2109	2198
36	941	1004	1071	1149	1213	1280	1391	1489	1592	1690	1818	1909	2001	2090	2186
37	936	1000	1082	1146	1227	1291	1379	1469	1592	1691	1798	1911	1990	2079	2169
38	932	1011	1078	1157	1225	1289	1379	1470	1571	1702	1801	1884	1991	2070	2157
39	936	1006	1090	1155	1237	1304	1369	1480	1573	1682	1804	1875	1965	2055	2146
40	932	1012	1084	1170	1235	1317	1382	1462	1585	1685	1780	1877	1957	2047	2147
41	912	1008	1081	1177	1247	1316	1398	1464	1588	1698	1772	1869	1959	2037	2122
42	908	990	1079	1160	1256	1328	1412	1478	1570	1694	1773	1844	1952	2038	2123
43	897	987	1069	1158	1240	1329	1409	1495	1575	1686	1766	1848	1944	2030	2115
44	894	985	1067	1157	1239	1336	1411	1507	1590	1664	1759	1842	1931	2032	2118
45	892	968	1066	1149	1239	1322	1419	1494	1587	1667	1762	1836	1923	2020	2102
46	875	974	1066	1149	1240	1323	1421	1498	1580	1661	1757	1836	1919	2016	2086
47	874	974	1051	1150	1249	1325	1415	1488	1584	1656	1748	1826	1906	2000	2085
48	874	974	1059	1151	1251	1328	1405	1482	1579	1658	1747	1827	1897	1987	2067
49	874	959	1060	1154	1244	1318	1405	1477	1571	1646	1738	1819	1909	1983	2063
50	882	961	1063	1156	1235	1309	1399	1482	1570	1646	1730	1809	1892	1969	2048
51	868	963	1058	1147	1235	1301	1394	1471	1559	1651	1730	1803	1888	1967	2060
52	871	969	1049	1138	1226	1302	1394	1482	1548	1640	1713	1797	1875	1954	2046
53	869	959	1049	1129	1218	1306	1382	1471	1550	1635	1719	1794	1874	1966	2046
54	872	950	1040	1130	1219	1298	1386	1461	1544	1618	1702	1782	1873	1951	2042
55	872	953	1043	1120	1209	1297	1386	1470	1542	1625	1701	1791	1869	1957	2035
56	857	951	1031	1120	1210	1287	1375	1459	1542	1610	1694	1772	1862	1953	2031
57	843	939	1029	1120	1199	1289	1375	1448	1529	1611	1689	1779	1858	1948	2027
58	830	927	1031	1122	1201	1291	1376	1458	1529	1592	1683	1762	1867	1946	2016
59	842	928	1021	1113	1204	1292	1376	1439	1509	1600	1680	1772	1851	1930	2012
60	834	929	1035	1127	1218	1304	1369	1439	1509	1596	1677	1766	1850	1918	1993
61	840	933	1027	1121	1210	1287	1358	1428	1500	1595	1686	1756	1832	1915	1982
62	835	937	1033	1125	1205	1276	1359	1429	1499	1591	1670	1753	1829	1898	1980
63	852	942	1050	1133	1205	1277	1349	1420	1512	1590	1667	1736	1827	1896	1972
64	861	951	1050	1123	1196	1267	1352	1422	1493	1570	1663	1733	1802	1895	1973
65	872	957	1035	1121	1192	1264	1335	1393	1481	1558	1635	1722	1799	1884	1955
66	891	950	1030	1103	1175	1247	1322	1380	1458	1546	1624	1712	1788	1855	1940
67	876	939	1012	1099	1172	1239	1295	1369	1447	1525	1614	1692	1776	1844	1929
68	857	935	1010	1091	1160	1230	1286	1348	1437	1516	1605	1681	1765	1833	1925
69	854	920	1002	1090	1147	1204	1274	1339	1418	1508	1586	1670	1744	1830	1916
70	837	926	1009	1069	1126	1197	1254	1338	1411	1508	1576	1667	1736	1822	1908
71	837	921	986	1062	1119	1190	1248	1338	1412	1505	1574	1658	1734	1821	1902
72	832	921	979	1042	1114	1172	1243	1316	1412	1481	1572	1658	1728	1808	1887
73	838	901	978	1037	1109	1168	1245	1319	1411	1480	1571	1657	1719	1798	1877

AZ	ZA= 106	ZA= 107	ZA= 108	ZA= 109	ZA= 110	ZA= 111	ZA= 112	ZA= 113	ZA= 114	ZA= 115	ZA= 116	ZA= 117	ZA= 118	ZA= 119	ZA= 120
74	816	893	957	1034	1093	1165	1232	1325	1412	1462	1539	1614	1662	1739	1812
75	797	878	940	1021	1082	1144	1187	1251	1317	1366	1439	1518	1560	1629	1686
76	782	848	926	988	1013	1077	1117	1184	1251	1294	1363	1403	1420	1461	1521
77	769	835	906	871	938	1007	1052	1116	1184	1231	1274	1279	1290	1319	1323
78	745	769	746	796	873	938	983	1052	1122	1162	1154	1161	1175	1203	1220
79	623	600	652	730	804	869	916	986	1018	1031	1032	1043	1058	1075	1107
80	457	534	611	666	736	802	867	870	891	891	912	928	959	978	994
81	389	467	546	595	664	718	738	761	762	766	777	809	829	855	872
82	320	400	478	548	552	573	608	615	619	640	659	694	713	716	727
83	255	336	392	399	433	457	463	468	475	503	535	533	552	564	482
84	221	204	225	247	284	290	312	320	355	349	370	392	409	295	239
85	128	79	89	102	132	178	225	273	219	132	77	76	91	107	126
86	40	7	9	33	81	128	176	133	47	43	44	46	51	64	81
87	5	6	8	12	44	93	36	29	30	31	34	37	40	43	48
88	5	6	8	10	11	13	14	17	18	21	24	27	31	34	37
89	3	5	6	6	5	5	5	5	7	10	14	17	21	23	23
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2c
Relative Spatial Response of DLV

AZ	ZA= 121	ZA= 122	ZA= 123	ZA= 124	ZA= 125	ZA= 126	ZA= 127	ZA= 128	ZA= 129	ZA= 130	ZA= 131	ZA= 132	ZA= 133	ZA= 134	ZA= 135
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	7	4	2	1	1	1	1	1	1	1	2	3	0	26	37
-88	15	14	8	3	2	2	2	1	1	3	4	13	47	76	88
-87	14	13	11	6	4	3	2	2	3	3	13	41	92	125	140
-86	47	29	17	8	6	4	3	3	4	19	34	60	122	171	190
-85	81	59	36	131	116	75	57	54	49	37	51	83	140	202	239
-84	74	7	202	284	240	291	321	410	403	389	282	279	222	249	278
-83	521	462	523	551	571	650	675	702	787	751	634	627	564	585	541
-82	1027	919	895	908	918	931	945	1021	1044	1069	1071	991	925	1089	1126
-81	1442	1351	1289	1289	1269	1276	1285	1296	1309	1384	1406	1435	1583	1608	1636
-80	1833	1735	1670	1693	1689	1690	1694	1789	1800	1826	1862	1963	2111	2127	2147
-79	2214	2064	2146	2241	2201	2194	2190	2191	2195	2292	2407	2533	2697	2705	2676
-78	2411	2421	2553	2672	2750	2653	2642	2652	2743	2764	2871	3093	3214	3223	3172
-77	2717	2836	2976	3067	3188	3154	3162	3242	3327	3416	3520	3630	3743	3800	3665
-76	3100	3238	3323	3395	3545	3631	3736	3807	3883	3887	3985	4087	4193	4302	4322
-75	3441	3602	3688	3773	3917	3953	4088	4248	4362	4440	4529	4625	4726	4749	4767
-74	3759	3842	4001	4196	4250	4222	4242	4466	4724	4966	4999	5088	5076	5106	5089
-73	3892	4048	4202	4356	4449	4528	4537	4679	4841	5075	5371	5527	5613	5566	5451
-72	3869	4130	4301	4413	4526	4658	4805	4810	5026	5254	5523	5820	6013	5986	5902
-71	3848	4075	4339	4493	4604	4727	4831	4977	5212	5438	5596	5890	6132	6257	6347
-70	3830	4050	4268	4513	4686	4798	4898	5058	5294	5540	5762	6045	6219	6326	6417
-69	3830	4034	4244	4503	4684	4833	4966	5144	5279	5578	5916	6157	6265	6410	6521
-68	3833	4035	4222	4455	4684	4833	5038	5232	5366	5620	5957	6149	6350	6500	6624
-67	3821	4041	4218	4438	4680	4835	5068	5289	5454	5687	5930	6165	6376	6588	6678
-66	3845	4066	4242	4462	4683	4864	5101	5272	5508	5751	5927	6161	6374	6563	6774
-65	3919	4094	4298	4466	4665	4840	5077	5282	5488	5724	5935	6141	6336	6541	6767
-64	3905	4075	4275	4443	4642	4809	5028	5231	5468	5639	5887	6141	6309	6541	6732
-63	3886	4078	4277	4445	4643	4810	4993	5183	5419	5622	5833	6095	6310	6510	6692

AZ	ZA= 121	ZA= 122	ZA= 123	ZA= 124	ZA= 125	ZA= 126	ZA= 127	ZA= 128	ZA= 129	ZA= 130	ZA= 131	ZA= 132	ZA= 133	ZA= 134	ZA= 135
-62	3828	4088	4259	4426	4624	4790	4990	5149	5373	5575	5816	6004	6267	6505	6660
-61	3819	4029	4232	4441	4607	4773	4969	5146	5369	5531	5766	5988	6246	6457	6656
-60	3814	3986	4171	4400	4592	4788	4953	5117	5340	5529	5755	5940	6191	6404	6612
-59	3783	3981	4180	4374	4574	4795	4961	5157	5339	5501	5723	5922	6173	6353	6594
-58	3777	3980	4151	4320	4517	4743	4940	5144	5315	5502	5724	5913	6121	6337	6579
-57	3775	3953	4149	4318	4524	4722	4918	5142	5321	5540	5701	5889	6111	6322	6531
-56	3773	3953	4123	4320	4488	4669	4893	5089	5284	5503	5706	5895	6116	6276	6509
-55	3746	3927	4153	4321	4489	4656	4876	5071	5256	5470	5671	5897	6061	6261	6484
-54	3765	3924	4083	4265	4448	4685	4860	5046	5252	5407	5600	5826	6027	6227	6456
-53	3718	3904	4063	4249	4432	4614	4795	4987	5193	5381	5574	5794	5995	6195	6385
-52	3719	3877	4063	4221	4398	4580	4761	4984	5169	5357	5574	5766	5965	6128	6355
-51	3700	3860	4018	4175	4366	4567	4752	4951	5146	5334	5551	5743	5899	6124	6326
-50	3676	3845	4021	4178	4334	4536	4721	4920	5121	5337	5530	5686	5877	6096	6299
-49	3641	3843	4007	4163	4319	4474	4653	4876	5072	5263	5465	5666	5857	6072	6273
-48	3614	3813	3982	4143	4321	4480	4650	4843	5035	5226	5422	5623	5842	6042	6236
-47	3600	3767	3973	4136	4296	4456	4619	4808	4999	5190	5381	5600	5801	5996	6194
-46	3573	3740	3945	4114	4273	4437	4600	4774	4984	5175	5365	5560	5756	5949	6148
-45	3563	3731	3936	4102	4276	4438	4601	4763	4951	5142	5332	5517	5710	5903	6102
-44	3539	3707	3905	4067	4233	4409	4584	4746	4920	5110	5290	5472	5666	5875	6076
-43	3522	3722	3885	4047	4206	4379	4542	4716	4891	5081	5258	5444	5639	5832	6034
-42	3500	3691	3854	4015	4173	4339	4513	4687	4861	5038	5215	5402	5597	5790	5993
-41	3500	3672	3837	3996	4142	4300	4473	4647	4858	5034	5211	5402	5597	5750	5938
-40	3481	3640	3808	3966	4124	4282	4484	4657	4832	5007	5171	5363	5558	5738	5922
-39	3450	3621	3786	3952	4128	4285	4447	4620	4794	4969	5148	5333	5513	5693	5873
-38	3427	3590	3744	3945	4112	4269	4425	4583	4758	4932	5100	5280	5461	5640	5818
-37	3387	3585	3747	3910	4067	4233	4398	4561	4729	4894	5053	5228	5409	5588	5766
-36	3397	3556	3706	3867	4033	4198	4360	4555	4721	4885	5055	5228	5408	5578	5756
-35	3375	3523	3681	3838	4027	4189	4349	4518	4683	4840	5010	5181	5359	5538	5710
-34	3344	3535	3689	3833	3987	4148	4302	4472	4640	4806	4976	5137	5311	5482	5651
-33	3351	3497	3648	3798	3948	4102	4265	4435	4597	4801	4972	5134	5299	5465	5634
-32	3309	3462	3614	3758	3942	4100	4259	4429	4599	4762	4919	5078	5243	5412	5578
-31	3307	3461	3607	3758	3909	4056	4225	4389	4547	4707	4867	5023	5189	5356	5530
-30	3272	3421	3572	3723	3868	4016	4213	4374	4535	4692	4851	5014	5179	5342	5519
-29	3232	3421	3568	3710	3853	4002	4163	4324	4482	4642	4801	4961	5127	5293	5467
-28	3232	3379	3517	3660	3802	3956	4111	4311	4471	4628	4789	4954	5116	5275	5443
-27	3195	3367	3502	3645	3793	3945	4102	4262	4420	4579	4738	4898	5057	5216	5379
-26	3190	3324	3454	3596	3746	3901	4055	4212	4407	4562	4718	4879	5038	5197	5359
-25	3181	3311	3442	3586	3739	3891	4040	4195	4350	4505	4658	4818	4980	5139	5298
-24	3139	3269	3400	3537	3687	3837	4023	4177	4332	4487	4639	4799	4960	5122	5281
-23	3130	3261	3391	3525	3672	3821	3970	4122	4277	4431	4584	4740	4901	5062	5223
-22	3091	3220	3383	3515	3656	3806	3955	4106	4261	4415	4567	4722	4883	5045	5202
-21	3083	3213	3344	3474	3611	3754	3903	4052	4207	4361	4513	4665	4826	4987	5144
-20	3073	3207	3337	3467	3604	3742	3889	4038	4192	4346	4498	4649	4810	4971	5121
-19	3031	3166	3299	3460	3597	3735	3876	4025	4178	4331	4483	4635	4794	4952	5100
-18	3024	3158	3292	3423	3556	3695	3832	3975	4127	4280	4431	4583	4739	4893	5043
-17	3016	3151	3285	3417	3550	3688	3825	3964	4114	4266	4418	4570	4722	4874	5017
-16	3009	3143	3278	3412	3544	3683	3820	3958	4102	4254	4406	4553	4698	4840	4989
-15	2970	3104	3238	3372	3506	3643	3776	3912	4046	4193	4344	4494	4629	4775	4923
-14	2960	3095	3228	3361	3488	3623	3759	3891	4024	4173	4324	4470	4605	4750	4891
-13	2947	3080	3213	3345	3472	3602	3738	3873	4005	4149	4300	4447	4575	4720	4867
-12	2932	3067	3200	3328	3452	3586	3721	3852	3984	4131	4282	4420	4552	4696	4837
-11	2883	3020	3153	3285	3433	3566	3702	3835	3967	4109	4260	4397	4529	4667	4814

AZ	ZA= 121	ZA= 122	ZA= 123	ZA= 124	ZA= 125	ZA= 126	ZA= 127	ZA= 128	ZA= 129	ZA= 130	ZA= 131	ZA= 132	ZA= 133	ZA= 134	ZA= 135
-10	2871	3006	3139	3266	3387	3517	3649	3782	3913	4053	4204	4336	4468	4607	4754
-9	2857	2996	3128	3249	3370	3498	3634	3766	3893	4033	4180	4314	4447	4579	4727
-8	2845	2983	3113	3235	3356	3480	3614	3746	3878	4017	4160	4287	4420	4558	4706
-7	2833	2971	3098	3218	3339	3467	3600	3731	3859	3997	4134	4267	4400	4538	4671
-6	2823	2962	3085	3202	3323	3449	3581	3713	3845	3979	4114	4241	4374	4507	4644
-5	2812	2947	3069	3190	3311	3436	3562	3694	3825	3954	4087	4220	4352	4484	4619
-4	2793	2928	3049	3170	3290	3414	3546	3677	3809	3932	4065	4190	4321	4450	4585
-3	2777	2913	3034	3150	3269	3393	3525	3656	3782	3902	4035	4168	4299	4426	4562
-2	2758	2894	3015	3134	3254	3377	3509	3641	3763	3881	4014	4140	4267	4394	4529
-1	2739	2875	2995	3114	3233	3357	3489	3618	3734	3853	3986	4118	4244	4371	4507
0	2695	2831	2950	3070	3189	3310	3442	3573	3686	3799	3933	4066	4190	4314	4451
1	2714	2843	2961	3080	3199	3323	3455	3573	3687	3805	3939	4066	4190	4318	4454
2	2698	2826	2943	3061	3181	3305	3431	3546	3660	3779	3910	4045	4169	4297	4431
3	2682	2810	2927	3048	3168	3292	3414	3527	3641	3760	3890	4015	4139	4267	4398
4	2671	2799	2916	3033	3150	3270	3387	3501	3615	3733	3860	3994	4119	4247	4374
5	2655	2781	2899	3016	3133	3247	3369	3483	3597	3714	3840	3965	4090	4215	4339
6	2638	2760	2878	3001	3118	3229	3343	3457	3572	3684	3809	3944	4069	4188	4312
7	2625	2746	2863	2981	3093	3203	3318	3432	3551	3662	3788	3913	4036	4150	4282
8	2605	2726	2843	2960	3068	3186	3301	3415	3521	3632	3757	3893	4012	4125	4242
9	2585	2706	2824	2945	3051	3161	3276	3388	3500	3611	3737	3863	3976	4100	4217
10	2566	2693	2811	2920	3026	3137	3260	3368	3469	3582	3708	3840	3951	4064	4181
11	2553	2674	2789	2896	3036	3150	3260	3362	3463	3594	3717	3831	3942	4069	4186
12	2565	2683	2792	2906	3013	3126	3231	3342	3443	3565	3685	3807	3918	4034	4164
13	2548	2669	2776	2882	2989	3108	3211	3312	3414	3547	3661	3772	3895	4011	4129
14	2537	2646	2752	2859	2975	3080	3181	3293	3395	3513	3625	3749	3860	3978	4108
15	2514	2622	2729	2844	2947	3050	3162	3264	3366	3491	3603	3714	3838	3956	4066
16	2518	2625	2740	2844	2942	3055	3157	3259	3373	3484	3596	3719	3830	3955	4064
17	2495	2611	2718	2816	2923	3025	3128	3239	3340	3464	3575	3687	3804	3913	4037
18	2481	2589	2693	2796	2893	3006	3109	3206	3320	3432	3556	3665	3766	3886	3996
19	2459	2567	2674	2788	2899	3002	3102	3207	3315	3439	3549	3650	3767	3871	3996
20	2464	2574	2667	2769	2871	2973	3080	3174	3296	3409	3527	3626	3743	3848	3971
21	2450	2545	2648	2740	2843	2953	3048	3154	3266	3391	3490	3602	3707	3825	3931
22	2423	2516	2640	2736	2848	2943	3049	3150	3275	3377	3489	3590	3709	3814	3933
23	2416	2519	2612	2720	2816	2923	3018	3132	3240	3353	3453	3568	3674	3793	3899
24	2400	2493	2594	2689	2796	2892	3020	3126	3240	3340	3453	3558	3677	3780	3895
25	2398	2491	2593	2679	2787	2894	2990	3104	3204	3317	3417	3537	3639	3754	3867
26	2373	2477	2570	2664	2756	2863	2971	3071	3205	3305	3421	3521	3634	3748	3846
27	2358	2476	2575	2660	2759	2855	2965	3076	3176	3287	3381	3493	3606	3704	3819
28	2356	2463	2552	2647	2732	2837	2935	3070	3178	3270	3379	3490	3587	3699	3813
29	2329	2459	2559	2644	2739	2830	2942	3049	3140	3246	3356	3453	3564	3674	3768
30	2335	2433	2531	2629	2715	2813	2925	3031	3137	3230	3341	3452	3562	3656	3765
31	2332	2437	2524	2622	2717	2804	2905	3007	3099	3208	3318	3413	3523	3633	3742
32	2306	2410	2508	2592	2706	2807	2897	2999	3099	3205	3300	3411	3521	3631	3722
33	2314	2401	2497	2592	2688	2778	2881	2980	3066	3194	3301	3409	3519	3609	3713
34	2288	2402	2497	2582	2680	2780	2867	2966	3069	3176	3284	3373	3477	3580	3685
35	2290	2374	2470	2565	2667	2767	2866	2966	3072	3163	3266	3367	3469	3572	3675
36	2281	2377	2458	2551	2649	2748	2847	2951	3055	3156	3257	3359	3463	3550	3651
37	2252	2363	2456	2551	2638	2737	2834	2929	3029	3130	3216	3318	3422	3523	3624
38	2250	2344	2425	2540	2638	2734	2830	2910	3008	3108	3208	3310	3411	3512	3612
39	2237	2330	2424	2520	2620	2716	2811	2905	3003	3103	3202	3298	3399	3500	3604
40	2236	2318	2409	2502	2599	2695	2807	2901	2999	3099	3181	3277	3373	3472	3577
41	2224	2318	2406	2498	2581	2678	2773	2867	2980	3080	3176	3273	3367	3446	3551

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42	2208	2305	2391	2481	2579	2675	2770	2865	2960	3059	3156	3250	3344	3442	3544
43	2201	2303	2390	2479	2577	2672	2753	2848	2941	3052	3146	3241	3335	3437	3540
44	2188	2275	2377	2464	2560	2656	2749	2841	2934	3027	3121	3215	3313	3434	3537
45	2186	2274	2376	2463	2555	2648	2741	2833	2926	3020	3113	3207	3306	3406	3524
46	2173	2261	2360	2446	2534	2624	2717	2810	2920	3014	3105	3197	3293	3392	3491
47	2170	2256	2354	2442	2531	2620	2709	2801	2893	2984	3076	3188	3283	3379	3478
48	2151	2249	2336	2425	2528	2615	2701	2789	2881	2973	3066	3162	3274	3369	3465
49	2147	2244	2332	2420	2507	2594	2678	2781	2870	2962	3058	3152	3247	3359	3451
50	2145	2226	2326	2414	2501	2600	2683	2772	2861	2966	3061	3142	3236	3346	3437
51	2144	2220	2305	2393	2494	2593	2677	2766	2852	2937	3050	3145	3226	3333	3424
52	2140	2215	2313	2402	2487	2572	2656	2760	2842	2927	3041	3136	3226	3302	3412
53	2123	2210	2294	2397	2482	2567	2651	2736	2832	2918	3014	3125	3214	3302	3400
54	2130	2206	2291	2377	2462	2573	2656	2738	2834	2909	3005	3113	3202	3291	3404
55	2113	2190	2297	2381	2464	2547	2646	2728	2810	2916	3006	3114	3191	3280	3391
56	2121	2190	2272	2372	2455	2538	2637	2720	2802	2906	2995	3083	3191	3268	3374
57	2110	2180	2275	2359	2459	2542	2625	2724	2800	2904	2982	3070	3178	3265	3360
58	2091	2183	2268	2352	2435	2535	2619	2711	2787	2874	2980	3069	3165	3252	3357
59	2079	2172	2272	2357	2441	2538	2613	2704	2787	2864	2970	3054	3160	3236	3342
60	2080	2166	2250	2351	2432	2524	2599	2673	2777	2865	2966	3035	3141	3226	3323
61	2070	2172	2257	2351	2426	2501	2593	2673	2779	2856	2945	3025	3129	3227	3311
62	2066	2177	2253	2329	2421	2497	2588	2664	2771	2843	2931	3006	3111	3216	3291
63	2071	2156	2249	2324	2417	2493	2579	2668	2759	2829	2912	3018	3101	3197	3280
64	2067	2143	2236	2312	2405	2481	2584	2657	2746	2810	2904	3008	3080	3185	3283
65	2055	2133	2233	2310	2403	2481	2573	2644	2727	2817	2895	2988	3067	3166	3273
66	2012	2113	2192	2293	2393	2461	2550	2615	2705	2800	2875	2976	3071	3156	3255
67	1997	2093	2173	2274	2376	2433	2518	2605	2680	2786	2862	2964	3061	3161	3200
68	1994	2081	2161	2257	2353	2410	2486	2582	2666	2765	2871	2947	3036	3102	3161
69	1985	2068	2145	2248	2329	2386	2451	2539	2616	2726	2835	2937	2982	3044	3096
70	1974	2057	2132	2233	2306	2374	2416	2477	2585	2665	2762	2863	2945	2991	3031
71	1963	2047	2142	2208	2277	2344	2381	2435	2520	2621	2692	2788	2886	2946	2987
72	1949	2045	2122	2176	2247	2310	2362	2351	2419	2528	2637	2736	2801	2817	2795
73	1942	2015	2090	2164	2217	2241	2229	2259	2315	2423	2535	2589	2630	2639	2600
74	1878	1921	1998	2089	2116	2089	2079	2145	2247	2344	2359	2402	2403	2440	2419
75	1745	1822	1855	1878	1933	1950	1974	2034	2078	2108	2156	2206	2255	2268	2278
76	1583	1649	1672	1694	1747	1764	1808	1835	1864	1862	1909	1963	2019	2075	2086
77	1384	1446	1498	1525	1580	1571	1566	1584	1616	1651	1699	1757	1816	1858	1815
78	1252	1261	1297	1352	1404	1349	1337	1332	1355	1360	1405	1513	1575	1594	1590
79	1140	1112	1124	1184	1157	1147	1138	1132	1130	1150	1196	1260	1350	1357	1363
80	1009	974	921	938	929	923	918	953	951	953	953	1016	1082	1092	1104
81	854	812	765	758	739	735	733	732	732	766	774	770	840	855	871
82	683	588	633	555	553	553	553	587	590	595	615	584	568	618	638
83	419	559	463	366	368	402	407	412	449	446	406	414	389	404	398
84	346	413	365	214	194	208	215	254	263	271	241	251	230	248	258
85	109	117	168	97	98	80	87	81	91	96	120	144	165	196	216
86	97	65	31	2	14	26	39	40	40	53	77	92	124	156	170
87	57	57	23	2	14	26	26	28	28	24	25	50	83	109	125
88	41	43	24	1	10	13	15	17	17	14	9	9	36	63	79
89	23	12	1	1	1	1	2	5	7	7	2	2	3	17	34
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2d
Relative Spatial Response of DLV

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-89	39	38	37	36	61	22	2	2	2	2	1	1	1	1	1
-88	91	90	88	116	163	106	49	12	5	3	2	2	1	2	2
-87	144	141	143	222	265	178	119	61	42	36	11	3	2	3	3
-86	196	191	248	301	338	278	217	272	384	401	369	337	153	112	87
-85	248	279	329	408	439	377	293	583	846	766	725	686	628	411	380
-84	313	390	438	515	539	456	740	1017	1149	1267	1234	1035	967	859	672
-83	663	568	599	632	628	914	1061	1331	1575	1614	1590	1535	1306	1191	1105
-82	1178	1074	1098	976	1118	1243	1505	1647	1880	2079	1944	1883	1643	1521	1400
-81	1669	1558	1564	1609	1582	1775	1908	2164	2249	2378	2449	2229	2132	1850	1723
-80	2160	2040	1973	2200	2154	2248	2353	2481	2677	2741	2803	2574	2451	2162	2028
-79	2546	2524	2579	2637	2725	2656	2679	2921	2984	3163	3135	3071	2784	2642	2348
-78	3035	3060	3260	3269	3188	3264	3143	3240	3412	3464	3474	3414	3116	2967	2667
-77	3639	3671	3706	3848	3758	3671	3588	3740	3783	3828	3933	3756	3600	3291	3004
-76	4339	4360	4386	4271	4172	4232	4139	4056	4091	4250	4291	4077	3886	3720	3523
-75	4952	4970	4986	4893	4790	4631	4471	4465	4504	4548	4586	4548	4379	4230	4083
-74	5241	5427	5431	5303	5246	5077	4910	4837	4858	4897	4988	5036	4899	4739	4812
-73	5514	5695	5880	5766	5587	5395	5222	5136	5150	5296	5331	5538	5463	5247	5309
-72	5888	6045	6148	6212	6036	5854	5705	5616	5619	5582	5611	5975	5933	6000	5862
-71	6124	6253	6436	6527	6374	6169	6025	5928	5910	5930	6061	6442	6402	6459	6313
-70	6518	6607	6786	6885	6818	6500	6383	6281	6201	6216	6381	6869	7098	6979	6762
-69	6623	6771	6993	7170	7153	6977	6825	6717	6668	6677	6972	7184	7553	7436	7240
-68	6678	6954	7240	7514	7439	7298	7181	7066	6961	6962	7295	7655	8018	7892	7678
-67	6855	7138	7326	7611	7864	7783	7495	7375	7311	7426	7775	7973	8329	8408	8152
-66	7028	7218	7436	7692	7907	8042	7973	7847	7663	7759	8102	8447	8796	8833	8586
-65	6945	7170	7426	7649	7819	8067	8252	8153	8068	8249	8584	8768	9098	9231	9056
-64	6932	7160	7385	7600	7800	8008	8238	8423	8553	8695	8877	8975	9087	9214	9395
-63	6890	7149	7337	7551	7782	7947	8178	8450	8607	8723	8837	8948	9061	9236	9417
-62	6883	7066	7328	7534	7699	7930	8158	8391	8573	8714	8811	8943	9078	9221	9402
-61	6844	7059	7278	7482	7684	7915	8101	8320	8541	8667	8804	8938	9064	9245	9428
-60	6842	7054	7262	7466	7668	7836	8084	8286	8490	8639	8778	8914	9089	9260	9400
-59	6802	7007	7246	7417	7653	7821	8056	8224	8421	8612	8731	8915	9060	9232	9403
-58	6752	6988	7165	7404	7606	7808	8021	8193	8391	8566	8706	8878	9061	9236	9375
-57	6725	6957	7151	7391	7561	7780	7916	8162	8332	8541	8694	8874	9058	9207	9404
-56	6698	6890	7122	7381	7550	7747	7883	8127	8304	8517	8659	8871	9023	9206	9410
-55	6673	6864	7095	7288	7523	7694	7852	8064	8270	8470	8658	8870	9021	9190	9380
-54	6615	6839	7069	7262	7488	7663	7821	8032	8239	8437	8604	8801	8969	9164	9324
-53	6591	6781	7045	7218	7443	7633	7792	8001	8199	8391	8531	8744	8897	9109	9251
-52	6560	6759	6966	7174	7399	7597	7742	7972	8133	8345	8487	8690	8842	9051	9190
-51	6532	6736	6923	7131	7357	7515	7712	7932	8088	8301	8443	8621	8834	8978	9175
-50	6504	6715	6881	7089	7316	7514	7672	7888	8044	8242	8439	8579	8776	8918	9104
-49	6464	6673	6839	7049	7255	7475	7616	7820	8043	8199	8398	8538	8706	8859	9046
-48	6424	6633	6798	7010	7216	7424	7559	7763	8002	8158	8340	8521	8645	8834	8989
-47	6384	6593	6759	6971	7179	7367	7502	7708	7956	8118	8300	8460	8584	8776	8977
-46	6364	6556	6722	6934	7123	7312	7488	7653	7882	8117	8242	8394	8567	8717	8909
-45	6324	6519	6728	6875	7060	7257	7433	7600	7829	8060	8220	8334	8499	8658	8854
-44	6280	6484	6672	6813	6999	7201	7380	7598	7778	7990	8161	8275	8440	8647	8797
-43	6238	6427	6611	6795	6939	7142	7328	7548	7760	7918	8099	8255	8383	8578	8774
-42	6182	6367	6552	6736	6935	7083	7275	7484	7692	7892	8031	8197	8371	8522	8697

AZ	ZA= 136	ZA= 137	ZA= 138	ZA= 139	ZA= 140	ZA= 141	ZA= 142	ZA= 143	ZA= 144	ZA= 145	ZA= 146	ZA= 147	ZA= 148	ZA= 149	ZA= 150
-41	6122	6307	6493	6686	6877	7070	7214	7416	7625	7825	8003	8139	8316	8496	8621
-40	6107	6249	6444	6629	6821	7010	7199	7399	7559	7759	7937	8117	8246	8420	8592
-39	6058	6244	6430	6573	6761	6949	7138	7336	7544	7694	7872	8048	8222	8348	8518
-38	6002	6188	6375	6558	6745	6888	7078	7277	7480	7674	7852	7980	8152	8326	8496
-37	5947	6133	6317	6499	6685	6873	7066	7219	7418	7610	7785	7958	8086	8258	8428
-36	5936	6076	6258	6441	6627	6815	7009	7209	7408	7545	7718	7891	8064	8237	8364
-35	5885	6062	6244	6428	6570	6757	6952	7153	7333	7511	7695	7827	7999	8173	8344
-34	5828	6012	6195	6372	6559	6745	6944	7124	7254	7430	7613	7796	7979	8153	8282
-33	5772	5957	6139	6325	6512	6690	6868	7045	7222	7398	7581	7716	7899	8081	8249
-32	5761	5945	6129	6315	6492	6662	6792	6967	7144	7321	7501	7685	7869	7999	8167
-31	5714	5891	6076	6250	6421	6591	6763	6940	7115	7292	7422	7607	7787	7964	8129
-30	5704	5880	6052	6223	6350	6521	6691	6868	7044	7219	7394	7573	7752	7927	8046
-29	5640	5812	5983	6154	6325	6496	6666	6842	7019	7194	7317	7490	7669	7844	8018
-28	5615	5787	5958	6086	6258	6428	6598	6772	6949	7117	7284	7456	7636	7810	7936
-27	5549	5720	5892	6063	6234	6405	6576	6742	6911	7085	7207	7375	7555	7735	7901
-26	5529	5699	5869	5997	6168	6340	6506	6658	6830	7007	7176	7344	7523	7701	7867
-25	5467	5637	5807	5976	6143	6310	6480	6624	6793	6976	7145	7314	7443	7620	7787
-24	5449	5618	5784	5947	6117	6284	6410	6552	6709	6884	7066	7239	7410	7587	7747
-23	5384	5549	5717	5880	6048	6215	6370	6520	6674	6849	7031	7206	7373	7546	7707
-22	5360	5525	5693	5856	6020	6191	6338	6488	6640	6815	6950	7125	7286	7459	7620
-21	5291	5459	5624	5790	5953	6123	6268	6410	6561	6734	6918	7093	7247	7419	7581
-20	5271	5434	5601	5764	5930	6086	6237	6380	6531	6702	6886	7055	7208	7380	7539
-19	5251	5412	5579	5742	5908	6056	6207	6351	6502	6623	6799	6975	7127	7295	7454
-18	5191	5349	5508	5673	5826	5983	6132	6282	6426	6592	6769	6938	7089	7257	7414
-17	5165	5320	5478	5643	5793	5948	6098	6254	6398	6562	6733	6901	7052	7220	7372
-16	5138	5284	5450	5605	5759	5904	6065	6226	6371	6532	6699	6864	7016	7137	7287
-15	5065	5214	5373	5533	5687	5830	5991	6141	6302	6458	6620	6785	6936	7096	7245
-14	5039	5181	5346	5502	5645	5798	5958	6109	6270	6416	6582	6747	6898	7056	7204
-13	5007	5155	5315	5460	5613	5767	5916	6077	6238	6380	6543	6709	6858	7015	7163
-12	4984	5130	5275	5429	5583	5735	5883	6045	6206	6343	6506	6672	6819	6975	7123
-11	4961	5095	5245	5399	5553	5692	5851	6013	6157	6268	6426	6579	6738	6895	7040
-10	4895	5032	5176	5330	5474	5623	5778	5929	6083	6232	6390	6540	6698	6856	7002
-9	4869	5004	5147	5292	5443	5593	5747	5895	6047	6197	6354	6502	6659	6817	6955
-8	4842	4967	5109	5263	5413	5563	5706	5861	6012	6162	6303	6463	6621	6779	6910
-7	4805	4940	5082	5233	5372	5522	5673	5826	5977	6128	6264	6423	6581	6740	6863
-6	4779	4914	5053	5193	5343	5494	5639	5790	5941	6078	6223	6382	6541	6700	6818
-5	4745	4880	5014	5165	5315	5466	5602	5754	5891	6040	6182	6342	6502	6656	6772
-4	4721	4854	4986	5137	5288	5433	5552	5705	5857	6002	6142	6303	6463	6614	6728
-3	4697	4828	4958	5099	5250	5388	5517	5670	5823	5965	6103	6264	6425	6571	6684
-2	4665	4791	4920	5072	5224	5354	5483	5636	5789	5926	6065	6226	6387	6527	6640
-1	4640	4765	4894	5046	5193	5320	5450	5603	5753	5888	6027	6189	6345	6483	6597
0	4587	4709	4831	4983	5135	5257	5378	5532	5686	5817	5949	6111	6274	6407	6540
1	4581	4703	4833	4986	5118	5240	5370	5524	5664	5796	5935	6098	6243	6376	6534
2	4556	4678	4809	4956	5085	5207	5338	5489	5627	5759	5899	6059	6200	6334	6492
3	4521	4644	4774	4928	5053	5176	5307	5455	5590	5723	5864	6020	6158	6293	6452
4	4497	4620	4752	4884	5007	5130	5277	5421	5554	5687	5829	5981	6116	6252	6411
5	4473	4597	4724	4852	4976	5099	5229	5368	5519	5652	5796	5939	6075	6211	6372
6	4436	4560	4684	4822	4945	5069	5196	5332	5466	5618	5757	5898	6035	6171	6332
7	4406	4530	4655	4779	4917	5041	5166	5300	5434	5568	5719	5857	5995	6132	6294
8	4363	4502	4626	4751	4875	4995	5135	5269	5404	5533	5682	5819	5957	6094	6248
9	4334	4459	4584	4723	4845	4963	5089	5239	5374	5497	5624	5782	5920	6054	6207
10	4310	4432	4557	4679	4814	4933	5059	5210	5338	5459	5587	5746	5884	6013	6165

AZ	ZA= 136	ZA= 137	ZA= 138	ZA= 139	ZA= 140	ZA= 141	ZA= 142	ZA= 143	ZA= 144	ZA= 145	ZA= 146	ZA= 147	ZA= 148	ZA= 149	ZA= 150
11	4304	4435	4558	4678	4796	4931	5063	5189	5329	5421	5551	5710	5843	5971	6123
12	4281	4395	4528	4647	4766	4885	5028	5151	5272	5412	5548	5680	5831	5959	6114
13	4259	4369	4486	4620	4739	4854	4992	5113	5235	5376	5508	5638	5790	5918	6073
14	4218	4341	4459	4579	4712	4823	4943	5081	5202	5340	5468	5596	5748	5877	6034
15	4190	4298	4433	4552	4664	4791	4912	5050	5171	5284	5426	5555	5708	5837	5988
16	4174	4301	4417	4547	4657	4789	4910	5028	5162	5274	5414	5544	5697	5797	5942
17	4147	4257	4387	4498	4626	4741	4880	4994	5126	5239	5373	5503	5657	5785	5930
18	4121	4230	4355	4466	4595	4711	4845	4958	5090	5204	5340	5463	5618	5745	5891
19	4106	4231	4341	4466	4573	4703	4815	4948	5060	5169	5306	5423	5579	5706	5852
20	4081	4206	4317	4442	4543	4667	4780	4913	5026	5162	5279	5415	5570	5695	5842
21	4057	4167	4293	4394	4511	4614	4745	4878	4992	5129	5246	5383	5533	5657	5797
22	4044	4165	4267	4385	4504	4607	4736	4850	4985	5123	5214	5351	5496	5613	5752
23	4015	4135	4235	4354	4455	4577	4702	4817	4952	5091	5208	5347	5479	5591	5728
24	4010	4110	4227	4346	4449	4571	4651	4784	4920	5059	5177	5309	5441	5548	5682
25	3967	4083	4200	4297	4420	4542	4646	4777	4916	5030	5163	5294	5402	5510	5642
26	3962	4079	4176	4267	4390	4495	4618	4746	4885	4993	5124	5254	5387	5495	5627
27	3936	4032	4145	4261	4385	4490	4613	4736	4869	4976	5084	5216	5349	5457	5587
28	3909	4022	4135	4233	4338	4462	4583	4705	4809	4937	5068	5201	5334	5464	5547
29	3878	3992	4105	4210	4332	4453	4573	4697	4801	4926	5030	5163	5293	5423	5526
30	3874	3983	4079	4202	4301	4421	4542	4647	4772	4897	5018	5143	5273	5402	5512
31	3851	3941	4052	4170	4291	4412	4534	4640	4762	4885	4985	5107	5231	5362	5492
32	3828	3932	4047	4164	4281	4403	4485	4607	4729	4850	4972	5095	5218	5321	5452
33	3800	3904	4021	4139	4256	4351	4472	4594	4715	4837	4960	5062	5186	5309	5432
34	3790	3900	4018	4114	4228	4341	4460	4580	4682	4804	4927	5051	5170	5290	5394
35	3781	3875	3990	4102	4195	4310	4430	4549	4669	4792	4912	5014	5133	5251	5376
36	3754	3845	3957	4069	4181	4300	4420	4540	4654	4755	4874	4993	5112	5233	5340
37	3727	3834	3943	4056	4171	4291	4406	4504	4619	4735	4853	4972	5073	5196	5323
38	3719	3827	3934	4043	4157	4255	4370	4484	4599	4716	4833	4934	5053	5205	5332
39	3712	3820	3926	4015	4120	4234	4348	4462	4579	4679	4797	4915	5062	5170	5292
40	3685	3774	3899	4004	4108	4212	4327	4443	4543	4661	4779	4921	5021	5145	5268
41	3658	3764	3871	3994	4098	4201	4290	4407	4525	4643	4761	4887	5002	5120	5227
42	3648	3755	3861	3965	4088	4175	4277	4388	4507	4625	4751	4869	4985	5084	5203
43	3643	3747	3850	3954	4041	4163	4268	4377	4489	4590	4734	4851	4951	5067	5209
44	3635	3736	3838	3925	4028	4151	4259	4368	4460	4599	4717	4817	4934	5075	5176
45	3623	3724	3826	3913	4016	4142	4251	4343	4453	4582	4696	4796	4910	5037	5150
46	3611	3713	3800	3903	4005	4134	4239	4331	4437	4564	4656	4769	4911	5010	5119
47	3580	3703	3790	3890	3991	4117	4208	4313	4441	4531	4634	4770	4870	4984	5116
48	3566	3688	3775	3875	3975	4097	4188	4293	4422	4512	4615	4743	4844	4954	5075
49	3550	3672	3759	3860	3960	4081	4169	4275	4403	4493	4620	4711	4818	4941	5044
50	3536	3657	3744	3845	3967	4067	4154	4280	4371	4474	4602	4693	4816	4910	5013
51	3523	3622	3730	3829	3950	4037	4136	4260	4351	4479	4570	4674	4792	4878	5010
52	3511	3609	3711	3810	3932	4031	4119	4243	4333	4461	4552	4676	4758	4875	4969
53	3500	3594	3708	3791	3914	4014	4125	4227	4338	4443	4534	4652	4735	4851	4939
54	3487	3601	3695	3776	3896	3998	4109	4211	4323	4425	4535	4628	4736	4828	4937
55	3484	3588	3680	3761	3875	3975	4089	4189	4303	4398	4506	4623	4706	4820	4908
56	3466	3570	3662	3774	3853	3974	4063	4189	4278	4390	4470	4587	4672	4784	4907
57	3448	3562	3644	3753	3833	3948	4037	4163	4246	4357	4461	4551	4664	4749	4877
58	3433	3545	3624	3732	3822	3927	4048	4132	4239	4325	4429	4515	4628	4747	4840
59	3427	3525	3634	3712	3825	3908	4019	4100	4208	4319	4397	4507	4598	4719	4840
60	3428	3514	3615	3702	3807	3889	3991	4094	4182	4288	4392	4474	4589	4718	4812
61	3408	3494	3596	3684	3789	3892	3966	4063	4178	4257	4361	4464	4544	4674	4802
62	3396	3475	3586	3688	3764	3866	3963	4043	4147	4252	4327	4429	4531	4628	4758

AZ	ZA= 136	ZA= 137	ZA= 138	ZA= 139	ZA= 140	ZA= 141	ZA= 142	ZA= 143	ZA= 144	ZA= 145	ZA= 146	ZA= 147	ZA= 148	ZA= 149	ZA= 150
63	3377	3488	3568	3661	3763	3838	3938	4041	4102	4218	4318	4395	4496	4615	4746
64	3368	3470	3563	3636	3731	3831	3911	3994	3988	4083	4208	4381	4488	4570	4701
65	3351	3444	3539	3630	3700	3804	3887	3857	3826	3885	4084	4200	4369	4559	4520
66	3330	3401	3507	3601	3698	3755	3746	3717	3634	3631	3834	4039	4245	4356	4256
67	3252	3361	3425	3534	3636	3631	3523	3496	3471	3464	3670	3793	4003	4110	4025
68	3179	3268	3378	3484	3493	3399	3378	3356	3309	3288	3422	3634	3847	3841	3757
69	3142	3176	3263	3333	3351	3247	3199	3189	3170	3152	3260	3390	3606	3604	3523
70	3075	3100	3171	3208	3202	3042	2989	2984	2948	2936	2957	3232	3449	3366	3256
71	2902	2943	3016	3095	2998	2895	2813	2805	2804	2799	2797	3020	3061	3095	3023
72	2774	2850	2890	2956	2847	2751	2662	2655	2658	2632	2629	2779	2817	2856	2789
73	2617	2694	2771	2737	2642	2543	2451	2418	2424	2489	2494	2631	2573	2484	2536
74	2494	2573	2572	2510	2489	2398	2309	2267	2276	2286	2326	2371	2307	2261	2317
75	2364	2369	2372	2333	2262	2192	2107	2093	2100	2113	2111	2169	2079	2038	1998
76	2090	2096	2104	2061	1997	2005	1939	1883	1880	1944	1939	1929	1903	1814	1747
77	1778	1788	1800	1873	1813	1755	1698	1731	1700	1697	1737	1736	1736	1639	1563
78	1537	1515	1600	1615	1559	1574	1505	1497	1519	1492	1493	1567	1507	1484	1390
79	1307	1305	1296	1318	1358	1308	1275	1349	1309	1316	1321	1399	1348	1328	1238
80	1130	1079	1043	1123	1104	1126	1124	1143	1171	1096	1149	1159	1189	1101	1085
81	906	858	870	858	848	893	915	995	975	949	952	961	1025	940	928
82	681	637	651	598	646	654	736	762	829	813	743	793	793	783	774
83	445	405	423	441	464	500	528	615	688	619	601	625	633	627	620
84	286	311	327	363	388	344	378	467	490	483	467	408	473	470	379
85	231	234	251	288	318	274	229	263	350	288	276	268	312	235	215
86	183	181	195	213	247	204	162	127	151	151	141	132	82	67	52
87	134	131	131	159	196	134	93	51	23	13	7	6	7	6	4
88	85	83	82	84	124	84	43	3	0	1	3	5	5	4	3
89	36	36	35	35	52	10	0	0	0	1	2	2	2	2	1
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2e

Relative Spatial Response of DLV

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-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	1	1	1	1	1	1	1	1	1	9	5	1	1	1	25
-88	2	2	2	2	4	4	4	3	15	27	15	7	5	0	93
-87	3	3	4	5	7	7	6	17	37	48	36	14	8	0	118
-86	62	27	19	8	9	9	20	39	59	57	44	28	32	145	188
-85	349	365	369	160	125	96	81	67	68	76	78	94	145	188	213
-84	635	649	703	501	459	423	402	207	186	188	217	155	203	292	283
-83	921	933	1041	842	793	750	548	520	488	561	365	369	383	374	308
-82	1206	1217	1320	1183	1126	1077	868	832	841	709	724	716	510	491	421
-81	1490	1502	1598	1504	1459	1230	1187	1142	998	1059	1130	864	849	813	531
-80	1783	1787	1876	1831	1791	1556	1506	1505	1355	1408	1269	1247	1192	932	850
-79	2179	2109	2193	2142	2119	1881	1826	1669	1713	1556	1603	1633	1332	1270	966
-78	2640	2462	2482	2414	2437	2207	2235	2068	2070	1906	1944	1767	1709	1399	1313
-77	3130	2963	2981	2745	2580	2584	2407	2433	2259	2288	2117	2162	1858	1758	1431
-76	3619	3466	3480	3233	2988	2982	2780	2798	2616	2637	2458	2292	2246	1884	1761
-75	4163	3999	3977	3720	3465	3468	3184	2961	2972	2784	2799	2648	2628	2231	1867
-74	4649	4476	4264	4244	3988	3692	3661	3366	3333	3132	2937	2946	2765	2565	2191

AZ	ZA= 151	ZA= 152	ZA= 153	ZA= 154	ZA= 155	ZA= 156	ZA= 157	ZA= 158	ZA= 159	ZA= 160	ZA= 161	ZA= 162	ZA= 163	ZA= 164	ZA= 165
-73	5135	4951	4747	4730	4465	4209	4171	3866	3529	3488	3277	3076	3165	2701	2299
-72	5675	5426	5236	5214	4942	4690	4386	4331	4018	3707	3625	3408	3277	3084	2632
-71	6141	5956	5755	5735	5417	5155	4861	4535	4473	4152	3834	3777	3571	3192	2743
-70	6550	6404	6218	5969	5937	5665	5330	4999	4666	4596	4268	3942	3665	3520	3067
-69	7014	6854	6653	6439	6162	6129	5833	5494	5118	4779	4701	4350	4044	3607	3193
-68	7419	7248	7094	6937	6634	6343	6303	5955	5603	5254	4873	4565	4650	3928	3509
-67	7847	7640	7479	7263	7093	6850	6507	6155	6053	5662	5534	5249	4854	4129	3597
-66	8311	8088	7863	7623	7400	7263	7003	6613	6242	5901	5793	5914	5354	4696	3973
-65	8735	8484	8301	7996	7713	7564	7422	7104	6878	6583	6336	6100	5501	4843	4148
-64	9196	8933	8683	8353	8071	7909	7716	7541	7377	7142	6809	6565	5925	5261	4598
-63	9560	9321	9066	8533	8223	8049	7895	7730	7502	7315	7066	6689	6054	5382	4711
-62	9583	9766	9236	8887	8579	8347	8187	8127	7820	7635	7486	7083	6376	5744	5068
-61	9568	9765	9609	9239	8885	8690	8554	8424	8388	7837	7598	7215	6495	5810	5173
-60	9595	9743	9837	9603	9243	8987	8698	8635	8514	8059	7819	7544	6870	6172	5482
-59	9567	9703	9805	9907	9586	9169	9000	8931	8871	8589	8009	7753	6990	6280	5583
-58	9571	9673	9761	9906	9736	9463	9375	9226	9000	8790	8215	7801	7287	6639	5935
-57	9553	9633	9731	9862	9979	9862	9676	9435	9356	9229	8747	7962	7400	6697	6033
-56	9513	9604	9716	9832	9935	9958	9895	9729	9644	9578	8909	8126	7738	7055	6335
-55	9484	9590	9687	9789	9936	9970	10000	9990	9771	9696	9220	8635	7719	7156	6430
-54	9444	9561	9644	9790	9878	9905	9939	9987	9968	9949	9276	8718	8001	7437	6523
-53	9429	9523	9616	9762	9820	9869	9914	9951	9979	9858	9473	8928	8139	7517	6734
-52	9373	9492	9618	9720	9747	9805	9845	9923	9962	9938	9435	8967	8420	7831	6799
-51	9305	9441	9577	9658	9718	9733	9814	9852	9902	9922	9592	9047	8456	7901	7114
-50	9248	9416	9547	9629	9645	9706	9741	9798	9874	9915	9551	9078	8532	7952	7018
-49	9232	9360	9526	9554	9589	9634	9667	9761	9820	9891	9679	9158	8560	8086	7061
-48	9167	9304	9456	9480	9541	9579	9634	9707	9799	9872	9706	9185	8709	7943	7298
-47	9111	9282	9383	9449	9461	9531	9571	9672	9751	9849	9758	9211	8661	8064	7153
-46	9056	9210	9354	9454	9402	9451	9524	9604	9726	9797	9755	9286	8684	7917	7272
-45	9035	9138	9283	9386	9351	9392	9444	9578	9662	9778	9820	9309	8678	7909	7265
-44	8963	9109	9211	9357	9460	9297	9432	9534	9637	9723	9807	9381	8668	8024	7115
-43	8897	9042	9186	9290	9434	9232	9382	9523	9596	9699	9779	9400	8780	7871	7229
-42	8867	8978	9123	9267	9371	9305	9325	9477	9584	9658	9763	9359	8624	7982	7075
-41	8792	8954	9060	9205	9350	9419	9317	9465	9543	9646	9720	9381	8609	7807	7061
-40	8718	8889	9038	9183	9274	9392	9267	9422	9532	9607	9709	9395	8724	7826	7172
-39	8691	8863	8976	9122	9237	9316	9308	9407	9492	9596	9626	9582	8778	8053	7169
-38	8621	8790	8955	9045	9171	9290	9328	9369	9481	9557	9559	9492	8990	8102	7215
-37	8601	8727	8880	9008	9134	9215	9325	9356	9442	9480	9468	9427	9040	8149	7419
-36	8535	8705	8841	8932	9059	9177	9287	9323	9431	9439	9401	9337	9034	8354	7462
-35	8516	8624	8770	8905	9033	9103	9214	9320	9352	9317	9309	9300	9264	8397	7502
-34	8437	8587	8732	8829	8958	9078	9190	9265	9284	9276	9217	9182	9176	8385	7701
-33	8400	8507	8652	8793	8924	9041	9117	9217	9243	9188	9147	9145	9141	8637	7738
-32	8320	8471	8615	8756	8850	8967	9071	9167	9211	9159	9105	9055	9013	8621	7631
-31	8284	8392	8546	8688	8826	8943	9042	9103	9187	9147	9093	9043	8990	8656	7632
-30	8213	8366	8510	8653	8789	8857	8956	9054	9143	9115	9064	9011	8958	8554	7700
-29	8178	8330	8433	8576	8709	8806	8906	9006	9090	9106	9053	9001	8948	8809	7715
-28	8100	8252	8398	8533	8663	8779	8842	8942	9043	9073	9021	8972	8914	8725	7672
-27	8065	8218	8354	8486	8592	8706	8800	8895	8996	9039	8991	8961	8901	8701	7700
-26	8032	8131	8264	8414	8546	8665	8760	8854	8934	9023	8979	8922	8860	8604	7991
-25	7947	8087	8234	8368	8501	8623	8704	8799	8895	8980	8941	8908	8847	8628	7941
-24	7903	8059	8188	8279	8414	8565	8664	8760	8857	8936	8926	8872	8809	8529	7962
-23	7816	7977	8108	8238	8387	8521	8624	8722	8836	8888	8889	8832	8795	8503	7908
-22	7774	7934	8067	8198	8343	8479	8585	8668	8754	8838	8874	8818	8692	8403	7924

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-21	7746	7892	8027	8174	8265	8397	8531	8618	8705	8814	8834	8778	8670	8375	8110
-20	7660	7807	7947	8095	8227	8352	8480	8568	8680	8764	8793	8764	8623	8322	8083
-19	7618	7766	7908	8056	8181	8325	8429	8542	8631	8715	8779	8727	8530	8293	7983
-18	7577	7726	7884	8008	8153	8272	8378	8460	8549	8660	8732	8677	8498	8190	7955
-17	7537	7685	7833	7917	8063	8183	8318	8410	8525	8611	8686	8661	8393	8160	7853
-16	7452	7600	7743	7867	8014	8131	8267	8361	8476	8563	8665	8563	8360	8056	7824
-15	7411	7551	7693	7839	7965	8104	8216	8336	8427	8540	8619	8536	8253	8024	7770
-14	7370	7525	7643	7790	7913	8053	8165	8288	8378	8492	8599	8446	8268	7968	7740
-13	7330	7477	7594	7741	7863	8002	8140	8238	8323	8412	8528	8375	8160	7935	7636
-12	7283	7427	7545	7653	7799	7914	8053	8157	8274	8391	8474	8346	8052	7828	7605
-11	7198	7341	7459	7605	7748	7863	8004	8134	8220	8335	8450	8362	8015	7794	7500
-10	7151	7292	7434	7554	7697	7838	7958	8077	8194	8279	8395	8349	7891	7686	7467
-9	7102	7244	7387	7507	7650	7793	7936	8025	8136	8254	8340	8267	7885	7578	7361
-8	7053	7196	7339	7460	7604	7748	7884	7974	8079	8198	8317	8164	7964	7542	7327
-7	7005	7149	7292	7437	7559	7703	7834	7951	8056	8143	8263	8124	7985	7429	7220
-6	6957	7101	7246	7391	7536	7654	7782	7901	8007	8119	8209	8019	7998	7425	7186
-5	6912	7055	7200	7346	7492	7631	7731	7851	7958	8065	8187	7979	7979	7519	7078
-4	6868	7009	7155	7301	7448	7581	7708	7801	7909	8018	8133	7874	7965	7543	7042
-3	6825	6966	7110	7257	7399	7530	7657	7780	7889	7997	8080	7770	7854	7592	6956
-2	6782	6924	7066	7214	7350	7479	7607	7730	7840	7950	8060	7730	7820	7608	6950
-1	6740	6882	7025	7165	7299	7428	7557	7682	7793	7904	8014	7627	7719	7613	7074
0	6683	6826	6970	7113	7243	7373	7503	7633	7745	7857	7968	7561	7665	7737	7266
1	6678	6822	6965	7097	7228	7359	7490	7608	7721	7834	7946	7585	7678	7616	7119
2	6637	6781	6919	7050	7182	7313	7439	7556	7670	7784	7893	7584	7670	7596	7131
3	6597	6742	6874	7003	7135	7268	7389	7504	7619	7733	7872	7584	7667	7588	7133
4	6557	6696	6827	6956	7090	7217	7337	7483	7598	7713	7819	7583	7632	7550	7144
5	6518	6651	6780	6910	7044	7168	7315	7431	7548	7660	7765	7581	7622	7537	7143
6	6472	6604	6734	6865	6994	7146	7263	7381	7498	7607	7745	7582	7591	7484	7152
7	6427	6557	6688	6820	6973	7093	7212	7330	7444	7586	7691	7579	7556	7466	7150
8	6380	6511	6642	6801	6922	7042	7161	7310	7424	7532	7638	7579	7537	7418	7158
9	6338	6469	6600	6749	6870	6990	7110	7260	7370	7478	7619	7566	7488	7399	7154
10	6296	6428	6555	6703	6823	6943	7090	7206	7316	7458	7566	7528	7468	7351	7155
11	6256	6388	6536	6657	6777	6925	7045	7158	7295	7404	7514	7519	7418	7302	7140
12	6247	6371	6518	6611	6732	6880	6998	7140	7248	7357	7495	7475	7398	7283	7133
13	6202	6324	6472	6593	6742	6862	6978	7117	7202	7341	7448	7459	7347	7234	7119
14	6157	6278	6426	6549	6698	6816	6960	7071	7210	7319	7406	7373	7296	7214	7096
15	6110	6259	6381	6504	6651	6768	6914	7025	7165	7268	7386	7313	7243	7133	7081
16	6064	6214	6336	6487	6605	6751	6868	7009	7120	7251	7331	7288	7186	7112	6955
17	6051	6197	6318	6440	6558	6704	6822	6964	7068	7198	7311	7228	7161	7059	6938
18	6012	6158	6272	6419	6537	6684	6830	6918	7050	7145	7256	7202	7102	7037	6930
19	5974	6113	6255	6373	6520	6639	6785	6886	7016	7145	7202	7141	7077	6979	6917
20	5930	6068	6209	6328	6476	6623	6733	6866	6962	7092	7146	7049	7018	6956	6932
21	5908	6044	6190	6310	6432	6580	6683	6812	6943	7039	7084	7023	6973	6948	6929
22	5889	5998	6146	6294	6409	6552	6683	6760	6890	7022	7021	6987	6965	6950	6833
23	5843	5953	6102	6251	6361	6501	6631	6761	6858	6970	6993	6967	6969	6968	6821
24	5821	5934	6079	6200	6342	6450	6581	6711	6841	6972	6998	6989	6981	6979	6827
25	5775	5919	6030	6171	6312	6451	6530	6661	6792	6919	7008	7021	7018	7008	6813
26	5757	5868	6011	6120	6262	6400	6532	6664	6743	6870	6963	7033	7030	7027	6796
27	5717	5848	5981	6123	6212	6350	6482	6613	6745	6861	6946	7005	7059	7056	6649
28	5676	5807	5939	6073	6216	6318	6432	6564	6695	6809	6903	6989	7071	7067	6622
29	5656	5789	5900	6033	6167	6301	6433	6565	6646	6758	6852	6947	7042	7095	6617
30	5616	5750	5883	6013	6142	6250	6383	6516	6647	6748	6836	6931	7027	6972	6593

AZ	ZA= 151	ZA= 152	ZA= 153	ZA= 154	ZA= 155	ZA= 156	ZA= 157	ZA= 158	ZA= 159	ZA= 160	ZA= 161	ZA= 162	ZA= 163	ZA= 164	ZA= 165
31	5625	5737	5841	5972	6100	6224	6351	6467	6598	6697	6794	6882	6985	6958	6469
32	5586	5717	5848	5978	6086	6211	6336	6470	6583	6680	6778	6881	6972	6926	6446
33	5564	5675	5806	5937	6062	6187	6295	6422	6541	6644	6735	6839	6944	6857	6433
34	5521	5652	5784	5896	6021	6147	6271	6379	6496	6599	6734	6827	6933	6750	6405
35	5502	5611	5743	5872	5998	6135	6260	6377	6493	6587	6693	6799	6893	6673	6266
36	5466	5592	5750	5860	5986	6104	6225	6330	6446	6558	6653	6789	6784	6635	6235
37	5475	5582	5710	5829	5950	6056	6175	6293	6431	6547	6654	6749	6714	6487	6204
38	5440	5563	5681	5780	5900	6019	6172	6278	6395	6500	6614	6751	6672	6448	6062
39	5416	5539	5639	5747	5896	6003	6123	6241	6347	6499	6616	6712	6521	6408	6029
40	5375	5499	5638	5747	5846	5967	6075	6227	6346	6452	6571	6619	6478	6259	6007
41	5351	5499	5596	5706	5816	5952	6072	6191	6299	6452	6559	6544	6326	6218	5850
42	5356	5457	5567	5677	5804	5916	6024	6142	6295	6403	6522	6498	6283	6148	5814
43	5317	5428	5536	5665	5772	5870	6019	6139	6247	6401	6510	6327	6209	6026	5789
44	5285	5394	5522	5630	5728	5868	5980	6089	6244	6353	6360	6274	6085	5955	5629
45	5253	5378	5487	5585	5725	5835	5935	6086	6195	6351	6304	6101	6040	5833	5603
46	5239	5343	5451	5581	5691	5791	5933	6037	6193	6303	6128	6048	5871	5790	5563
47	5208	5310	5437	5547	5648	5790	5891	6034	6145	6195	6071	5874	5820	5718	5400
48	5178	5298	5403	5503	5646	5747	5890	5992	6144	6100	5894	5820	5728	5595	5371
49	5176	5269	5372	5501	5603	5747	5849	5992	6097	5954	5836	5766	5598	5510	5141
50	5135	5238	5360	5467	5601	5713	5848	5950	5974	5858	5693	5591	5546	5382	5073
51	5104	5227	5331	5455	5567	5702	5815	5950	5878	5711	5600	5536	5374	5333	5048
52	5102	5197	5330	5425	5556	5669	5805	5817	5730	5614	5456	5360	5322	5243	4821
53	5072	5167	5292	5426	5523	5669	5773	5750	5634	5467	5361	5305	5149	5022	4764
54	5033	5167	5263	5398	5522	5627	5763	5566	5485	5373	5217	5170	5097	4943	4511
55	5032	5137	5264	5360	5495	5627	5577	5498	5303	5226	5157	5073	4892	4677	4434
56	5000	5127	5233	5360	5457	5484	5420	5312	5238	5164	4976	4938	4766	4597	4357
57	4998	5095	5223	5329	5457	5402	5299	5143	5087	4985	4916	4840	4535	4376	4093
58	4969	5094	5192	5329	5297	5194	5122	5026	4878	4821	4725	4609	4449	4250	4014
59	4941	5063	5192	5290	5210	5015	4898	4848	4800	4710	4660	4517	4176	4024	3772
60	4941	5063	5161	5124	5027	4901	4716	4670	4583	4540	4426	4238	4089	3940	3692
61	4897	5029	5031	4906	4813	4721	4630	4545	4505	4465	4139	4000	3856	3691	3425
62	4888	5019	4787	4705	4628	4509	4422	4367	4330	4173	4039	3907	3768	3585	3344
63	4844	4773	4678	4500	4390	4315	4245	4188	4052	3922	3794	3667	3493	3331	3099
64	4650	4556	4430	4355	4290	4224	4118	4062	3941	3817	3651	3530	3404	3243	3017
65	4395	4305	4217	4144	4043	3983	3924	3832	3684	3522	3405	3289	3170	2991	2748
66	4172	4087	3970	3892	3835	3779	3713	3572	3425	3292	3158	3193	3080	2879	2664
67	3911	3832	3755	3680	3627	3565	3459	3343	3329	3193	3057	2909	2804	2626	2432
68	3682	3609	3538	3467	3369	3307	3359	3242	3105	2969	2808	2688	2713	2536	2354
69	3453	3385	3283	3210	3145	3202	3145	3012	2854	2723	2721	2598	2479	2300	2127
70	3189	3125	3055	2983	3035	2982	2887	2756	2629	2630	2505	2381	2260	2193	2025
71	2959	2891	2822	2869	2771	2723	2649	2525	2531	2409	2289	2298	2170	1981	1798
72	2719	2617	2553	2605	2546	2503	2413	2422	2305	2188	2175	2080	1956	1902	1719
73	2480	2398	2320	2376	2321	2287	2304	2190	2052	2069	1978	1889	1878	1691	1513
74	2269	2183	2106	2148	2096	2023	2041	1933	1953	1867	1782	1813	1667	1618	1439
75	2059	1976	1973	1902	1836	1912	1804	1714	1747	1667	1702	1625	1588	1412	1233
76	1813	1748	1771	1695	1630	1665	1583	1620	1543	1581	1506	1412	1377	1200	1157
77	1598	1541	1568	1496	1447	1442	1368	1410	1337	1381	1310	1324	1157	1125	955
78	1384	1333	1365	1331	1377	1300	1269	1200	1221	1154	1203	1102	1077	919	886
79	1223	1159	1207	1179	1213	1181	1095	964	1016	954	1007	1017	865	844	684
80	994	979	1030	1005	1102	1056	945	869	811	868	813	799	784	637	614
81	835	819	874	852	984	930	823	734	605	667	727	582	572	562	411
82	676	660	718	731	866	873	699	594	515	467	502	496	359	354	341

AZ	ZA= 151	ZA= 152	ZA= 153	ZA= 154	ZA= 155	ZA= 156	ZA= 157	ZA= 158	ZA= 159	ZA= 160	ZA= 161	ZA= 162	ZA= 163	ZA= 164	ZA= 165
83	516	501	562	611	749	746	575	473	387	381	279	278	279	279	257
84	357	342	408	492	633	619	520	352	253	182	188	188	222	224	236
85	196	183	289	372	515	492	395	298	138	112	145	177	209	170	178
86	36	23	167	254	400	364	270	176	102	83	116	151	154	149	157
87	2	7	47	136	285	236	144	82	72	70	104	102	98	94	99
88	1	1	3	48	172	103	52	44	42	41	77	79	77	74	79
89	1	1	0	10	50	19	14	13	13	15	24	22	21	20	22
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2f
Relative Spatial Response of DLV

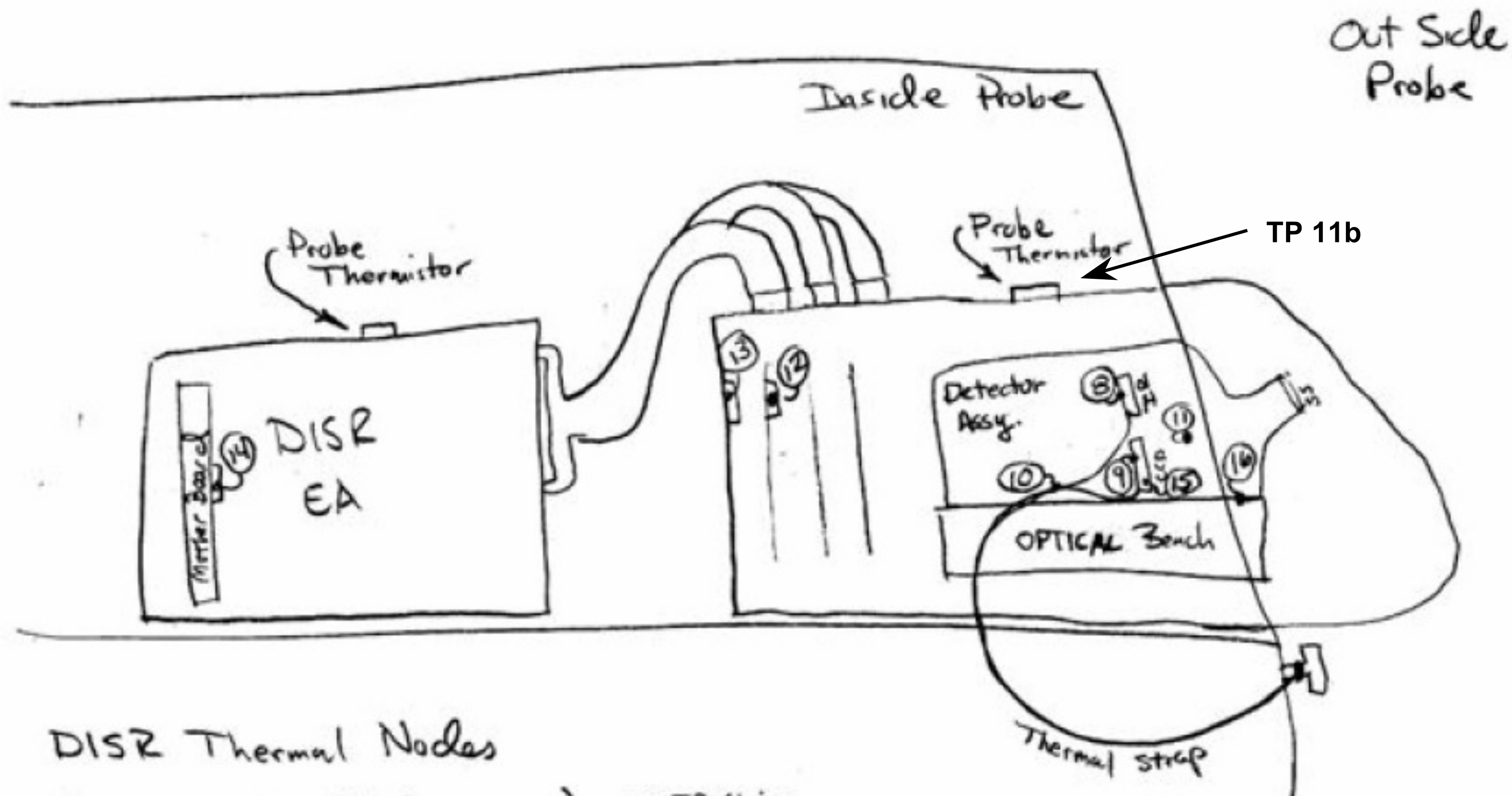
AZ	ZA= 166	ZA= 167	ZA= 168	ZA= 169	ZA= 170	ZA= 171	ZA= 172	ZA= 173	ZA= 174	ZA= 175	ZA= 176	ZA= 177	ZA= 178	ZA= 179	ZA= 180
-90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-89	22	20	18	17	15	3	3	2	3	1	0	0	0	0	0
-88	43	40	37	34	21	6	6	5	5	2	0	0	0	0	0
-87	109	103	98	100	37	9	8	7	7	2	1	0	0	0	0
-86	131	123	117	114	46	22	21	10	8	3	1	1	0	0	0
-85	197	186	178	127	55	25	24	22	19	3	1	1	0	0	0
-84	220	206	196	163	91	29	26	24	20	6	1	1	1	0	0
-83	288	270	214	172	99	50	29	27	20	6	1	1	1	0	0
-82	311	291	279	208	108	56	42	29	21	7	3	1	1	0	0
-81	454	381	293	217	143	61	45	42	22	7	3	1	1	0	0
-80	557	480	371	226	151	75	47	44	26	7	3	3	1	0	0
-79	883	794	459	308	159	82	61	45	27	8	3	3	1	0	0
-78	994	890	761	388	231	90	63	46	27	9	4	3	1	0	0
-77	1318	986	848	682	303	138	65	50	28	10	4	3	1	0	0
-76	1421	1295	935	761	375	203	67	50	28	10	4	3	1	0	0
-75	1737	1390	1235	840	660	267	90	51	32	10	6	4	2	0	0
-74	1835	1694	1320	1133	731	331	120	51	33	11	6	4	3	1	0
-73	2150	1788	1603	1210	802	603	149	67	33	11	6	4	3	1	0
-72	2251	2095	1687	1271	1086	646	177	92	34	15	6	4	3	1	0
-71	2565	2188	1770	1561	1156	687	315	118	34	15	6	4	3	1	0
-70	2664	2494	2067	1637	1201	647	344	142	50	16	7	5	3	1	0
-69	2980	2585	2150	1712	1325	666	368	276	72	16	7	6	3	1	0
-68	3070	2676	2445	2004	1345	684	505	296	93	16	8	6	3	1	0
-67	3381	2962	2526	2051	1364	810	533	321	113	17	9	6	3	1	0
-66	3478	3048	2590	2156	1491	827	560	345	130	28	9	6	4	1	0
-65	3799	3368	2721	2054	1508	842	587	369	259	45	9	6	4	1	0
-64	3933	3421	2740	2071	1403	857	724	502	280	86	9	6	4	1	0
-63	4043	3473	2867	2197	1527	979	750	525	300	92	9	7	4	1	0
-62	4393	3488	2884	2213	1541	1002	777	548	320	97	9	7	4	1	0
-61	4491	3562	2779	2227	1555	1032	799	571	339	102	9	7	4	1	0
-60	4839	3887	2921	2350	1676	1170	934	703	485	107	13	10	7	5	0
-59	4808	3957	2987	2241	1687	1199	960	756	491	101	13	10	8	5	0
-58	5134	3904	3050	2252	1576	1227	985	763	497	94	14	10	8	5	0
-57	5205	4223	3363	2383	1585	1256	1010	769	502	88	14	10	8	5	0
-56	5275	4287	3301	2438	1702	1425	1035	775	373	81	14	10	8	5	0
-55	5473	4602	3359	2370	1710	1432	1163	769	364	73	14	10	8	5	0
-54	5538	4541	3667	2680	1716	1439	1047	758	371	66	14	10	8	5	0

AZ	ZA= 166	ZA= 167	ZA= 168	ZA= 169	ZA= 170	ZA= 171	ZA= 172	ZA= 173	ZA= 174	ZA= 175	ZA= 176	ZA= 177	ZA= 178	ZA= 179	ZA= 180
-53	5853	4600	3721	2725	1759	1445	1035	747	362	67	14	10	8	5	0
-52	5798	4911	3652	2767	1796	1421	1022	735	352	68	15	10	8	5	0
-51	5849	4959	3921	2808	1831	1309	1024	626	342	70	13	10	8	6	0
-50	6122	4852	3958	2922	1865	1293	1010	630	331	71	14	9	9	6	0
-49	6162	5121	3992	2954	2092	1277	996	618	321	72	15	9	9	6	0
-48	6058	5157	4115	2984	2036	1295	884	605	228	73	17	8	9	6	0
-47	6325	5048	4146	3244	2065	1321	869	592	217	74	18	8	9	6	0
-46	6358	5311	4174	3150	2094	1249	869	578	205	75	18	7	9	6	0
-45	6248	5340	4291	3179	2316	1273	853	467	193	92	19	7	9	6	0
-44	6472	5225	4316	3207	2253	1296	837	468	181	85	20	7	9	6	0
-43	6320	5481	4339	3340	2277	1523	723	454	169	86	21	7	9	6	0
-42	6309	5504	4235	3364	2299	1543	706	439	156	87	21	7	9	6	0
-41	6421	5382	4491	3387	2514	1465	725	424	163	88	29	6	9	6	0
-40	6253	5600	4514	3407	2447	1483	741	311	163	88	29	6	9	6	0
-39	6268	5614	4535	3534	2465	1705	756	295	164	89	30	6	9	6	0
-38	6542	5527	4660	3551	2481	1720	673	294	165	90	22	6	9	7	0
-37	6531	5540	4677	3566	2604	1638	686	278	166	90	22	6	8	7	0
-36	6571	5764	4692	3456	2617	1651	698	261	166	98	23	6	8	7	0
-35	6693	5649	4581	3699	2629	1663	913	244	159	99	23	6	8	7	0
-34	6701	5656	4592	3710	2640	1674	825	235	159	99	24	6	8	7	0
-33	6706	5661	4828	3594	2543	1790	834	235	176	100	24	5	8	7	0
-32	6585	5752	4707	3601	2764	1799	841	235	176	100	24	5	8	7	0
-31	6799	5754	4708	3606	2771	1806	848	248	176	100	24	5	8	7	0
-30	6674	5628	4583	3716	2674	1715	825	260	170	92	23	5	7	7	0
-29	6671	5626	4794	3718	2679	1719	1051	277	169	92	24	5	7	7	0
-28	6666	5834	4790	3717	2683	1723	1071	293	168	92	32	5	7	7	0
-27	6821	5691	4660	3591	2685	1929	1090	309	167	92	32	5	7	7	0
-26	6846	5698	4652	3587	2793	1911	1079	324	166	92	32	5	7	7	0
-25	6795	5649	4643	3582	2793	1930	1096	321	165	108	32	5	7	7	0
-24	6815	5668	4514	3659	2791	1948	1112	334	152	108	32	5	7	7	0
-23	6759	5684	4801	3660	2774	1965	1127	347	150	102	32	5	7	7	0
-22	7039	5890	4741	3660	2791	1952	1112	359	148	101	24	4	7	7	0
-21	6979	5902	4753	3658	2808	1966	1125	537	146	100	23	4	7	7	0
-20	6990	5839	4762	3672	2794	1980	1342	533	143	99	23	4	7	7	0
-19	6998	5847	4697	3684	2808	2168	1353	543	129	98	23	4	6	8	0
-18	6931	5780	4702	3650	3025	2179	1334	552	127	96	22	4	6	8	0
-17	6935	5784	4633	3925	3009	2190	1343	560	125	86	22	4	6	8	0
-16	6864	6050	4899	3934	3018	2170	1352	555	123	85	21	4	6	8	0
-15	7128	5977	4899	3914	3027	2178	1359	563	121	83	21	3	6	8	0
-14	7052	5974	4823	3928	3006	2185	1336	570	105	81	20	3	6	8	0
-13	7047	5896	4819	3919	3012	2191	1342	577	103	79	20	3	6	8	0
-12	6966	5889	4831	3929	3017	2167	1346	568	101	77	20	3	6	8	0
-11	6956	5808	4834	3938	2989	2171	1349	573	99	56	20	3	6	8	0
-10	6872	5797	4836	3914	2991	2174	1323	576	97	54	19	3	5	8	0
-9	6857	5783	4796	3918	2992	2147	1324	580	81	51	19	2	5	8	0
-8	6768	5695	4804	3920	2961	2147	1324	567	79	48	18	2	5	8	0
-7	6749	5678	4797	3893	2959	2147	1306	568	76	46	14	2	5	8	0
-6	6655	5672	4800	3893	2956	2117	1305	569	74	43	13	2	5	8	0
-5	6632	5665	4802	3863	2921	2115	1304	569	71	25	13	2	5	8	0
-4	6534	5622	4779	3860	2916	2111	1302	553	55	22	12	2	5	8	0
-3	6506	5625	4775	3855	2909	2078	1275	551	53	19	11	2	5	8	0
-2	6476	5609	4749	3822	2871	2072	1270	549	50	17	11	2	5	8	0

AZ	ZA= 166	ZA= 167	ZA= 168	ZA= 169	ZA= 170	ZA= 171	ZA= 172	ZA= 173	ZA= 174	ZA= 175	ZA= 176	ZA= 177	ZA= 178	ZA= 179	ZA= 180
-1	6461	5607	4742	3814	2862	2065	1265	546	47	14	10	1	5	8	0
0	6602	5828	4734	4061	3049	2263	1438	701	45	11	10	0	5	8	0
1	6429	5657	4788	3864	2909	2108	1312	587	91	59	8	1	5	7	0
2	6434	5669	4802	3877	2922	2119	1325	596	99	66	9	1	5	7	0
3	6451	5712	4855	3926	2976	2129	1338	605	107	73	10	1	5	7	0
4	6453	5720	4866	3935	2986	2177	1402	612	114	80	11	1	5	7	0
5	6467	5759	4926	3943	2996	2185	1412	660	160	87	13	1	5	7	0
6	6465	5765	4936	3989	3046	2191	1421	665	168	134	14	1	5	7	0
7	6477	5800	4944	3993	3053	2263	1429	671	176	141	15	1	5	7	0
8	6472	5802	4995	4037	3059	2271	1509	675	183	148	23	1	5	7	0
9	6480	5835	4999	4039	3106	2278	1518	719	191	155	24	1	5	7	0
10	6471	5833	5048	4039	3109	2341	1525	722	236	162	25	1	5	7	0
11	6501	5830	5048	4070	3111	2347	1594	724	244	169	25	1	5	7	0
12	6495	5878	5047	4068	3151	2352	1599	725	251	190	26	1	5	7	0
13	6522	5875	5090	4064	3151	2414	1603	765	258	194	26	1	5	7	0
14	6515	5920	5085	4093	3149	2421	1605	764	266	199	26	2	5	6	0
15	6546	5915	5124	4085	3185	2428	1670	763	311	203	50	2	5	6	0
16	6432	5962	5116	4123	3180	2434	1670	761	318	207	51	2	5	6	0
17	6464	5808	4859	4113	3174	2501	1670	798	325	211	52	2	5	6	0
18	6464	5808	4893	3858	3242	2505	1668	796	332	233	53	2	5	6	0
19	6496	5853	4879	3889	3075	2508	1728	794	339	236	54	2	5	6	0
20	6494	5851	4909	3874	3078	2413	1724	790	387	238	54	2	5	6	0
21	6491	5894	4892	3858	3142	2414	1496	822	394	241	55	2	5	6	0
22	6476	5889	4873	4026	3142	2414	1490	649	401	243	55	2	5	6	0
23	6309	5762	5083	4041	3141	2476	1546	643	408	246	73	2	5	6	0
24	6298	5750	4886	4054	3187	2474	1537	636	379	266	73	2	5	6	0
25	6273	5738	4983	4022	3189	2472	1528	628	410	265	73	2	5	6	0
26	6274	5758	4973	4043	3189	2468	1517	655	412	216	73	2	5	6	0
27	6252	5745	4961	4062	3141	2526	1568	646	414	215	73	2	5	6	0
28	6130	5750	5017	4122	3154	2294	1555	636	416	214	73	2	5	6	0
29	6111	5618	5003	4108	3165	2278	1541	625	418	213	31	1	5	6	0
30	6092	5603	4785	4093	3175	2261	1304	614	419	211	30	1	6	6	0
31	6092	5594	4835	3936	3236	2339	1380	628	439	227	54	1	5	3	0
32	5949	5574	4816	3918	3218	2324	1367	586	437	225	54	1	6	3	0
33	5947	5452	4866	3897	3016	2309	1353	587	435	223	53	1	6	3	0
34	5924	5431	4636	3941	3079	2188	1338	588	385	221	53	2	6	3	0
35	5899	5410	4611	3918	3065	2177	1462	630	382	219	52	2	6	3	0
36	5762	5405	4661	3719	3049	2165	1272	637	396	216	51	2	6	3	0
37	5732	5269	4636	3777	3033	2151	1271	642	393	196	50	2	6	3	0
38	5715	5245	4608	3760	2916	2232	1268	648	390	195	49	2	6	3	0
39	5562	5217	4484	3742	2899	2216	1350	561	387	193	65	2	6	3	0
40	5529	5187	4462	3621	2881	2004	1337	557	383	192	64	2	6	3	0
41	5509	4958	4440	3600	2945	1987	1323	663	379	190	62	2	6	3	0
42	5353	4921	4232	3578	2741	2056	1192	666	345	188	23	2	5	3	0
43	5318	4870	4198	3554	2719	2035	1187	669	341	186	22	2	5	2	0
44	5296	4634	4149	3428	2697	1834	1269	671	336	184	20	2	5	2	0
45	5075	4593	4100	3402	2756	1813	1263	575	332	199	18	2	5	2	0
46	5029	4539	3879	3375	2548	1792	1257	691	327	162	16	2	5	2	0
47	4969	4299	3827	3356	2521	1856	1157	693	323	160	14	2	5	2	0
48	4725	4256	3774	3124	2494	1832	1154	694	318	157	13	2	5	2	0
49	4675	4197	3550	3075	2548	1713	1248	694	273	154	30	3	3	2	0
50	4612	3955	3496	3025	2335	1705	1245	694	267	152	28	3	3	2	0

AZ	ZA= 166	ZA= 167	ZA= 168	ZA= 169	ZA= 170	ZA= 171	ZA= 172	ZA= 173	ZA= 174	ZA= 175	ZA= 176	ZA= 177	ZA= 178	ZA= 179	ZA= 180
51	4393	3935	3440	2825	2304	1696	1242	568	260	149	26	3	3	2	0
52	4334	3880	3231	2779	2272	1770	1102	641	254	146	5	3	2	2	0
53	4310	3661	3208	2732	2239	1632	1092	630	247	143	4	3	2	2	0
54	4094	3610	3162	2684	2116	1617	1081	618	240	99	4	3	2	1	0
55	4039	3593	2952	2475	2087	1601	1144	606	170	93	4	4	2	1	0
56	3854	3378	2904	2465	2058	1585	1002	465	160	87	3	4	2	1	0
57	3797	3325	2889	2420	1904	1514	984	451	186	81	3	2	2	1	0
58	3738	3109	2676	2258	1873	1494	966	435	179	75	3	2	2	1	0
59	3516	3087	2626	2224	1876	1472	947	420	172	69	2	2	2	1	0
60	3422	3031	2574	2224	1845	1450	927	478	165	62	2	2	1	1	0
61	3184	2812	2406	2064	1688	1303	782	334	122	36	2	2	2	1	0
62	3108	2754	2400	2028	1655	1279	834	318	118	31	2	2	2	1	0
63	2869	2580	2360	1991	1622	1288	813	302	114	26	2	2	2	1	0
64	2769	2528	2195	1829	1464	1133	791	285	110	21	2	2	2	1	0
65	2692	2476	2154	1791	1463	1102	643	218	106	19	2	2	1	1	0
66	2471	2275	1951	1787	1429	1071	620	209	75	15	2	2	1	1	0
67	2398	2214	1916	1592	1268	1039	596	200	89	10	2	2	1	1	0
68	2177	1978	1860	1547	1233	882	572	190	85	10	1	1	1	1	0
69	2081	1910	1654	1357	1196	849	414	188	81	9	1	1	1	1	0
70	1859	1842	1596	1305	1000	816	469	164	77	9	1	1	1	1	0
71	1786	1626	1389	1252	957	666	443	159	72	9	1	1	1	1	0
72	1563	1557	1331	1049	926	627	287	153	72	9	1	1	1	1	0
73	1489	1340	1272	1005	728	588	264	147	73	5	1	1	1	1	0
74	1266	1271	1074	951	679	408	242	145	73	5	1	1	1	1	0
75	1191	1030	1014	747	630	364	219	146	74	4	1	1	1	1	0
76	983	961	805	692	431	319	184	146	73	4	1	1	0	1	0
77	918	763	744	637	381	274	179	147	74	4	1	1	0	1	0
78	721	698	684	432	330	216	175	121	74	4	1	1	0	1	0
79	656	633	474	376	258	204	170	119	75	3	1	1	0	0	0
80	459	436	412	297	245	193	137	116	75	3	1	0	0	0	0
81	393	376	320	283	232	141	129	114	60	3	1	0	0	0	0
82	292	308	302	269	181	130	121	84	59	3	1	0	0	0	0
83	273	290	237	217	169	120	84	77	58	3	0	0	0	0	0
84	216	226	217	202	156	82	76	70	57	3	0	0	0	0	0
85	197	205	197	135	104	73	68	63	57	1	0	0	0	0	0
86	140	136	129	119	91	65	60	28	20	1	0	0	0	0	0
87	118	114	109	102	78	27	24	21	15	0	0	0	0	0	0
88	48	44	41	37	23	18	16	14	10	0	0	0	0	0	0
89	24	22	20	19	12	9	8	7	5	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

DISR Thermistor Locations



DISR Thermal Nodes

T08 - IR Chip (Reads 10C warm) - on IR chip
T09 - CCD Lug - on bolt which attaches CCD
T10 - Strap - at union of thermal straps
T11 - Optics - on Fiber optic conduit
T12 - Aux Board - SH Elect. Board w/ 2Watt heater
T13 - SH Box - On Inside of SH Box
T14 - EA Box - On EA Motherboard
T15 - CCD Chip - ON CCD Chip
T16 - VioleT - On front of optical Benc

Appendix 24 - Dark Current Data Set Summary.

The dark datasets consist of two columns of data (2 x 256 entries) which are made up of: 1) the row sum of accumulated DN in covered CCD columns 7 + 8, and 2) the row sum of accumulated DN in covered CCD columns 9 + 10 over the indicated exposure time. Ergo valid magnitudes are from 0 to 8190 DN.

The dark current is comprised of 4 components; the Image Zone Dark Current (R_I), which accumulates during the exposure; the Memory Zone Dark Current (R_M) which accumulates while the image is waiting under the covered section of the CCD to be read-out, the Serial Register Dark Current (R_S), which occurs as the row is being clocked-out, and an electronics offset (*O*) of about 8.9 DN:

$$DN = O + R_s + R_M \Delta t_M + R_I \Delta t_I , \qquad \text{(Equation A24-1)}$$

where:

DN is dark current contribution to the observed signal,

O is the electronics offset (about 8.9 DN during calibration),

R_s, R_M, and R_I are the dark current generation rates in the serial register, memory zone, and image zone, respectively, &

Δt_M and Δt_I are the residence times in the memory zone and image zone, respectively.

R_s, R_M, and R_I are functions of detector temperature.

The electronics plus serial register offset is derived by scaling from the full frame mode (Image) data using:

$$(Serial\_Register + Bias)_{SPECTRA} = ((Serial\_Register + Bias_{FULL} - 8.9) * 0.992/8.384) + 8.9 \qquad \text{(Equation A24-2)}$$

Here 8.9 DN is the best estimate of the electronic bias. The estimate is made from prelaunch calibration data at temperatures so cold that the serial register dark current is negligible. 0.992/8.384 is the ratio of the pixel lifetime within the serial register in the Spectra readout mode to that in the Full readout mode. It takes 2159 ms to shift the data through the CCD memory zone in Full Readout mode, and 263 ms in Spectral Readout mode (ref 7).

The full frame bias was determined from the Image dataset's null pixel data per:

$$(Serial\_Register + Bias)_{FULL} = ((NullPixel2 / 4.0 + 0.125) + (NullPixel3 / 4.0 + 0.125)) / 2.0 \qquad \text{(Equation A24-3)}$$

The results are fit with a temperature dependent exponential thusly:

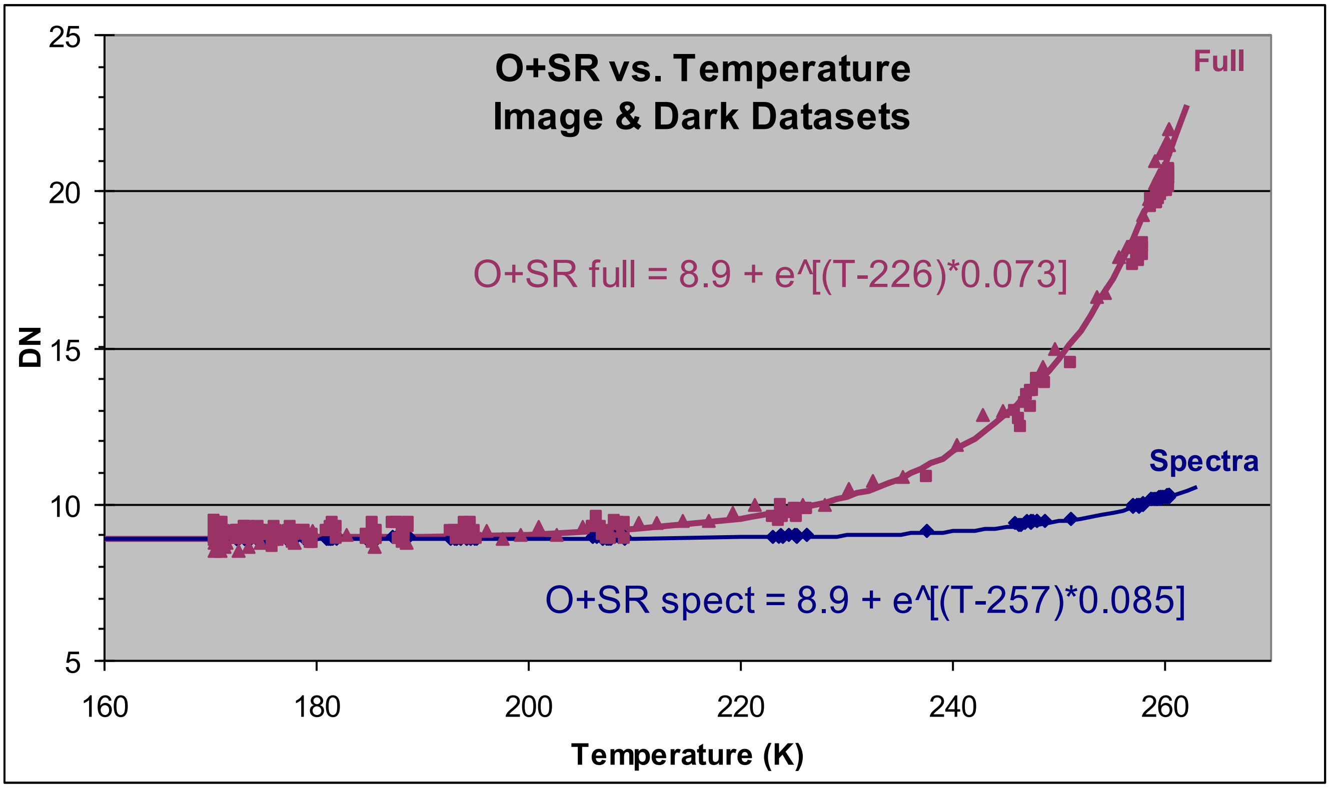


Figure A25.1 - Curve fit of the electronics bias plus serial register dark data collected in full read mode (Image and Dark datasets) during the Titan descent, along with the same data scaled by serial register dwell time for use with spectral mode datasets (ULVS, DLVS, & SA).

The average dark current generation rate is then calculated by removing O+SR from the per-pixel average dark dataset reading and dividing the result by the average memory zone dwell time (half of 2160 ms) plus the exposure time:

D = Dark / (2.160 / 2.0 + exp / 1000.0)   in DN/sec

The result is plotted against temperature and fit with an exponential:

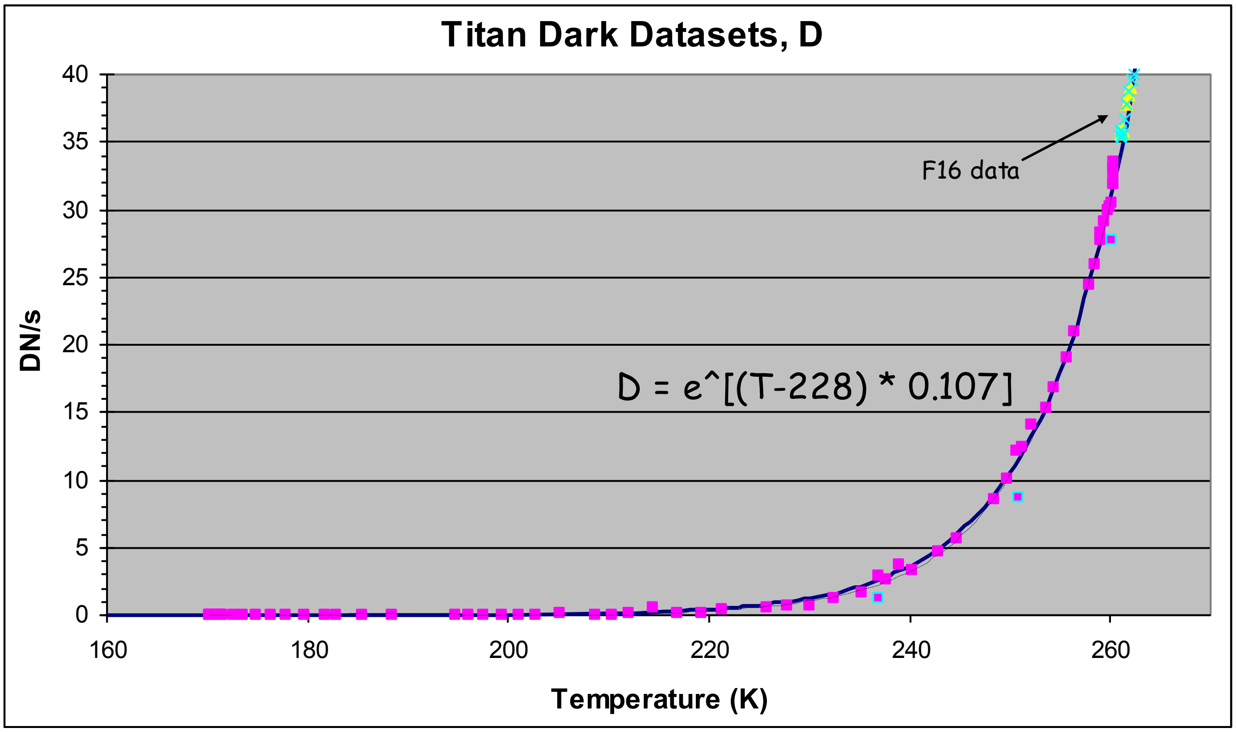


Figure A25.2 - Average dark current rate (D) for the DISR CCD during the Titan descent by temperature.

Saturation of the CCD instruments by the Surface Science Lamp light obstructs determination of the dark current after landing, however the temperatures are low enough during this period of operation that the dark current can be neglected for datasets collected on Titan's surface.

The following table summarizes the DISR Dark Datasets from the Titan descent:

1) Table line number
2) Data set index corresponding to number in filename.
3) Mission time in seconds after T0 (parachute deploy)
4) Altitude at start of observation
5 CCD chip temperature in degrees Kelvin
6) Exposure Time in milliseconds
7) The average and maximum of the row sum of covered CCD columns 7 & 8.
8) The average and maximum of the row sum of covered CCD columns 9 & 10.
9) Indicates that at least one of the pixel pairs in the column is saturated.
10) Condition of the DISR lamps, 0=off, 1=on, The order is Cal1,Cal2,Cal3,SSL
11) Calculated value for electronics offset plus serial register dark current scaled from full mode ($O+SR = 8.9+e^{[(T-226)*0.073]}$)
12) Per pixel average of Dark Dataset with O+SR removed (i.e. {[Mean(cols 7&8) + Mean(cols 9&10)] / 4} - O+SR).
13) Average covered column dark current rate, D in DN/s (with O+SR removed).
    D = Dark/(2.159 / 2 + exp. time)   i.e. 2.16 ms to empty memory zone.

1	2	3	4	5	6	7		8		9	10	11	12	13
Line	Set #	Time (sec)	Altitude (km)	Temp. (K)	Exp. (ms)	Cols 7 & 8 Mean	Max.	Cols 9 & 10 Mean	Max.	*	Lamp	O+SR (DN)	Dark (DN)	D DN/s
1	1	190.59	140.343	259.1	10	102.3	165	101.3	168		0000	20.1	30.8	28.3
2	2	292.53	135.445	259.7	10	107.2	174	105.6	175		0000	20.6	32.6	29.9
3	3	480.27	127.109	260.3	10	112.3	186	111.1	185		0000	21.1	34.7	31.9
4	4	596.97	122.385	260.4	10	113.5	188	112.5	188		0000	21.2	35.3	32.4
5	5	710.07	118.023	260.4	15	116.3	189	115.2	192		1110	21.2	36.7	33.5
6	6	760.97	116.166	260.2	0	101.8	178	101.9	178		0000	21.0	29.9	27.7
7	7	777.53	115.587	260.4	15	115.6	188	114.3	188		0000	21.2	36.2	33.1
8	8	819.08	114.089	260.4	15	115.3	190	113.7	191		1110	21.2	36.0	32.9
9	9	855.08	112.838	260.3	10	112.3	208	110.9	218		0000	21.1	34.7	31.8
10	10	1,001.02	105.208	260.2	10	109.0	179	108.3	179		0000	21.0	33.3	30.5
11	11	1,059.32	100.948	260	10	108.0	177	106.9	178		0000	20.9	32.9	30.1
12	12	1,163.42	93.936	259.5	10	104.5	174	104.2	174		0000	20.4	31.7	29.1
13	13	1,243.26	89.055	259.1	10	100.8	164	100.7	168		0000	20.1	30.3	27.8
14	14	1,343.02	83.584	258.5	10	95.8	155	96.1	158		0000	19.6	28.3	26.0
15	15	1,424.23	79.516	258	10	91.6	150	91.8	148		0000	19.2	26.6	24.4
16	16	1,566.54	73.203	256.5	10	81.9	129	81.9	130		0000	18.2	22.8	20.9
17	17	1,648.12	69.983	255.6	10	76.5	121	76.7	122		0000	17.6	20.7	19.0
18	18	1,740.97	66.741	254.3	10	70.4	109	70.4	110		0000	16.8	18.4	16.9
19	19	1,803.76	64.755	253.6	10	65.9	102	66.2	102		0000	16.4	16.6	15.3
20	20	1,896.19	62.114	252.1	15	62.0	92	62.3	92		1110	15.6	15.4	14.1
21	21	1,954.36	60.602	251.2	15	57.9	85	57.5	86		0000	15.2	13.6	12.5
22	22	1,959.64	60.470	250.8	0	48.6	78	48.8	78		0000	15.0	9.3	8.7

Line	Set #	Time (sec)	Altitude (km)	Temp. (K)	Exp. (ms)	Cols 7 & 8 Mean	Max.	Cols 9 & 10 Mean	Max.	*	Lamp	O+SR (DN)	Dark (DN)	D DN/s
23	23	1,988.17	59.758	250.6	15	56.0	81	56.8	82		1110	14.9	13.3	12.1
24	24	2,031.64	58.709	249.7	10	51.0	75	51.3	76		0000	14.5	11.0	10.1
25	25	2,108.68	56.950	248.4	10	46.4	66	46.8	69		0000	14.0	9.3	8.5
26	26	2,270.27	53.577	244.8	10	38.0	53	38.1	53		0000	12.8	6.2	5.7
27	27	2,350.76	52.034	242.9	10	35.0	46	34.7	46		0000	12.3	5.1	4.7
28	28	2,456.06	50.121	240.3	10	30.8	39	30.6	39		0000	11.7	3.6	3.3
29	29	2,506.82	49.241	239	15	31.1	39	30.9	39		1110	11.5	4.0	3.7
30	30	2,559.56	48.345	237.6	15	28.5	36	28.1	35		0000	11.2	2.9	2.7
31	31	2,566.45	48.230	237	0	25.0	33	24.8	33		0000	11.1	1.3	1.2
32	32	2,586.02	47.907	236.9	15	28.7	35	28.6	34		1110	11.1	3.2	2.9
33	33	2,647.52	46.912	235.2	10	25.2	31	25.5	31		0000	10.9	1.8	1.7
34	34	2,749.83	45.330	232.5	10	23.9	28	23.8	28		0000	10.5	1.4	1.3
35	35	2,835.74	44.059	230.1	10	22.3	25	21.8	25		0000	10.2	0.8	0.7
36	36	2,916.52	42.912	227.9	10	21.7	25	21.7	24		0000	10.0	0.8	0.7
37	37	2,998.24	41.796	225.8	10	20.9	24	20.9	24		0000	9.9	0.6	0.5
38	38	3,156.73	39.726	221.4	10	20.0	22	20.0	22		0000	9.6	0.4	0.4
39	39	3,241.71	38.667	219.2	10	19.2	21	19.5	22		0000	9.5	0.2	0.2
40	40	3,328.19	37.627	216.9	10	19.0	21	19.2	21		0000	9.4	0.1	0.1
41	41	3,426.96	36.479	214.5	10	20.5	256	19.1	42		0000	9.3	0.6	0.5
42	42	3,521.71	35.413	212.1	10	18.8	20	18.8	21		0000	9.3	0.1	0.1
43	43	3,600.57	34.555	210.3	10	18.7	20	18.1	20		0000	9.2	0.0	0.0
44	44	3,668.34	33.839	208.7	10	18.3	20	18.3	20		0000	9.2	0.0	0.0
45	45	3,835.15	32.130	205.1	10	18.6	83	18.2	20		0000	9.1	0.1	0.1
46	46	3,939.30	31.108	202.7	10	18.0	20	17.5	19		0000	9.1	-0.2	0.0
47	47	4,024.85	30.294	201	10	17.8	20	18.1	20		0000	9.1	-0.1	0.0
48	48	4,114.04	29.461	199.3	10	18.0	19	17.8	19		0000	9.0	-0.1	0.0
49	49	4,205.51	28.628	197.5	10	17.8	19	17.3	20		0000	9.0	-0.3	0.0
50	50	4,283.51	27.936	196	10	17.5	19	17.9	20		0000	9.0	-0.2	0.0
51	51	4,352.79	27.331	194.8	10	17.5	19	17.3	19		0000	9.0	-0.3	0.0
52	52	4,871.32	23.090	188.5	10	17.8	19	17.2	19		0000	9.0	-0.2	0.0
53	53	5,211.55	20.549	185.5	10	17.3	19	17.3	19		0000	9.0	-0.3	0.0
54	54	5,579.35	17.980	182.9	10	18.0	19	17.8	19		0000	8.9	0.0	0.0
55	55	5,741.45	16.896	181.8	10	17.8	19	17.4	19		0000	8.9	-0.1	0.0
56	56	6,082.15	14.703	179.7	10	17.9	19	17.3	18		0000	8.9	-0.1	0.0
57	57	6,431.51	12.575	177.9	10	17.1	18	17.3	19		0000	8.9	-0.3	0.0
58	58	6,763.93	10.651	176.3	10	17.4	19	17.4	19		0000	8.9	-0.2	0.0
59	59	7,089.02	8.839	174.8	10	17.1	19	17.0	19		0000	8.9	-0.4	0.0
60	60	7,412.09	7.104	173.6	10	17.2	19	17.0	19		0000	8.9	-0.4	0.0
61	61	7,721.67	5.498	172.6	10	17.0	19	17.4	19		0000	8.9	-0.3	0.0
62	62	8,095.28	3.642	171.6	10	17.2	21	17.0	19		0000	8.9	-0.4	0.0
63	63	8,222.76	3.025	171.4	10	17.0	19	17.1	19		0000	8.9	-0.4	0.0
64	64	8,231.76	2.982	171.3	10	17.5	19	17.5	19		0000	8.9	-0.2	0.0

Line	Set #	Time (sec)	Altitude (km)	Temp. (K)	Exp. (ms)	Cols 7 & 8 Mean	Max.	Cols 9 & 10 Mean	Max.	*	Lamp	O+SR (DN)	Dark (DN)	D DN/s
65	65	8,271.38	2.790	171.3	10	17.0	19	16.7	18		0000	8.9	-0.5	0.0
66	66	8,280.57	2.746	171.3	10	16.7	18	16.9	18		0000	8.9	-0.5	0.0
67	67	8,320.50	2.556	171	10	17.8	19	17.5	19		0000	8.9	-0.1	0.0
68	68	8,329.69	2.512	171.1	10	17.5	19	17.6	19		0000	8.9	-0.1	0.0
69	69	8,369.00	2.325	171	10	18.1	148	17.6	140		0000	8.9	0.0	0.0
70	70	8,378.19	2.281	171	10	17.0	18	17.0	19		0000	8.9	-0.4	0.0
71	71	8,417.38	2.097	170.9	10	17.6	19	17.2	19		0000	8.9	-0.2	0.0
72	72	8,426.54	2.054	170.9	10	17.0	19	17.1	19		0000	8.9	-0.4	0.0
73	73	8,467.50	1.859	170.9	10	17.5	19	17.5	19		0000	8.9	-0.2	0.0
74	74	8,476.43	1.817	170.9	10	17.7	19	17.7	20		0000	8.9	-0.1	0.0
75	75	8,516.38	1.630	170.8	10	17.4	21	17.0	26		0000	8.9	-0.3	0.0
76	76	8,525.33	1.589	170.8	10	17.5	19	17.4	19		0000	8.9	-0.2	0.0
77	77	8,565.63	1.403	170.8	10	17.0	18	16.6	18		0000	8.9	-0.5	0.0
78	78	8,574.64	1.361	170.5	10	17.9	20	17.4	19		0000	8.9	-0.1	0.0
79	79	8,614.25	1.175	170.7	10	17.2	19	16.7	18		0000	8.9	-0.4	0.0
80	80	8,623.32	1.132	170.7	10	16.7	18	17.5	19		0000	8.9	-0.4	0.0
81	81	8,664.03	0.942	170.5	10	17.4	19	17.2	19		0000	8.9	-0.3	0.0
82	82	8,673.15	0.900	170.5	10	17.4	19	17.5	19		0000	8.9	-0.2	0.0
83	83	8,712.03	0.719	170.4	10	17.3	19	17.3	19		0000	8.9	-0.3	0.0
84	84	8,721.30	0.676	170.4	10	17.0	19	16.9	18		0000	8.9	-0.5	0.0
85	85	8,762.38	0.487	170.4	10	17.0	18	17.0	19		0001	8.9	-0.4	0.0
86	86	8,771.69	0.445	170.4	10	18.0	20	17.4	19		0001	8.9	-0.1	0.0
87	89	8,817.59	0.237	170.3	35	17.7	19	17.8	19		0001	8.9	0.0	0.0
88	90	8,822.47	0.215	170.3	35	18.0	20	17.8	20		0001	8.9	0.0	0.0
89	91	9,032.18	0.000	170	10	165.6	8190	164.5	8190	*	0001	8.9	73.6	67.5
90	92	9,401.65	0.000	170.9	10	165.1	8190	164.0	8190	*	0001	8.9	73.4	67.3
91	93	9,716.98	0.000	172.2	10	166.3	8190	164.4	8190	*	0001	8.9	73.8	67.7
92	94	10,014.57	0.000	173.6	10	167.7	8190	165.8	8190	*	0001	8.9	74.4	68.3
93	95	10,340.91	0.000	175	10	167.2	8190	166.0	8190	*	0001	8.9	74.4	68.2
94	96	10,624.65	0.000	176.3	10	169.3	8190	167.5	8190	*	0001	8.9	75.3	69.0
95	97	10,945.39	0.000	177.7	10	168.7	8190	167.4	8190	*	0001	8.9	75.1	68.9
96	98	11,197.89	0.000	178.8	10	170.5	8190	168.6	8190	*	0001	8.9	75.9	69.6
97	99	11,486.18	0.000	180	10	171.4	8190	169.3	8190	*	0001	8.9	76.2	69.9
98	100	11,774.07	0.000	181.3	10	171.7	8190	169.2	8190	*	0001	8.9	76.3	70.0
99	102	12,344.45	0.000	183.5	10	172.9	8190	171.5	8190	*	0001	8.9	77.1	70.8
100	103	12,636.42	0.000	184.3	10	174.0	8190	171.6	8190	*	0001	8.9	77.4	71.1
101	104	12,878.37	0.000	185.1	10	174.1	8190	172.2	8190	*	0001	9.0	77.6	71.2

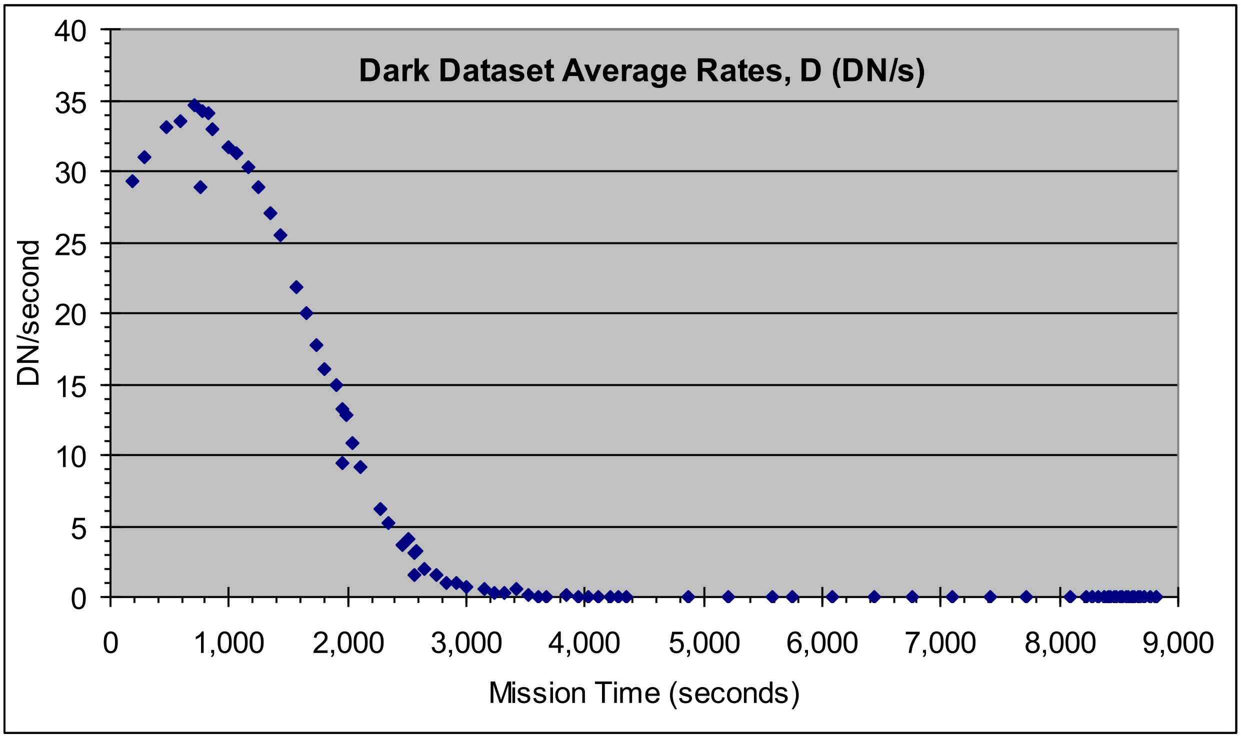
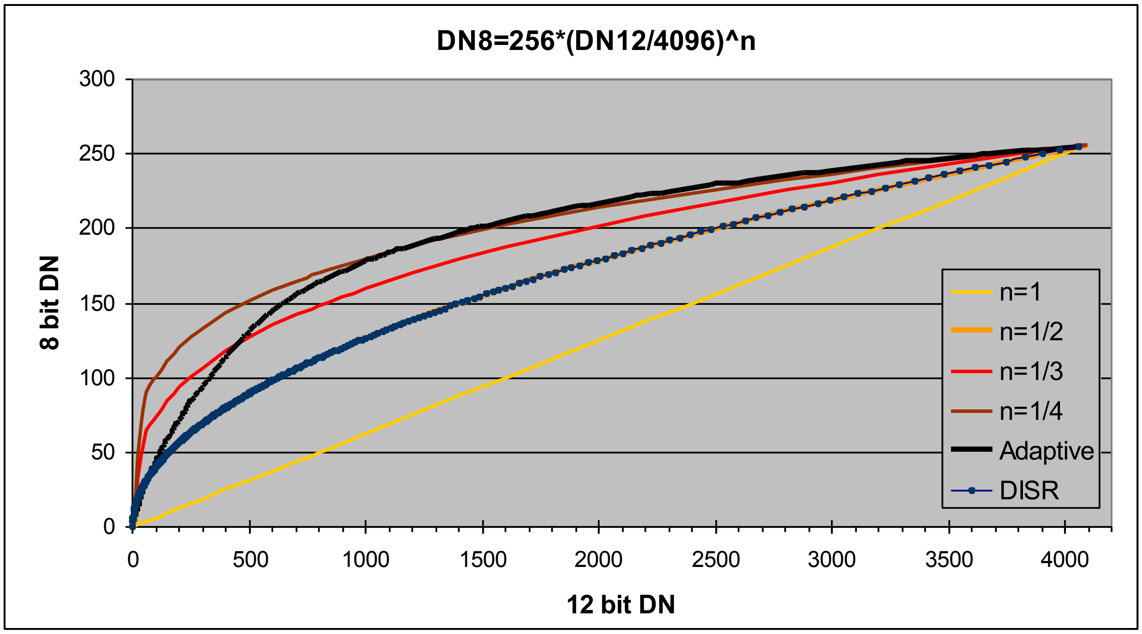


Figure - Average CCD dark current generation rate vs. mission time.

Appendix 25 - DISR "Square Root" 12 bit to 8 bit conversion tables.

This appendix presents a comparison of the DISR 12 bit to 8 bit conversion scheme with a power law conversion (8bitDN = A $12bitDN^{(1/n)}$) and typical Adaptive lookup table.



A comparison of the DISR 12 bit to 8 bit algorithm (dark blue), adaptive table (in black) and power law translation, f(x) = a $x^{(1/n)}$ for n = 1 thru 4.

12 low	12 high	12 ave	8 bit		12 low	12 high	12 ave	8 bit
0	0	0	0		123	125	124	51
1	1	1	1		126	128	127	52
2	3	2.5	2		129	131	130	53
4	5	4.5	3		132	134	133	54
6	7	6.5	4		135	137	136	55
8	9	8.5	5		138	141	139.5	56
10	11	10.5	6		142	145	143.5	57
12	13	12.5	7		146	149	147.5	58
14	15	14.5	8		150	153	151.5	59
16	17	16.5	9		154	157	155.5	60
18	19	18.5	10		158	161	159.5	61
20	21	20.5	11		162	165	163.5	62
22	23	22.5	12		166	169	167.5	63
24	25	24.5	13		170	173	171.5	64
26	27	26.5	14		174	177	175.5	65
28	29	28.5	15		178	181	179.5	66
30	31	30.5	16		182	185	183.5	67
32	33	32.5	17		186	189	187.5	68
34	35	34.5	18		190	193	191.5	69
36	37	36.5	19		194	197	195.5	70
38	39	38.5	20		198	201	199.5	71
40	41	40.5	21		202	205	203.5	72
42	43	42.5	22		206	209	207.5	73
44	45	44.5	23		210	213	211.5	74
46	47	46.5	24		214	217	215.5	75
48	49	48.5	25		218	221	219.5	76
50	51	50.5	26		222	225	223.5	77
52	53	52.5	27		226	229	227.5	78
54	56	55	28		230	233	231.5	79
57	59	58	29		234	237	235.5	80
60	62	61	30		238	241	239.5	81
63	65	64	31		242	245	243.5	82
66	68	67	32		246	249	247.5	83
69	71	70	33		250	253	251.5	84
72	74	73	34		254	257	255.5	85
75	77	76	35		258	262	260	86
78	80	79	36		263	267	265	87
81	83	82	37		268	272	270	88
84	86	85	38		273	277	275	89
87	89	88	39		278	282	280	90
90	92	91	40		283	287	285	91
93	95	94	41		288	292	290	92
96	98	97	42		293	297	295	93
99	101	100	43		298	302	300	94
102	104	103	44		303	307	305	95
105	107	106	45		308	312	310	96
108	110	109	46		313	317	315	97

111	113	112	47		318	322	320	98
114	116	115	48		323	327	325	99
117	119	118	49		328	332	330	100
120	122	121	50					

12 low	12 high	12 ave	8 bit		12 low	12 high	12 ave	8 bit
333	337	335	101		651	660	655.5	151
338	342	340	102		661	670	665.5	152
343	347	345	103		671	680	675.5	153
348	352	350	104		681	690	685.5	154
353	357	355	105		691	700	695.5	155
358	362	360	106		701	711	706	156
363	367	365	107		712	722	717	157
368	372	370	108		723	733	728	158
373	377	375	109		734	744	739	159
378	382	380	110		745	756	750.5	160
383	387	385	111		757	768	762.5	161
388	392	390	112		769	780	774.5	162
393	397	395	113		781	792	786.5	163
398	402	400	114		793	805	799	164
403	407	405	115		806	818	812	165
408	413	410.5	116		819	831	825	166
414	419	416.5	117		832	844	838	167
420	425	422.5	118		845	858	851.5	168
426	431	428.5	119		859	872	865.5	169
432	437	434.5	120		873	886	879.5	170
438	443	440.5	121		887	900	893.5	171
444	449	446.5	122		901	915	908	172
450	455	452.5	123		916	930	923	173
456	461	458.5	124		931	945	938	174
462	467	464.5	125		946	961	953.5	175
468	473	470.5	126		962	977	969.5	176
474	479	476.5	127		978	993	985.5	177
480	485	482.5	128		994	1010	1002	178
486	491	488.5	129		1011	1027	1019	179
492	497	494.5	130		1028	1044	1036	180
498	503	500.5	131		1045	1062	1053.5	181
504	509	506.5	132		1063	1080	1071.5	182
510	515	512.5	133		1081	1098	1089.5	183
516	522	519	134		1099	1117	1108	184
523	529	526	135		1118	1136	1127	185
530	536	533	136		1137	1156	1146.5	186
537	543	540	137		1157	1176	1166.5	187
544	550	547	138		1177	1196	1186.5	188
551	557	554	139		1197	1217	1207	189
558	565	561.5	140		1218	1238	1228	190
566	573	569.5	141		1239	1260	1249.5	191
574	581	577.5	142		1261	1282	1271.5	192

582	589	585.5	143		1283	1305	1294	193
590	597	593.5	144		1306	1328	1317	194
598	605	601.5	145		1329	1352	1340.5	195
606	614	610	146		1353	1376	1364.5	196
615	623	619	147		1377	1400	1388.5	197
624	632	628	148		1401	1425	1413	198
633	641	637	149		1426	1450	1438	199
642	650	646	150		1451	1476	1463.5	200

12 low	12 high	12 ave	8 bit		12 low	12 high	12 ave	8 bit
1477	1503	1490	201		3703	3794	3748.5	251
1504	1530	1517	202		3795	3867	3831	252
1531	1558	1544.5	203		3868	3941	3904.5	253
1559	1586	1572.5	204		3942	4017	3979.5	254
1587	1615	1601	205		4018	4095	4056.5	255
1616	1644	1630	206					
1645	1674	1659.5	207					
1675	1704	1689.5	208					
1705	1735	1720	209					
1736	1767	1751.5	210					
1768	1799	1783.5	211					
1800	1832	1816	212					
1833	1866	1849.5	213					
1867	1900	1883.5	214					
1901	1935	1918	215					
1936	1971	1953.5	216					
1972	2007	1989.5	217					
2008	2044	2026	218					
2045	2082	2063.5	219					
2083	2121	2102	220					
2122	2161	2141.5	221					
2162	2201	2181.5	222					
2202	2242	2222	223					
2243	2284	2263.5	224					
2285	2327	2306	225					
2328	2371	2349.5	226					
2372	2415	2393.5	227					
2416	2460	2438	228					
2461	2506	2483.5	229					
2507	2553	2530	230					
2554	2601	2577.5	231					
2602	2650	2626	232					
2651	2700	2675.5	233					
2701	2751	2726	234					
2752	2803	2777.5	235					
2804	2856	2830	236					
2857	2910	2883.5	237					
2911	2965	2938	238					

2966	3021	2993.5	239					
3022	3079	3050.5	240					
3080	3138	3109	241					
3139	3198	3168.5	242					
3199	3259	3229	243					
3260	3321	3290.5	244					
3322	3385	3353.5	245					
3386	3450	3418	246					
3451	3516	3483.5	247					
3517	3583	3550	248					
3584	3652	3618	249					
3653	3702	3677.5	250					

Appendix 26 - Dark Dataset information from the last in-flight checkout, F16

Dark datasets collected during the Titan descent do not have much variation in exposure time, particularly considering the 0 ms exposures are erroneous. That leaves only 10 ms and 15 ms exposures, which are not different enough to accurately measure the image zone dark current rate.

However, on November 23rd, 2004, about 2 months before the Titan encounter, the 16th in-flight checkout (F16) was run, which contained special commands designed to measure all components of the CCD dark current. A summary of this data is presented in figure A26.1.

The first 8200 seconds of data are from a simulated descent sequence. These data primarily have exposure times of 10 ms, although there are some measurements at 0 & 15 ms during the calibration cycles (which are indicated by Cx on the plot). Around 8200 seconds six 70 ms exposures were taken. From 9200 to 12700 seconds are a series of 0.5 ms and 1000 ms non-compressed (i.e. un-summed) exposures, designed to measure the image zone dark current. After this are a few darks collected during another small portion of a simulated descent. The positive slope of the data is due to the increasing temperature during the test.

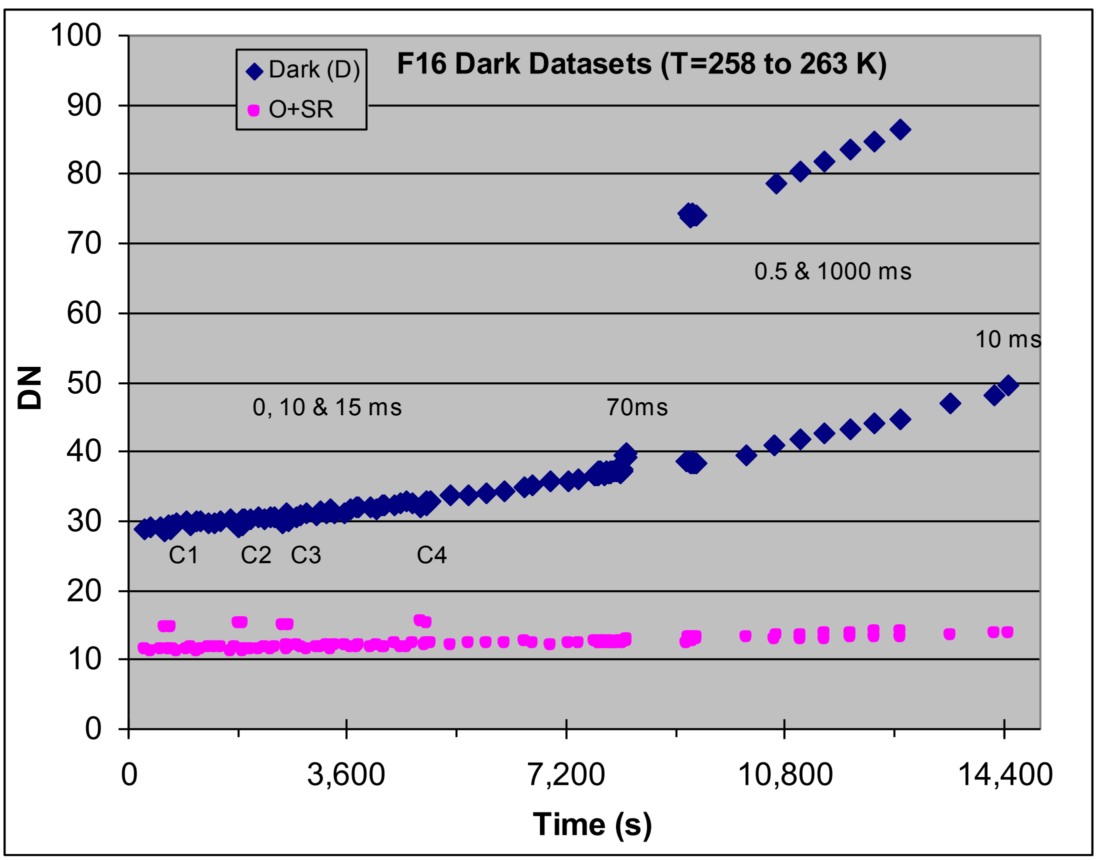


Figure A26.1 - A summary of the dark datasets taken during the 16th in-flight checkout on 23rd November 2004. Blue diamonds are the per-pixel average signal measured under the covered CCD columns with the electronics offset and serial register dark current removed. The red diamonds are the sum of the electronics offset plus the serial register dark current for each dataset.

A summary of the F16 dark data is presented in the table below.

Using the null pixel information from this data it is possible to calculate the bias plus serial register dark current (O+SR) for each measurement:

$$(Serial\_Register + Bias)_{FULL} = ((NullPixel2 / 4.0 + 0.125) + (NullPixel3 / 4.0 + 0.125)) / 2.0$$

The average image zone dark current (in DN/second) is then calculated using 0.5 ms and 1000 ms exposure pairs by:

Img Z = { [P1 - (O+SR)] - [P0 - (O+SR)] } / { (1000-0.5) / 1000 }

where:

P1 is the per-pixel average of the 1000 ms exposure (in DN), and
P0 is the per-pixel average of the 0.5 ms exposure (in DN).

and lastly the average memory zone dark current (in DN/second) is calculate from the 0.5 ms exposures using the knowledge of the Img Z and the average dwell time in the memory zone of 1.08 seconds:

Mem Z = { P0 - (O+SR) - (0.5/1000 * Img Z) } / 1.08

where:

P0 is the per-pixel average of the 0.5 ms exposure (in DN),
(O+SR) is the corresponding bias plus serial resister contribution for the dataset (in DN),
(0.5/1000 * Img Z) is the Image zone contribution for the dataset (in DN), and
1.08 is the average dwell time in the memory zone in seconds.

The results are plotted in figure A26.2. The first notable result is that the image and memory zone dark currents are quite similar. The second is that the difference between the 10 ms and 70 ms exposures are marginally sufficient to calculate the image zone dark current (points on the left of the plot), and significant noise results. The implication is that the difference between the 10 ms and 15 ms exposures during the Titan descent are not sufficient to determine image zone dark current. At 260º K, the dark current exhibits significant dependence on temperature, as seen by the positive slope of the data in the plot.

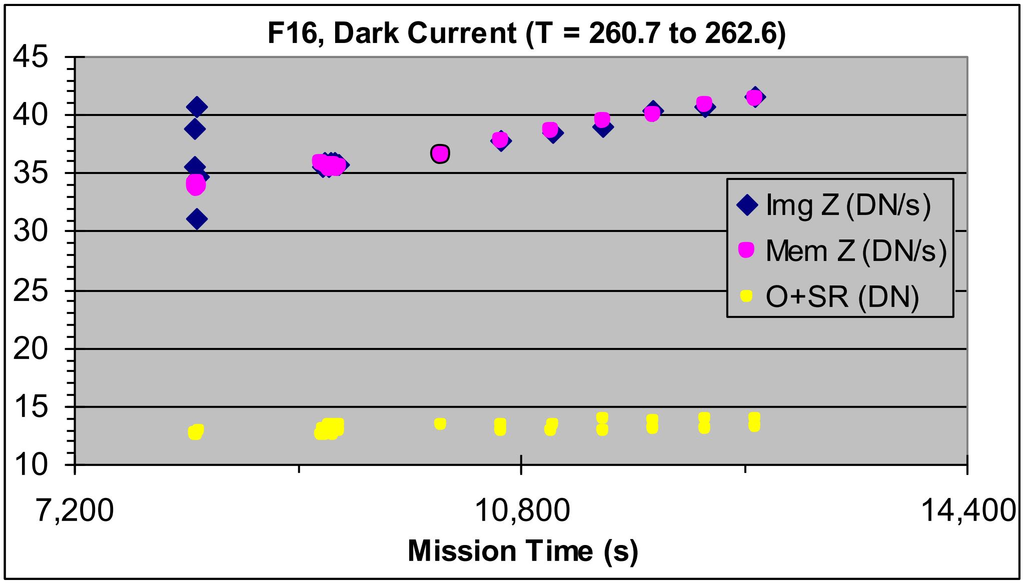


Figure A26.2 - A summary of the dark current measurements observed during the F16 in-flight test. Blue diamonds are the CCD image zone dark current calculations results in DN/s. Red dots are the CCD memory zone dark current results in DN/s, and the yellow dots are the calculated electronics bias plus serial register dark current for the dataset in DN.

F16 data summary table

1) Table entry number
2) Dataset number, corresponding to the number in the dataset file name
3) Mission time at beginning of observation in seconds after parachute deployment (T0)
4) CCD chip temperature at beginning of observation.
5) Exposure time of measurement in milliseconds
6) Number of columns in the data set. If "2" then only row summed data is available.
7) Column average of the sum of CCD columns 7 + 8.
8) Row maximum of the sum of CCD columns 7 + 8.
9) Column average of the sum of CCD columns 9 + 10.
10) Row maximum of the sum of CCD columns 9 + 10.
11) Condition of DISR lamps during observation (0 = off, 1 = on) for [Cal1, Cal2, Cal1, SSL]
12) Sum of electronics plus serial register offset calculated from null pixels (in DN).
13) Per-pixel average observe dark current with bias and serial register dark removed in DN.
14) Calculate Image Zone dark current using 0.5 & 1000 ms or 10 & 17 ms exposure pairs.
15) Calculated Memory Zone dark current using 0.5 ms & 70 ms exposures.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
#	Set #	Time (sec)	Temp (K)	Exp. (ms)	# Col	Cols 7+ 8 Mean	Max	Cols 9 + 10 Mean	Max.	Lamp	O+SR (DN)	Dark (DN)	Img Z (DN/s)	Mem Z (DN/s)
0	1	264	257.8	10	2	80.0	137	81.2	138	0000	11.5	28.8		
1	2	368.23	257.9	10	2	80.4	137	81.5	142	0000	11.4	29.1		
2	3	535.85	257.9	10	2	80.9	140	81.8	140	0000	11.5	29.2		
3	4	600.58	258.0	15	2	86.4	142	86.3	141	1110	14.8	28.4		
4	5	656.24	257.8	0	2	80.7	139	81.7	141	0000	11.6	29.0		
5	6	660.58	258.0	15	2	81.2	137	82.6	141	0000	11.6	29.3		
6	7	690.58	258.0	15	2	86.5	141	87.3	144	1110	14.8	28.7		
7	8	723.74	258.0	10	2	81.2	139	82.1	142	0000	11.5	29.3		
8	9	804.18	258.0	10	2	81.7	140	82.8	144	0000	11.4	29.8		
9	10	947.85	258.0	10	2	82.3	139	83.4	144	0000	11.5	29.9		
10	11	1021.52	258.1	10	2	81.6	139	83.5	142	0000	11.9	29.4		
11	12	1112.02	258.1	10	2	82.1	140	82.9	143	0000	11.4	29.9		
12	13	1199.44	258.1	10	2	82.8	143	83.7	143	0000	11.6	30.0		
13	14	1315.36	258.1	10	2	82.4	143	84.0	144	0000	11.9	29.7		
14	15	1409.54	258.1	10	2	82.2	140	84.1	147	0000	11.9	29.7		
15	16	1519.56	258.3	10	2	82.7	140	83.7	142	0000	11.8	29.9		
16	17	1663.44	258.3	10	2	82.5	141	83.7	143	0000	11.4	30.2		
17	18	1729.92	258.3	10	2	82.6	139	83.2	143	0000	11.8	29.7		
18	19	1806.18	258.3	15	2	88.4	145	89.1	145	1110	15.3	29.1		
19	20	1864.23	258.0	0	2	82.0	139	83.5	144	0000	11.6	29.8		
20	21	1868.31	258.4	15	2	82.5	142	84.5	146	0000	11.4	30.4		
21	22	1889.49	258.4	15	2	88.8	147	89.7	148	1110	15.3	29.4		
22	23	1920.83	258.4	10	2	83.0	141	83.9	146	0000	11.5	30.2		
23	24	2003.3	258.4	10	2	83.2	143	84.3	145	0000	11.6	30.3		
24	25	2154.15	258.4	10	2	83.6	143	85.0	145	0000	11.6	30.5		
25	26	2235.71	258.5	10	2	83.4	144	84.9	146	0000	11.8	30.3		
26	27	2327.44	258.5	10	2	83.3	143	84.7	145	0000	11.5	30.5		
27	28	2400.29	258.5	10	2	84.2	146	84.9	146	0000	11.9	30.4		

#	Set #	Time (sec)	Temp (K)	Exp. (ms)	# Col	Cols 7+ 8 Mean	Max	Cols 9 + 10 Mean	Max.	Lamp	O+SR (DN)	Dark (DN)	Img Z (DN/s)	Mem Z (DN/s)
28	29	2522.53	258.5	15	2	89.6	146	89.9	148	1110	15.1	29.8		
29	30	2582.53	258.5	15	2	85.0	146	86.1	147	0000	12.1	30.7		
30	31	2587.81	258.3	0	2	83.3	145	87.3	347	0000	11.6	31.0		
31	32	2618.53	258.5	15	2	89.7	147	90.3	149	1110	15.0	30.0		
32	33	2636.29	258.5	10	2	85.1	145	85.8	150	0000	11.9	30.9		
33	34	2749.93	258.7	10	2	85.4	146	85.8	147	0000	12.1	30.7		
34	35	2843.35	258.7	10	2	85.2	146	85.9	148	0000	11.9	30.9		
35	36	2932.89	258.6	10	2	84.8	145	86.5	149	0000	11.6	31.2		
36	37	3080.61	258.7	10	2	85.3	149	86.1	148	0000	11.9	31.0		
37	38	3148.88	258.7	10	2	85.7	147	86.6	151	0000	11.8	31.3		
38	39	3249.28	258.9	10	2	85.5	147	87.1	150	0000	12.0	31.1		
39	40	3336.7	258.9	10	2	86.1	149	86.9	152	0000	11.6	31.6		
40	41	3403.55	258.9	10	2	85.8	147	87.1	151	0000	12.0	31.2		
41	42	3557.76	258.9	10	2	85.9	147	87.0	153	0000	12.1	31.1		
42	43	3655.02	258.9	10	2	86.4	148	87.2	152	0000	11.8	31.7		
43	44	3735.46	259.0	10	2	86.8	151	87.6	150	0000	11.8	31.9		
44	45	3799.14	259.0	10	2	87.5	149	88.4	154	0000	12.0	32.0		
45	46	3966.56	259.0	10	2	87.2	150	88.2	152	0000	11.9	32.0		
46	47	4072.85	259.0	10	2	87.0	149	88.8	152	0000	12.1	31.8		
47	48	4163.31	259.0	10	2	87.9	151	88.7	152	0000	11.8	32.4		
48	49	4212.33	259.1	10	2	87.5	151	89.0	156	0000	11.9	32.2		
49	50	4383.38	259.1	10	2	88.7	152	89.6	155	0000	12.4	32.2		
50	51	4481.68	259.2	10	2	88.0	151	89.7	154	0000	11.8	32.7		
51	52	4582.4	259.2	10	2	89.0	179	89.9	160	0000	11.9	32.8		
52	53	4656.34	259.2	10	2	88.7	155	90.5	157	0000	12.3	32.5		
53	54	4804.68	259.2	15	2	94.8	155	95.9	160	1110	15.6	32.0		
54	55	4869.36	259.1	0	2	88.8	153	90.0	159	0000	12.1	32.6		
55	56	4885.95	259.3	15	2	89.9	155	90.8	189	0000	12.3	32.9		
56	57	4913.32	259.3	15	2	94.8	156	96.0	160	1110	15.4	32.3		
57	58	4954.93	259.3	10	2	89.7	155	90.3	158	0000	12.3	32.8		
58	59	5296.77	259.5	10	2	91.1	155	91.7	160	0000	12.0	33.7		
59	60	5597.39	259.7	10	2	92.0	157	93.4	161	0000	12.5	33.9		
60	61	5888.33	259.7	10	2	92.6	159	93.6	165	0000	12.5	34.1		
61	62	6188.18	260.0	10	2	92.7	160	94.8	165	0000	12.5	34.4		
62	63	6505.34	260.0	10	2	94.0	163	95.8	166	0000	12.6	34.8		
63	64	6654.9	260.1	10	2	94.6	164	96.5	168	0000	12.5	35.3		
64	65	6946.29	260.2	10	2	95.2	164	96.6	169	0000	12.1	35.8		
65	66	7251.4	260.2	10	2	95.7	167	97.8	171	0000	12.5	35.9		
66	67	7411.32	260.4	10	2	96.3	168	98.0	172	0000	12.5	36.1		
67	68	7671.13	260.4	10	2	98.0	169	99.3	171	0000	12.6	36.7		
68	69	7685.75	260.4	10	2	97.9	171	99.3	174	0000	12.8	36.6		
69	70	7720.63	260.4	10	2	98.4	170	99.9	173	0000	12.5	37.1		
70	71	7731.69	260.4	10	2	97.4	172	98.6	171	0000	12.4	36.6		
71	72	7770.5	260.4	10	2	98.2	172	100.0	173	0000	12.5	37.0		
72	73	7781.57	260.4	10	2	98.3	169	100.1	173	0000	12.6	37.0		
73	74	7819	260.6	10	2	97.8	168	99.5	173	0000	12.6	36.7		

#	Set #	Time (sec)	Temp (K)	Exp. (ms)	# Col	Cols 7+ 8 Mean	Max	Cols 9 + 10 Mean	Max.	Lamp	O+SR (DN)	Dark (DN)	Img Z (DN/s)	Mem Z (DN/s)
74	75	7830.1	260.6	10	2	98.2	170	99.8	174	0000	12.5	37.0		
75	76	7869.13	260.6	10	2	98.8	168	100.1	175	0000	12.5	37.2		
76	77	7880.23	260.6	10	2	97.7	171	99.3	174	0000	12.4	36.9		
77	78	7920.02	260.6	10	2	98.8	172	99.8	175	0000	12.8	36.9		
78	79	7931.15	260.6	10	2	97.9	170	99.9	176	0000	12.4	37.1		
79	80	7969.5	260.6	10	2	98.6	172	99.8	173	0000	12.5	37.1		
80	81	7980.64	260.6	10	2	98.1	169	99.7	175	0000	12.4	37.1		
81	82	8020.62	260.6	10	2	99.4	172	100.7	176	0000	12.5	37.5		
82	83	8031.77	260.7	10	2	98.6	171	99.9	173	0000	12.5	37.1		
83	84	8070.75	260.7	10	2	98.9	172	100.9	176	0000	12.6	37.3		
84	85	8081.92	260.6	10	2	98.7	170	99.8	174	0000	12.6	37.0		
85	86	8120.37	260.7	10	2	99.3	181	100.1	176	0001	12.4	37.5		
86	87	8131.55	260.7	10	2	99.0	169	100.7	177	0001	12.8	37.2		
87	88	8170.67	260.7	70	2	103.6	178	105.1	220	0001	12.6	39.5	38.8	34.0
88	89	8173.68	260.7	70	2	103.1	176	105.3	225	0001	12.8	39.4	35.6	33.9
89	90	8177.76	260.7	70	2	102.5	175	104.9	221	0001	12.8	39.1	31.1	33.6
90	91	8182.66	260.7	70	2	103.6	176	105.6	219	0001	12.6	39.7	40.8	34.1
91	92	8187.55	260.7	70	2	103.6	178	105.6	219	0001	12.6	39.7	40.7	34.1
92	93	8202.42	260.7	70	2	103.6	176	105.1	222	0001	12.9	39.3	34.7	33.8
93	94	9189.13	261.1	0.5	4	101.9	179	103.1	179	0000	12.5	38.7		35.8
94	95	9203.13	261.2	1000	4	168.6	470	181.3	1272	0000	13.1	74.3	35.6	
95	96	9219.13	261.2	0.5	4	101.1	177	103.5	182	0000	12.6	38.5		35.7
96	97	9223.13	261.1	1000	4	168.5	462	181.8	1269	0000	13.1	74.4	35.9	
97	98	9243.13	261.1	0.5	4	101.4	177	103.0	183	0000	12.9	38.2		35.4
98	99	9247.13	261.1	1000	4	168.1	461	180.7	1264	0000	13.4	73.8	35.6	
99	100	9263.13	261.1	0.5	4	101.5	179	103.0	179	0000	12.9	38.2		35.4
100	101	9267.13	261.1	1000	4	169.0	465	180.9	1285	0000	13.4	74.1	35.9	
101	102	9288.13	261.1	0.5	4	101.4	179	103.7	180	0000	12.6	38.7		35.8
102	103	9292.13	261.2	1000	4	169.4	465	181.0	1288	0000	13.1	74.5	35.8	
103	104	9312.13	261.1	0.5	4	101.5	178	103.1	180	0000	12.9	38.3		35.4
104	105	9316.13	261.2	1000	4	168.7	466	180.8	1299	0000	13.4	74.0	35.7	
105	106	9332.13	261.2	0.5	4	102.0	176	103.4	182	0000	12.9	38.5		35.6
106	107	9336.13	261.1	1000	4	168.7	468	181.6	1290	0000	13.4	74.2	35.7	
107	108	10150.13	261.4	0.5	4	105.3	183	106.6	187	0100	13.4	39.6		36.6
108	109	10639.39	261.7	0.5	4	106.7	187	108.3	193	0000	12.9	40.9		37.8
109	110	10643.13	261.7	1000	4	178.2	481	190.5	1319	0000	13.5	78.7	37.8	
110	111	11048.13	261.9	0.5	4	108.5	190	110.7	196	0000	13.0	41.8		38.7
111	112	11052.13	261.9	1000	4	180.9	506	194.3	1354	0000	13.5	80.3	38.5	
112	113	11457.13	262.2	0.5	4	110.4	193	111.9	197	0000	12.9	42.7		39.5
113	114	11461.13	262.0	1000	4	184.5	512	197.8	1382	0000	13.9	81.7	39.0	
114	115	11866.13	262.3	0.5	4	111.9	196	113.8	201	0000	13.1	43.3		40.1
115	116	11870.13	262.3	1000	4	188.2	518	201.2	1391	0000	13.8	83.6	40.3	
116	117	12280.13	262.4	0.5	4	114.2	199	114.9	207	0000	13.1	44.2		40.9
117	118	12284.13	262.4	1000	4	190.5	521	204.8	1419	0000	14.0	84.8	40.7	
118	119	12689.13	262.6	0.5	4	115.8	201	116.4	209	0000	13.3	44.8		41.5
119	120	12694.13	262.6	1000	4	193.4	525	208.1	1601	0000	14.0	86.4	41.6	

#	Set #	Time (sec)	Temp (K)	Exp. (ms)	# Col	Cols 7+ 8 Mean	Max	Cols 9 + 10 Mean	Max.	Lamp	O+SR (DN)	Dark (DN)	Img Z (DN/s)	Mem Z (DN/s)
120	121	13534.04	263.1	10	2	120.9	211	121.5	216	0000	13.5	47.1		
121	122	14245.47	263.4	10	2	123.8	218	123.9	218	0001	13.8	48.2		
122	123	14474.85	263.4	10	2	127.7	251	126.2	224	0001	13.9	49.6		

Appendix 27 - The Relative Spectral Response for each of the DISR imagers at 239ºK.

This appendix presents the baseline Relative Spectral Response (RSR) for the DISR imagers from which it is possible to determine the RSR at other temperatures as described in section 5.8 of the DISR Archive Users' Guide.

Wave (nm)	DLI1/HRI	DLI2/MRI	SLI		Wave (nm)	DLI1/HRI	DLI2/MRI	SLI
500	0	0	0		805	0.841674	0.853984	0.837847
505	0	0	0		810	0.839578	0.854923	0.836568
510	0	0	0		815	0.841458	0.858315	0.838013
515	0	0	0		820	0.843338	0.861706	0.839458
520	0	0	0		825	0.841023	0.860913	0.835838
525	0	0	0		830	0.838709	0.86012	0.832217
530	0	0	0		835	0.82699	0.848455	0.818866
535	0	0	0		840	0.815271	0.83679	0.805514
540	0	0	0		845	0.79308	0.813673	0.781053
545	0	0	0		850	0.770889	0.790554	0.756592
550	0	0	0		855	0.735982	0.754979	0.720897
555	0	0	0		860	0.701076	0.719406	0.685203
560	0	0	0		865	0.666	0.684288	0.650023
565	0	0	0		870	0.630923	0.64917	0.614842
570	0	0	0		875	0.598818	0.616737	0.583045
575	0	0	0		880	0.566713	0.584305	0.551246
580	0	0	0		885	0.535752	0.553321	0.520912
585	0	0	0		890	0.504792	0.522336	0.490576
590	0	0	0		895	0.476903	0.494873	0.463724
595	0	0	0		900	0.449014	0.46741	0.436871
600	0.000467	0.000383	0.000361		905	0.425092	0.443053	0.413641
605	0.000561	0.000364	0.00034		910	0.401169	0.418696	0.390413
610	0.000656	0.000344	0.000318		915	0.378426	0.395422	0.367949
615	0.000959	0.000368	0.000337		920	0.355683	0.372149	0.345484
620	0.001263	0.000391	0.000356		925	0.335042	0.351299	0.325461
625	0.002696	0.000615	0.000558		930	0.314402	0.33045	0.305437
630	0.004129	0.000839	0.00076		935	0.296659	0.312792	0.288538
635	0.018483	0.00471	0.004389		940	0.278917	0.295134	0.271637
640	0.032836	0.008581	0.008017		945	0.263306	0.279177	0.256359
645	0.113475	0.054995	0.053885		950	0.247695	0.263219	0.241083
650	0.194114	0.101409	0.099753		955	0.232864	0.247732	0.226398
655	0.320387	0.234332	0.236099		960	0.218033	0.232246	0.211714
660	0.44666	0.367254	0.372444		965	0.205064	0.21875	0.198927
665	0.538186	0.482736	0.492119		970	0.192097	0.205254	0.18614
670	0.629713	0.598218	0.611793		975	0.179035	0.191675	0.173324
675	0.692778	0.670837	0.68492		980	0.165974	0.178097	0.160507
680	0.755843	0.743455	0.758045		985	0.152876	0.164244	0.147652
685	0.798187	0.787344	0.800341		990	0.139779	0.15039	0.134797
690	0.840531	0.831235	0.842638		995	0.127098	0.136779	0.122323
695	0.858707	0.84805	0.85862		1000	0.114417	0.123169	0.109849

700	0.876882	0.864867	0.874603		1005	0.10224	0.110033	0.097923
705	0.882544	0.869708	0.879882		1010	0.090064	0.096898	0.085997
710	0.888207	0.87455	0.88516		1015	0.07897	0.084983	0.075278
715	0.89651	0.883477	0.894725		1020	0.067875	0.073069	0.064558
720	0.904813	0.892404	0.904292		1025	0.058341	0.062886	0.055457
725	0.918621	0.908381	0.919604		1030	0.048807	0.052704	0.046356
730	0.932428	0.924359	0.934916		1035	0.041611	0.045016	0.039531
735	0.951511	0.946217	0.95458		1040	0.034415	0.037329	0.032706
740	0.970594	0.968075	0.974245		1045	0.028866	0.031331	0.027419
745	0.984447	0.98324	0.986812		1050	0.023317	0.025333	0.022132
750	0.998301	0.998404	0.99938		1055	0.020275	0.02206	0.019239
755	0.996518	0.996147	0.99497		1060	0.017233	0.018787	0.016346
760	0.994736	0.993891	0.99056		1065	0.01498	0.016341	0.014186
765	0.975333	0.973964	0.969146		1070	0.012727	0.013895	0.012025
770	0.955931	0.954037	0.947732		1075	0.011268	0.012329	0.010651
775	0.930429	0.929027	0.92207		1080	0.009808	0.010762	0.009276
780	0.904926	0.904017	0.896409		1085	0.008715	0.00957	0.008228
785	0.884382	0.885675	0.876653		1090	0.007622	0.008377	0.00718
790	0.863838	0.867334	0.856898		1095	0	0	0
795	0.853805	0.860189	0.848012		1100	0	0	0
800	0.843771	0.853045	0.839126					

Appendix 28 - DISR Sun Sensor Dataset Summary

The following table summarizes the DISR sun sensor data, taken during the Titan descent.

Columns:
1 The Dataset number, corresponding to the number in the archive filename.
2 The mission time of the first pulse detected in the triplet for the given revolution of the probe in seconds after T0
3 The mission time of the second pulse detected in the triplet for the given revolution of the probe in seconds after T0
4 The mission time of the third pulse detected in the triplet for the given revolution of the probe in seconds after T0
5 The amplitude of the Sun Sensor signal in data numbers (DN).
6 The absolute value of the probe spin at the time of the Sun Sensor observation.
7 The spin rate correction factor, which the absolute responsivity is to be multiplied by.
8 The sun elevation angle at the time of the observation in degrees from horizontal.
9 The (low frequency) east-west tip at the time of the observation in degrees.
10 The spin axis tip toward the sun (high frequency) deduced from the extinction trend lines shown in section 5.5 of the Guide.
11 The spin rate correction factor, which the absolute responsivity is to be multiplied by.
12 The DISR Optics temperature at the time of the observation in degrees Kelvin.
13 The resulting temperature correction factor, which the absolute responsivity is to be multiplied by.
14 The probe altitude at the time of the observation in kilometers, from the DTWG 2011 submittal.
15 The resulting altitude correction factor, which the absolute responsivity is to be multiplied by.
16 The calculated flux in the Sun Sensor pass band, as described in the DISR Archive Users' Guide, in watts/(sqm-micron).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Set #	Pulse 1 (sec)	Pulse 2 (sec)	Pulse 3 (sec)	Amp. (DN)	|Spin| (rpm)	R (spin)	Sun Elev. (deg)	E/W Tip (deg)	Tip toward Sun (deg)	Re	Temp. (ºK)	Rt	Altitude (km)	Rh	Flux @ 943 nm (W/m^2-u)
1	265.061	265.724	266.499	745	3.57	1.001	50.5	8.3	-4.0	0.928	264.2	0.977	136.70	1.001	1.973
2	281.937	283.009	283.894	686	3.39	1.001	50.6	1.9	6.0	0.865	264.2	0.977	135.89	1.001	1.947
2	301.439	302.004	302.682	775	3.13	1.002	50.6	-1.3	-2.0	0.989	264.2	0.977	135.01	1.001	1.924
3	455.918	458.399	461.098	567	0.99	1.004	50.9	4.4	5.3	0.830	264.3	0.977	128.02	1.001	1.671
4	785.603	786.875	788.118	522	2.11	1.003	51.6	-2.3	-1.0	0.981	264.3	0.977	115.26	1.002	1.300
5	811.646	813.063	814.488	480	2.32	1.003	51.7	-8.6	10.0	0.931	264.3	0.977	114.29	1.002	1.260
6	968.003	968.572	969.192	466	4.19	0.999	52.1	-4.9	-4.0	1.002	264.2	0.977	107.57	1.002	1.141
6	980.998	981.450	981.912	415	4.61	0.998	52.1	-4.7	5.0	0.944	264.2	0.977	106.62	1.002	1.079

Set #	Pulse 1 (sec)	Pulse 2 (sec)	Pulse 3 (sec)	Amp. (DN)	|Spin| (rpm)	R (spin)	Sun Elev. (deg)	E/W Tip (deg)	Tip toward Sun (deg)	Re	Temp. (ºK)	Rt	Altitude (km)	Rh	Flux @ 943 nm (W/m^2-u)
6	993.170	993.841	994.464	413	5.03	0.997	52.1	-6.2	4.5	0.962	264.2	0.977	105.73	1.002	1.055
7	1074.191	1074.586	1075.074	372	6.52	0.990	52.3	-1.4	-4.0	0.991	264.1	0.977	99.85	1.003	0.928
8	1154.015	1154.182	1154.368	342	8.27	0.979	52.4	-4.4	-5.0	1.002	263.8	0.977	94.52	1.003	0.852
8	1207.844	1208.049	1208.222	290	9.41	0.979	52.5	-5.2	2.0	0.973	263.7	0.977	91.18	1.003	0.744
8	1214.035	1214.316	1214.614	297	9.53	0.980	52.5	-4.7	-2.0	0.994	263.7	0.977	90.80	1.003	0.744
8	1220.277	1220.517	1220.783	301	9.62	0.981	52.5	-6.9	-1.0	0.998	263.7	0.977	90.42	1.003	0.751
8	1226.416	1226.723	1226.967	284	9.69	0.982	52.5	-5.7	1.0	0.983	263.7	0.977	90.04	1.003	0.718
9	1232.634	1232.844	1233.006	295	9.74	0.982	52.6	-7.6	-3.0	1.003	263.7	0.977	89.66	1.003	0.731
9	1282.306	1282.624	1282.896	251	9.52	0.980	52.6	-4.3	1.0	0.973	263.6	0.976	86.84	1.003	0.642
10	1320.735	1320.909	1321.089	255	9.40	0.979	52.7	-6.3	-1.0	0.995	263.5	0.976	84.76	1.004	0.638
10	1327.122	1327.262	1327.423	260	9.39	0.979	52.7	-6.2	-5.0	1.003	263.5	0.976	84.42	1.004	0.646
10	1387.962	1388.210	1388.415	230	8.32	0.979	52.8	-2.9	-5.0	0.998	263.2	0.976	81.28	1.004	0.573
10	1395.305	1395.422	1395.557	234	8.18	0.980	52.8	-8.3	-2.0	1.002	263.2	0.976	80.92	1.004	0.581
10	1402.442	1402.813	1403.132	209	8.09	0.980	52.8	-4.3	3.0	0.953	263.1	0.976	80.55	1.004	0.544
11	1471.573	1471.851	1472.124	208	7.51	0.984	52.9	-4.6	-5.0	1.002	262.8	0.976	77.30	1.004	0.514
11	1522.150	1522.712	1523.183	175	6.87	0.988	52.9	-0.6	0.0	0.948	262.6	0.975	75.06	1.004	0.454
12	1597.941	1598.423	1598.878	145	5.81	0.993	53.0	-0.3	6.0	0.858	262.3	0.975	71.91	1.004	0.412
12	1608.438	1608.950	1609.589	159	5.91	0.993	53.0	3.7	-3.0	0.936	262.3	0.975	71.48	1.004	0.415
13	1775.443	1775.755	1776.141	127	4.77	0.998	53.1	-0.9	2.0	0.926	261.0	0.974	65.62	1.005	0.333
14	1984.530	1985.238	1986.063	109	4.28	0.999	53.2	-0.5	1.0	0.932	259.1	0.971	59.83	1.005	0.283
14	1998.622	1999.314	2000.039	107	4.37	0.999	53.2	-0.2	1.0	0.929	258.9	0.971	59.49	1.005	0.278
15	2114.573	2115.325	2116.010	97	3.88	1.000	53.3	-1.4	1.0	0.941	257.9	0.970	56.80	1.005	0.248
15	2196.047	2196.380	2196.681	90	3.56	1.001	53.4	-0.9	3.0	0.908	256.9	0.969	55.07	1.005	0.239
16	2289.711	2290.578	2291.254	87	3.11	1.002	53.5	-1.5	0.0	0.951	255.8	0.967	53.18	1.005	0.220
17	2465.927	2466.362	2466.719	79	2.46	1.003	53.6	0.4	0.0	0.929	253.2	0.964	49.94	1.006	0.204
18	2580.770	2581.835	2582.925	73	2.73	1.003	53.7	-0.2	0.0	0.934	251.3	0.962	47.98	1.006	0.188
19	2697.740	2698.885	2699.861	65	2.56	1.003	53.8	0.7	0.0	0.923	249.3	0.959	46.11	1.006	0.169
20	2719.492	2720.594	2721.554	68	2.76	1.003	53.9	0.1	-3.0	0.962	248.9	0.958	45.77	1.006	0.170
21	2850.740	2851.865	2853.043	60	2.66	1.003	54.0	-1.3	0.0	0.944	246.5	0.955	43.83	1.006	0.153
21	2873.109	2874.232	2875.699	62	2.59	1.003	54.0	0.8	-2.0	0.945	246.1	0.954	43.51	1.006	0.158
22	2896.835	2897.865	2899.070	57	2.59	1.003	54.0	-1.3	2.0	0.919	245.6	0.954	43.17	1.006	0.149

Set #	Pulse 1 (sec)	Pulse 2 (sec)	Pulse 3 (sec)	Amp. (DN)	|Spin| (rpm)	R (spin)	Sun Elev. (deg)	E/W Tip (deg)	Tip toward Sun (deg)	Re	Temp. (ºK)	Rt	Altitude (km)	Rh	Flux @ 943 nm (W/m^2-u)
23	3010.873	3011.755	3012.705	57	2.78	1.003	54.1	-1.8	-3.0	0.975	243.3	0.950	41.61	1.006	0.141
24	3362.419	3363.615	3364.596	46	2.50	1.003	54.3	2.6	-1.0	0.907	235.9	0.938	37.21	1.007	0.122
25	3488.918	3490.063	3491.104	44	2.49	1.003	54.4	0.3	-3.0	0.955	233.1	0.934	35.76	1.007	0.111
26	3643.402	3643.679	3644.004	37	2.47	1.003	54.5	0.4	0.0	0.918	229.6	0.927	34.10	1.007	0.097
27	3722.131	3722.471	3722.746	39	2.30	1.003	54.5	-4.0	-6.0	0.999	227.8	0.924	33.27	1.007	0.094
28	3993.598	3993.778	3994.005	38	2.76	1.003	54.6	0.4	-7.0	0.985	221.8	0.913	30.59	1.007	0.094

Appendix 29 - Visible Spectrometer Wavelength Calibration.

The tables below present the average wavelength across each row from the equation:

$$\langle WL \rangle = a + b*\text{pixel} + c*\text{pixel}^2$$

where:

<WL> is the average wavelength of the pixels in across the row (in nm), &
"pixel" is the row number of the in the dataset, starting at 0 (0 to199).

Table - DLVS Column Average Wavelength vs. Optics Temperature. The first row presents the DISR Optics temperature, the 2nd thru 4th present the temperature dependent coefficients and the remainder of the table presents the column average wavelength for each row of the DISR data.

Optics T =	260	240	220	210	200	180	160
a =	976.853	976.789	976.724	976.692	976.659	976.595	976.530
b =	-2.3076	-2.3078	-2.3080	-2.3081	-2.3082	-2.3084	-2.3086
c =	-0.00101	-0.00101	-0.00101	-0.00101	-0.00101	-0.00101	-0.00101
0	976.85	976.79	976.72	976.69	976.66	976.59	976.53
1	974.54	974.48	974.41	974.38	974.35	974.29	974.22
2	972.23	972.17	972.10	972.07	972.04	971.97	971.91
3	969.92	969.86	969.79	969.76	969.73	969.66	969.60
4	967.61	967.54	967.48	967.44	967.41	967.34	967.28
5	965.29	965.22	965.16	965.13	965.09	965.03	964.96
6	962.97	962.91	962.84	962.81	962.77	962.71	962.64
7	960.65	960.58	960.52	960.49	960.45	960.39	960.32
8	958.33	958.26	958.20	958.16	958.13	958.06	958.00
9	956.00	955.94	955.87	955.84	955.80	955.74	955.67
10	953.68	953.61	953.54	953.51	953.48	953.41	953.34
11	951.35	951.28	951.21	951.18	951.15	951.08	951.01
12	949.02	948.95	948.88	948.85	948.82	948.75	948.68
13	946.68	946.62	946.55	946.52	946.48	946.42	946.35
14	944.35	944.28	944.21	944.18	944.15	944.08	944.01
15	942.01	941.94	941.88	941.84	941.81	941.74	941.67
16	939.67	939.61	939.54	939.50	939.47	939.40	939.33
17	937.33	937.26	937.20	937.16	937.13	937.06	936.99
18	934.99	934.92	934.85	934.82	934.78	934.72	934.65
19	932.64	932.58	932.51	932.47	932.44	932.37	932.30
20	930.30	930.23	930.16	930.13	930.09	930.02	929.95
21	927.95	927.88	927.81	927.78	927.74	927.67	927.60
22	925.60	925.53	925.46	925.42	925.39	925.32	925.25
23	923.24	923.17	923.11	923.07	923.04	922.97	922.90
24	920.89	920.82	920.75	920.72	920.68	920.61	920.54
25	918.53	918.46	918.39	918.36	918.32	918.25	918.18
26	916.17	916.10	916.03	916.00	915.96	915.89	915.82
27	913.81	913.74	913.67	913.64	913.60	913.53	913.46
28	911.45	911.38	911.31	911.27	911.24	911.17	911.10
29	909.08	909.01	908.94	908.91	908.87	908.80	908.73
30	906.72	906.65	906.58	906.54	906.50	906.43	906.36

Optics T =	260	240	220	210	200	180	160
31	904.35	904.28	904.21	904.17	904.13	904.06	903.99
32	901.98	901.91	901.83	901.80	901.76	901.69	901.62
33	899.60	899.53	899.46	899.42	899.39	899.32	899.25
34	897.23	897.16	897.08	897.05	897.01	896.94	896.87
35	894.85	894.78	894.71	894.67	894.64	894.56	894.49
36	892.47	892.40	892.33	892.29	892.26	892.18	892.11
37	890.09	890.02	889.95	889.91	889.87	889.80	889.73
38	887.71	887.63	887.56	887.53	887.49	887.42	887.34
39	885.32	885.25	885.18	885.14	885.10	885.03	884.96
40	882.93	882.86	882.79	882.75	882.72	882.64	882.57
41	880.54	880.47	880.40	880.36	880.33	880.25	880.18
42	878.15	878.08	878.01	877.97	877.93	877.86	877.79
43	875.76	875.69	875.61	875.58	875.54	875.47	875.39
44	873.36	873.29	873.22	873.18	873.14	873.07	873.00
45	870.97	870.89	870.82	870.78	870.75	870.67	870.60
46	868.57	868.49	868.42	868.38	868.35	868.27	868.20
47	866.17	866.09	866.02	865.98	865.94	865.87	865.79
48	863.76	863.69	863.61	863.58	863.54	863.46	863.39
49	861.36	861.28	861.21	861.17	861.13	861.06	860.98
50	858.95	858.87	858.80	858.76	858.72	858.65	858.57
51	856.54	856.46	856.39	856.35	856.31	856.24	856.16
52	854.13	854.05	853.98	853.94	853.90	853.83	853.75
53	851.72	851.64	851.56	851.53	851.49	851.41	851.34
54	849.30	849.22	849.15	849.11	849.07	849.00	848.92
55	846.88	846.81	846.73	846.69	846.65	846.58	846.50
56	844.46	844.39	844.31	844.27	844.23	844.16	844.08
57	842.04	841.96	841.89	841.85	841.81	841.73	841.66
58	839.62	839.54	839.46	839.42	839.39	839.31	839.23
59	837.19	837.11	837.04	837.00	836.96	836.88	836.81
60	834.76	834.69	834.61	834.57	834.53	834.45	834.38
61	832.33	832.26	832.18	832.14	832.10	832.02	831.95
62	829.90	829.82	829.75	829.71	829.67	829.59	829.51
63	827.47	827.39	827.31	827.27	827.23	827.16	827.08
64	825.03	824.95	824.88	824.84	824.80	824.72	824.64
65	822.60	822.52	822.44	822.40	822.36	822.28	822.20
66	820.16	820.08	820.00	819.96	819.92	819.84	819.76
67	817.71	817.63	817.56	817.52	817.48	817.40	817.32
68	815.27	815.19	815.11	815.07	815.03	814.95	814.87
69	812.82	812.74	812.66	812.62	812.59	812.51	812.43
70	810.38	810.30	810.22	810.18	810.14	810.06	809.98
71	807.93	807.85	807.77	807.73	807.69	807.61	807.53
72	805.47	805.39	805.31	805.27	805.23	805.15	805.07
73	803.02	802.94	802.86	802.82	802.78	802.70	802.62
74	800.56	800.48	800.40	800.36	800.32	800.24	800.16
75	798.11	798.03	797.94	797.90	797.86	797.78	797.70
76	795.65	795.57	795.48	795.44	795.40	795.32	795.24
77	793.18	793.10	793.02	792.98	792.94	792.86	792.78

Optics T =	260	240	220	210	200	180	160
78	790.72	790.64	790.56	790.52	790.47	790.39	790.31
79	788.25	788.17	788.09	788.05	788.01	787.93	787.84
80	785.79	785.70	785.62	785.58	785.54	785.46	785.37
81	783.32	783.23	783.15	783.11	783.07	782.99	782.90
82	780.84	780.76	780.68	780.64	780.60	780.51	780.43
83	778.37	778.29	778.20	778.16	778.12	778.04	777.95
84	775.89	775.81	775.73	775.69	775.64	775.56	775.48
85	773.42	773.33	773.25	773.21	773.16	773.08	773.00
86	770.94	770.85	770.77	770.73	770.68	770.60	770.52
87	768.45	768.37	768.29	768.24	768.20	768.12	768.03
88	765.97	765.89	765.80	765.76	765.72	765.63	765.55
89	763.48	763.40	763.31	763.27	763.23	763.14	763.06
90	761.00	760.91	760.83	760.78	760.74	760.66	760.57
91	758.51	758.42	758.33	758.29	758.25	758.16	758.08
92	756.01	755.93	755.84	755.80	755.76	755.67	755.58
93	753.52	753.43	753.35	753.30	753.26	753.18	753.09
94	751.02	750.94	750.85	750.81	750.76	750.68	750.59
95	748.52	748.44	748.35	748.31	748.26	748.18	748.09
96	746.02	745.94	745.85	745.81	745.76	745.68	745.59
97	743.52	743.43	743.35	743.30	743.26	743.17	743.09
98	741.02	740.93	740.84	740.80	740.76	740.67	740.58
99	738.51	738.42	738.34	738.29	738.25	738.16	738.07
100	736.00	735.91	735.83	735.78	735.74	735.65	735.56
101	733.49	733.40	733.32	733.27	733.23	733.14	733.05
102	730.98	730.89	730.80	730.76	730.71	730.63	730.54
103	728.47	728.38	728.29	728.24	728.20	728.11	728.02
104	725.95	725.86	725.77	725.73	725.68	725.59	725.50
105	723.43	723.34	723.25	723.21	723.16	723.07	722.98
106	720.91	720.82	720.73	720.69	720.64	720.55	720.46
107	718.39	718.30	718.21	718.16	718.12	718.03	717.94
108	715.86	715.77	715.68	715.64	715.59	715.50	715.41
109	713.34	713.25	713.16	713.11	713.07	712.97	712.88
110	710.81	710.72	710.63	710.58	710.54	710.45	710.35
111	708.28	708.19	708.10	708.05	708.00	707.91	707.82
112	705.74	705.65	705.56	705.52	705.47	705.38	705.29
113	703.21	703.12	703.03	702.98	702.94	702.84	702.75
114	700.67	700.58	700.49	700.44	700.40	700.31	700.21
115	698.13	698.04	697.95	697.90	697.86	697.77	697.67
116	695.59	695.50	695.41	695.36	695.32	695.22	695.13
117	693.05	692.96	692.87	692.82	692.77	692.68	692.59
118	690.51	690.41	690.32	690.27	690.23	690.13	690.04
119	687.96	687.87	687.77	687.73	687.68	687.59	687.49
120	685.41	685.32	685.22	685.18	685.13	685.04	684.94
121	682.86	682.77	682.67	682.63	682.58	682.49	682.39
122	680.31	680.21	680.12	680.07	680.03	679.93	679.84
123	677.75	677.66	677.56	677.52	677.47	677.38	677.28
124	675.20	675.10	675.01	674.96	674.91	674.82	674.72

Optics T =	260	240	220	210	200	180	160
125	672.64	672.54	672.45	672.40	672.35	672.26	672.16
126	670.08	669.98	669.89	669.84	669.79	669.70	669.60
127	667.51	667.42	667.32	667.27	667.23	667.13	667.04
128	664.95	664.85	664.76	664.71	664.66	664.56	664.47
129	662.38	662.29	662.19	662.14	662.09	662.00	661.90
130	659.81	659.72	659.62	659.57	659.52	659.43	659.33
131	657.24	657.14	657.05	657.00	656.95	656.85	656.76
132	654.67	654.57	654.47	654.43	654.38	654.28	654.18
133	652.09	652.00	651.90	651.85	651.80	651.70	651.61
134	649.52	649.42	649.32	649.27	649.22	649.13	649.03
135	646.94	646.84	646.74	646.69	646.64	646.55	646.45
136	644.36	644.26	644.16	644.11	644.06	643.96	643.87
137	641.77	641.68	641.58	641.53	641.48	641.38	641.28
138	639.19	639.09	638.99	638.94	638.89	638.79	638.69
139	636.60	636.50	636.40	636.35	636.30	636.20	636.11
140	634.01	633.91	633.81	633.76	633.71	633.61	633.51
141	631.42	631.32	631.22	631.17	631.12	631.02	630.92
142	628.83	628.73	628.63	628.58	628.53	628.43	628.33
143	626.23	626.13	626.03	625.98	625.93	625.83	625.73
144	623.64	623.54	623.43	623.38	623.33	623.23	623.13
145	621.04	620.94	620.83	620.78	620.73	620.63	620.53
146	618.44	618.33	618.23	618.18	618.13	618.03	617.93
147	615.83	615.73	615.63	615.58	615.53	615.43	615.32
148	613.23	613.13	613.02	612.97	612.92	612.82	612.72
149	610.62	610.52	610.42	610.36	610.31	610.21	610.11
150	608.01	607.91	607.81	607.75	607.70	607.60	607.50
151	605.40	605.30	605.19	605.14	605.09	604.99	604.88
152	602.79	602.68	602.58	602.53	602.48	602.37	602.27
153	600.17	600.07	599.96	599.91	599.86	599.76	599.65
154	597.55	597.45	597.35	597.29	597.24	597.14	597.03
155	594.93	594.83	594.73	594.67	594.62	594.52	594.41
156	592.31	592.21	592.10	592.05	592.00	591.89	591.79
157	589.69	589.58	589.48	589.43	589.37	589.27	589.16
158	587.06	586.96	586.85	586.80	586.75	586.64	586.54
159	584.44	584.33	584.23	584.17	584.12	584.01	583.91
160	581.81	581.70	581.60	581.54	581.49	581.38	581.28
161	579.18	579.07	578.96	578.91	578.86	578.75	578.64
162	576.54	576.44	576.33	576.28	576.22	576.12	576.01
163	573.91	573.80	573.69	573.64	573.59	573.48	573.37
164	571.27	571.16	571.05	571.00	570.95	570.84	570.73
165	568.63	568.52	568.41	568.36	568.31	568.20	568.09
166	565.99	565.88	565.77	565.72	565.66	565.56	565.45
167	563.34	563.24	563.13	563.07	563.02	562.91	562.80
168	560.70	560.59	560.48	560.43	560.37	560.26	560.16
169	558.05	557.94	557.83	557.78	557.72	557.62	557.51
170	555.40	555.29	555.18	555.13	555.07	554.96	554.86
171	552.75	552.64	552.53	552.48	552.42	552.31	552.20

Optics T =	260	240	220	210	200	180	160
172	550.10	549.99	549.88	549.82	549.77	549.66	549.55
173	547.44	547.33	547.22	547.16	547.11	547.00	546.89
174	544.78	544.67	544.56	544.51	544.45	544.34	544.23
175	542.12	542.01	541.90	541.85	541.79	541.68	541.57
176	539.46	539.35	539.24	539.18	539.13	539.02	538.90
177	536.80	536.69	536.57	536.52	536.46	536.35	536.24
178	534.13	534.02	533.91	533.85	533.80	533.68	533.57
179	531.46	531.35	531.24	531.18	531.13	531.01	530.90
180	528.79	528.68	528.57	528.51	528.46	528.34	528.23
181	526.12	526.01	525.90	525.84	525.78	525.67	525.56
182	523.45	523.34	523.22	523.17	523.11	523.00	522.88
183	520.77	520.66	520.55	520.49	520.43	520.32	520.20
184	518.10	517.98	517.87	517.81	517.75	517.64	517.52
185	515.42	515.30	515.19	515.13	515.07	514.96	514.84
186	512.73	512.62	512.50	512.45	512.39	512.27	512.16
187	510.05	509.93	509.82	509.76	509.70	509.59	509.47
188	507.36	507.25	507.13	507.07	507.02	506.90	506.79
189	504.68	504.56	504.44	504.39	504.33	504.21	504.10
190	501.99	501.87	501.75	501.70	501.64	501.52	501.40
191	499.29	499.18	499.06	499.00	498.94	498.83	498.71
192	496.60	496.48	496.37	496.31	496.25	496.13	496.01
193	493.90	493.79	493.67	493.61	493.55	493.43	493.32
194	491.21	491.09	490.97	490.91	490.85	490.73	490.62
195	488.51	488.39	488.27	488.21	488.15	488.03	487.92
196	485.80	485.69	485.57	485.51	485.45	485.33	485.21
197	483.10	482.98	482.86	482.80	482.74	482.62	482.51
198	480.39	480.27	480.16	480.10	480.04	479.92	479.80
199	477.69	477.57	477.45	477.39	477.33	477.21	477.09

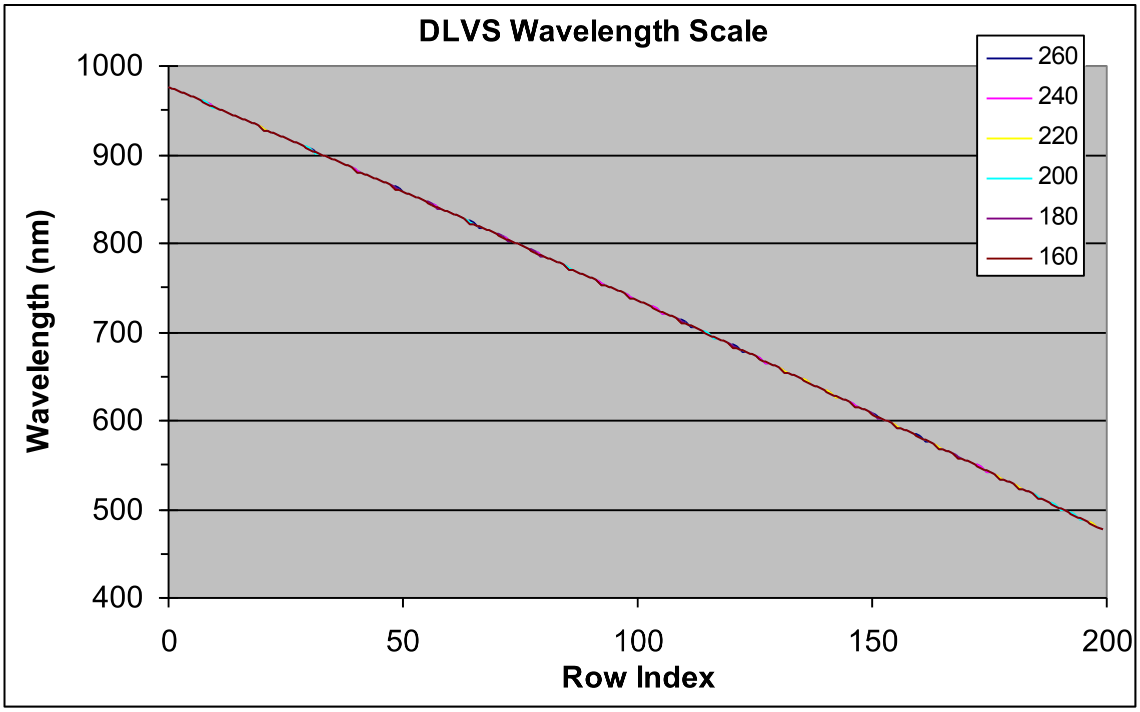


Figure - Plot of the data contained in the preceding table (the DLVS wavelength scale at various temperatures).

The following table presents the wavelengths for selected DLVS pixels calculated at 210ºK, in order to demonstrate the variation in wavelength with column (spatial dimension).

Table - DLVS Pixel Wavelengths for Selected Columns at 210ºK

Row\Col	0	5	10	11	15	19
0	975.96	976.35	976.73	976.81	977.11	977.42
1	973.65	974.04	974.42	974.50	974.81	975.11
2	971.34	971.72	972.11	972.19	972.50	972.81
3	969.02	969.41	969.80	969.87	970.19	970.50
4	966.70	967.09	967.48	967.56	967.87	968.18
5	964.38	964.77	965.17	965.24	965.56	965.87
6	962.06	962.45	962.85	962.92	963.24	963.55
7	959.73	960.13	960.53	960.60	960.92	961.24
8	957.41	957.81	958.20	958.28	958.60	958.92
9	955.08	955.48	955.88	955.96	956.28	956.59
10	952.75	953.15	953.55	953.63	953.95	954.27
11	950.42	950.82	951.22	951.30	951.62	951.94
12	948.08	948.49	948.89	948.97	949.29	949.62
13	945.75	946.15	946.56	946.64	946.96	947.29
14	943.41	943.81	944.22	944.30	944.63	944.95
15	941.07	941.48	941.88	941.97	942.29	942.62
16	938.72	939.13	939.54	939.63	939.96	940.28

Row\Col	0	5	10	11	15	19
17	936.38	936.79	937.20	937.29	937.62	937.95
18	934.03	934.45	934.86	934.94	935.27	935.61
19	931.68	932.10	932.51	932.60	932.93	933.26
20	929.33	929.75	930.17	930.25	930.59	930.92
21	926.98	927.40	927.82	927.90	928.24	928.57
22	924.62	925.05	925.47	925.55	925.89	926.22
23	922.27	922.69	923.11	923.20	923.54	923.87
24	919.91	920.33	920.76	920.84	921.18	921.52
25	917.55	917.97	918.40	918.49	918.83	919.17
26	915.19	915.61	916.04	916.13	916.47	916.81
27	912.82	913.25	913.68	913.77	914.11	914.45
28	910.45	910.88	911.32	911.40	911.75	912.09
29	908.08	908.52	908.95	909.04	909.38	909.73
30	905.71	906.15	906.58	906.67	907.02	907.37
31	903.34	903.78	904.21	904.30	904.65	905.00
32	900.97	901.40	901.84	901.93	902.28	902.63
33	898.59	899.03	899.47	899.56	899.91	900.26
34	896.21	896.65	897.09	897.18	897.54	897.89
35	893.83	894.27	894.72	894.80	895.16	895.51
36	891.44	891.89	892.34	892.43	892.78	893.14
37	889.06	889.51	889.95	890.04	890.40	890.76
38	886.67	887.12	887.57	887.66	888.02	888.38
39	884.28	884.73	885.18	885.28	885.64	886.00
40	881.89	882.34	882.80	882.89	883.25	883.61
41	879.50	879.95	880.41	880.50	880.86	881.23
42	877.10	877.56	878.02	878.11	878.47	878.84
43	874.71	875.16	875.62	875.71	876.08	876.45
44	872.31	872.77	873.23	873.32	873.69	874.05
45	869.91	870.37	870.83	870.92	871.29	871.66
46	867.50	867.97	868.43	868.52	868.89	869.26
47	865.10	865.56	866.03	866.12	866.49	866.86
48	862.69	863.16	863.62	863.72	864.09	864.46
49	860.28	860.75	861.22	861.31	861.69	862.06
50	857.87	858.34	858.81	858.90	859.28	859.66
51	855.45	855.93	856.40	856.49	856.87	857.25
52	853.04	853.51	853.99	854.08	854.46	854.84
53	850.62	851.10	851.57	851.67	852.05	852.43
54	848.20	848.68	849.16	849.25	849.64	850.02
55	845.78	846.26	846.74	846.84	847.22	847.60
56	843.36	843.84	844.32	844.42	844.80	845.19
57	840.93	841.41	841.90	841.99	842.38	842.77
58	838.50	838.99	839.47	839.57	839.96	840.35
59	836.07	836.56	837.05	837.14	837.53	837.92
60	833.64	834.13	834.62	834.72	835.11	835.50
61	831.21	831.70	832.19	832.29	832.68	833.07
62	828.77	829.26	829.76	829.86	830.25	830.64

Row\Col	0	5	10	11	15	19
63	826.33	826.83	827.32	827.42	827.82	828.21
64	823.89	824.39	824.89	824.99	825.38	825.78
65	821.45	821.95	822.45	822.55	822.95	823.34
66	819.01	819.51	820.01	820.11	820.51	820.91
67	816.56	817.06	817.57	817.67	818.07	818.47
68	814.11	814.62	815.12	815.22	815.63	816.03
69	811.66	812.17	812.68	812.78	813.18	813.58
70	809.21	809.72	810.23	810.33	810.73	811.14
71	806.76	807.27	807.78	807.88	808.29	808.69
72	804.30	804.81	805.32	805.43	805.84	806.24
73	801.84	802.36	802.87	802.97	803.38	803.79
74	799.38	799.90	800.41	800.52	800.93	801.34
75	796.92	797.44	797.96	798.06	798.47	798.88
76	794.46	794.98	795.49	795.60	796.01	796.43
77	791.99	792.51	793.03	793.14	793.55	793.97
78	789.52	790.05	790.57	790.67	791.09	791.51
79	787.05	787.58	788.10	788.21	788.63	789.04
80	784.58	785.11	785.63	785.74	786.16	786.58
81	782.11	782.63	783.16	783.27	783.69	784.11
82	779.63	780.16	780.69	780.80	781.22	781.64
83	777.15	777.68	778.22	778.32	778.75	779.17
84	774.67	775.21	775.74	775.85	776.27	776.70
85	772.19	772.73	773.26	773.37	773.80	774.22
86	769.71	770.24	770.78	770.89	771.32	771.75
87	767.22	767.76	768.30	768.40	768.84	769.27
88	764.73	765.27	765.81	765.92	766.35	766.79
89	762.24	762.78	763.33	763.43	763.87	764.30
90	759.75	760.29	760.84	760.95	761.38	761.82
91	757.25	757.80	758.35	758.46	758.89	759.33
92	754.76	755.31	755.85	755.96	756.40	756.84
93	752.26	752.81	753.36	753.47	753.91	754.35
94	749.76	750.31	750.86	750.97	751.41	751.86
95	747.26	747.81	748.36	748.47	748.92	749.36
96	744.75	745.31	745.86	745.97	746.42	746.86
97	742.24	742.80	743.36	743.47	743.92	744.36
98	739.74	740.30	740.85	740.97	741.41	741.86
99	737.22	737.79	738.35	738.46	738.91	739.36
100	734.71	735.28	735.84	735.95	736.40	736.85
101	732.20	732.76	733.33	733.44	733.89	734.35
102	729.68	730.25	730.82	730.93	731.38	731.84
103	727.16	727.73	728.30	728.41	728.87	729.32
104	724.64	725.21	725.78	725.90	726.35	726.81
105	722.12	722.69	723.26	723.38	723.84	724.30
106	719.59	720.17	720.74	720.86	721.32	721.78
107	717.07	717.64	718.22	718.34	718.80	719.26
108	714.54	715.12	715.70	715.81	716.27	716.74

Row\Col	0	5	10	11	15	19
109	712.01	712.59	713.17	713.28	713.75	714.21
110	709.47	710.06	710.64	710.76	711.22	711.69
111	706.94	707.52	708.11	708.23	708.69	709.16
112	704.40	704.99	705.58	705.69	706.16	706.63
113	701.86	702.45	703.04	703.16	703.63	704.10
114	699.32	699.91	700.50	700.62	701.09	701.57
115	696.78	697.37	697.96	698.08	698.56	699.03
116	694.23	694.83	695.42	695.54	696.02	696.49
117	691.69	692.28	692.88	693.00	693.48	693.95
118	689.14	689.74	690.33	690.45	690.93	691.41
119	686.59	687.19	687.79	687.91	688.39	688.87
120	684.03	684.64	685.24	685.36	685.84	686.32
121	681.48	682.08	682.69	682.81	683.29	683.77
122	678.92	679.53	680.13	680.25	680.74	681.22
123	676.36	676.97	677.58	677.70	678.19	678.67
124	673.80	674.41	675.02	675.14	675.63	676.12
125	671.24	671.85	672.46	672.58	673.07	673.56
126	668.67	669.29	669.90	670.02	670.51	671.00
127	666.10	666.72	667.34	667.46	667.95	668.44
128	663.54	664.15	664.77	664.89	665.39	665.88
129	660.96	661.58	662.20	662.33	662.82	663.32
130	658.39	659.01	659.63	659.76	660.26	660.75
131	655.81	656.44	657.06	657.19	657.69	658.18
132	653.24	653.86	654.49	654.61	655.11	655.61
133	650.66	651.29	651.91	652.04	652.54	653.04
134	648.08	648.71	649.34	649.46	649.97	650.47
135	645.49	646.12	646.76	646.88	647.39	647.89
136	642.91	643.54	644.17	644.30	644.81	645.31
137	640.32	640.96	641.59	641.72	642.23	642.73
138	637.73	638.37	639.01	639.13	639.64	640.15
139	635.14	635.78	636.42	636.55	637.06	637.57
140	632.55	633.19	633.83	633.96	634.47	634.98
141	629.95	630.59	631.24	631.36	631.88	632.39
142	627.35	628.00	628.64	628.77	629.29	629.80
143	624.75	625.40	626.05	626.18	626.69	627.21
144	622.15	622.80	623.45	623.58	624.10	624.62
145	619.55	620.20	620.85	620.98	621.50	622.02
146	616.94	617.59	618.25	618.38	618.90	619.42
147	614.33	614.99	615.64	615.77	616.30	616.82
148	611.72	612.38	613.04	613.17	613.70	614.22
149	609.11	609.77	610.43	610.56	611.09	611.62
150	606.50	607.16	607.82	607.95	608.48	609.01
151	603.88	604.54	605.21	605.34	605.87	606.40
152	601.26	601.93	602.59	602.73	603.26	603.79
153	598.64	599.31	599.98	600.11	600.65	601.18
154	596.02	596.69	597.36	597.49	598.03	598.57

Row\Col	0	5	10	11	15	19
155	593.40	594.07	594.74	594.87	595.41	595.95
156	590.77	591.44	592.12	592.25	592.79	593.33
157	588.14	588.82	589.49	589.63	590.17	590.71
158	585.51	586.19	586.87	587.00	587.55	588.09
159	582.88	583.56	584.24	584.38	584.92	585.46
160	580.25	580.93	581.61	581.75	582.29	582.84
161	577.61	578.29	578.98	579.12	579.66	580.21
162	574.97	575.66	576.34	576.48	577.03	577.58
163	572.33	573.02	573.71	573.85	574.40	574.95
164	569.69	570.38	571.07	571.21	571.76	572.31
165	567.05	567.74	568.43	568.57	569.12	569.68
166	564.40	565.09	565.79	565.93	566.48	567.04
167	561.75	562.45	563.14	563.28	563.84	564.40
168	559.10	559.80	560.50	560.64	561.20	561.75
169	556.45	557.15	557.85	557.99	558.55	559.11
170	553.79	554.50	555.20	555.34	555.90	556.46
171	551.14	551.84	552.55	552.69	553.25	553.81
172	548.48	549.19	549.89	550.03	550.60	551.16
173	545.82	546.53	547.24	547.38	547.94	548.51
174	543.16	543.87	544.58	544.72	545.29	545.86
175	540.49	541.20	541.92	542.06	542.63	543.20
176	537.83	538.54	539.25	539.40	539.97	540.54
177	535.16	535.87	536.59	536.73	537.31	537.88
178	532.49	533.21	533.92	534.07	534.64	535.22
179	529.81	530.53	531.26	531.40	531.98	532.55
180	527.14	527.86	528.59	528.73	529.31	529.89
181	524.46	525.19	525.91	526.06	526.64	527.22
182	521.78	522.51	523.24	523.38	523.96	524.55
183	519.10	519.83	520.56	520.71	521.29	521.87
184	516.42	517.15	517.88	518.03	518.61	519.20
185	513.74	514.47	515.20	515.35	515.94	516.52
186	511.05	511.78	512.52	512.67	513.26	513.84
187	508.36	509.10	509.84	509.98	510.57	511.16
188	505.67	506.41	507.15	507.30	507.89	508.48
189	502.98	503.72	504.46	504.61	505.20	505.79
190	500.28	501.03	501.77	501.92	502.51	503.11
191	497.59	498.33	499.08	499.23	499.82	500.42
192	494.89	495.63	496.38	496.53	497.13	497.73
193	492.19	492.94	493.69	493.84	494.44	495.04
194	489.48	490.23	490.99	491.14	491.74	492.34
195	486.78	487.53	488.29	488.44	489.04	489.64
196	484.07	484.83	485.58	485.73	486.34	486.94
197	481.36	482.12	482.88	483.03	483.64	484.24
198	478.65	479.41	480.17	480.32	480.93	481.54
199	475.94	476.70	477.46	477.62	478.23	478.84

Table - Deviation in the DLVS column average wavelength scale (in nm) with optics temperature (from 160ºK to 260ºK) from the value at 210ºK (by row).

Row	260	240	220	200	180	160
0	-0.162	-0.097	-0.032	0.032	0.097	0.162
1	-0.162	-0.097	-0.032	0.032	0.097	0.162
2	-0.163	-0.098	-0.033	0.033	0.098	0.163
3	-0.163	-0.098	-0.033	0.033	0.098	0.163
4	-0.164	-0.098	-0.033	0.033	0.098	0.164
5	-0.164	-0.098	-0.033	0.033	0.098	0.164
6	-0.164	-0.099	-0.033	0.033	0.099	0.164
7	-0.165	-0.099	-0.033	0.033	0.099	0.165
8	-0.165	-0.099	-0.033	0.033	0.099	0.165
9	-0.166	-0.100	-0.033	0.033	0.100	0.166
10	-0.166	-0.100	-0.033	0.033	0.100	0.166
11	-0.167	-0.100	-0.033	0.033	0.100	0.167
12	-0.167	-0.100	-0.033	0.033	0.100	0.167
13	-0.168	-0.101	-0.034	0.034	0.101	0.168
14	-0.168	-0.101	-0.034	0.034	0.101	0.168
15	-0.169	-0.101	-0.034	0.034	0.101	0.169
16	-0.169	-0.102	-0.034	0.034	0.102	0.169
17	-0.170	-0.102	-0.034	0.034	0.102	0.170
18	-0.170	-0.102	-0.034	0.034	0.102	0.170
19	-0.171	-0.103	-0.034	0.034	0.103	0.171
20	-0.171	-0.103	-0.034	0.034	0.103	0.171
21	-0.172	-0.103	-0.034	0.034	0.103	0.172
22	-0.172	-0.103	-0.034	0.034	0.103	0.172
23	-0.173	-0.104	-0.035	0.035	0.104	0.173
24	-0.173	-0.104	-0.035	0.035	0.104	0.173
25	-0.174	-0.104	-0.035	0.035	0.104	0.174
26	-0.174	-0.105	-0.035	0.035	0.105	0.174
27	-0.175	-0.105	-0.035	0.035	0.105	0.175
28	-0.176	-0.105	-0.035	0.035	0.105	0.176
29	-0.176	-0.106	-0.035	0.035	0.106	0.176
30	-0.177	-0.106	-0.035	0.035	0.106	0.177
31	-0.177	-0.106	-0.035	0.035	0.106	0.177
32	-0.178	-0.107	-0.036	0.036	0.107	0.178
33	-0.178	-0.107	-0.036	0.036	0.107	0.178
34	-0.179	-0.107	-0.036	0.036	0.107	0.179
35	-0.179	-0.108	-0.036	0.036	0.108	0.179
36	-0.180	-0.108	-0.036	0.036	0.108	0.180
37	-0.180	-0.108	-0.036	0.036	0.108	0.180
38	-0.181	-0.109	-0.036	0.036	0.109	0.181
39	-0.181	-0.109	-0.036	0.036	0.109	0.181
40	-0.182	-0.109	-0.036	0.036	0.109	0.182
41	-0.183	-0.110	-0.037	0.037	0.110	0.183
42	-0.183	-0.110	-0.037	0.037	0.110	0.183
43	-0.184	-0.110	-0.037	0.037	0.110	0.184
44	-0.184	-0.111	-0.037	0.037	0.111	0.184
45	-0.185	-0.111	-0.037	0.037	0.111	0.185

Row	260	240	220	200	180	160
46	-0.185	-0.111	-0.037	0.037	0.111	0.185
47	-0.186	-0.112	-0.037	0.037	0.112	0.186
48	-0.187	-0.112	-0.037	0.037	0.112	0.187
49	-0.187	-0.112	-0.037	0.037	0.112	0.187
50	-0.188	-0.113	-0.038	0.038	0.113	0.188
51	-0.188	-0.113	-0.038	0.038	0.113	0.188
52	-0.189	-0.113	-0.038	0.038	0.113	0.189
53	-0.189	-0.114	-0.038	0.038	0.114	0.189
54	-0.190	-0.114	-0.038	0.038	0.114	0.190
55	-0.191	-0.114	-0.038	0.038	0.114	0.191
56	-0.191	-0.115	-0.038	0.038	0.115	0.191
57	-0.192	-0.115	-0.038	0.038	0.115	0.192
58	-0.192	-0.115	-0.038	0.038	0.115	0.192
59	-0.193	-0.116	-0.039	0.039	0.116	0.193
60	-0.194	-0.116	-0.039	0.039	0.116	0.194
61	-0.194	-0.117	-0.039	0.039	0.117	0.194
62	-0.195	-0.117	-0.039	0.039	0.117	0.195
63	-0.195	-0.117	-0.039	0.039	0.117	0.195
64	-0.196	-0.118	-0.039	0.039	0.118	0.196
65	-0.197	-0.118	-0.039	0.039	0.118	0.197
66	-0.197	-0.118	-0.039	0.039	0.118	0.197
67	-0.198	-0.119	-0.040	0.040	0.119	0.198
68	-0.198	-0.119	-0.040	0.040	0.119	0.198
69	-0.199	-0.119	-0.040	0.040	0.119	0.199
70	-0.200	-0.120	-0.040	0.040	0.120	0.200
71	-0.200	-0.120	-0.040	0.040	0.120	0.200
72	-0.201	-0.121	-0.040	0.040	0.121	0.201
73	-0.202	-0.121	-0.040	0.040	0.121	0.202
74	-0.202	-0.121	-0.040	0.040	0.121	0.202
75	-0.203	-0.122	-0.041	0.041	0.122	0.203
76	-0.203	-0.122	-0.041	0.041	0.122	0.203
77	-0.204	-0.122	-0.041	0.041	0.122	0.204
78	-0.205	-0.123	-0.041	0.041	0.123	0.205
79	-0.205	-0.123	-0.041	0.041	0.123	0.205
80	-0.206	-0.124	-0.041	0.041	0.124	0.206
81	-0.207	-0.124	-0.041	0.041	0.124	0.207
82	-0.207	-0.124	-0.041	0.041	0.124	0.207
83	-0.208	-0.125	-0.042	0.042	0.125	0.208
84	-0.209	-0.125	-0.042	0.042	0.125	0.209
85	-0.209	-0.126	-0.042	0.042	0.126	0.209
86	-0.210	-0.126	-0.042	0.042	0.126	0.210
87	-0.211	-0.126	-0.042	0.042	0.126	0.211
88	-0.211	-0.127	-0.042	0.042	0.127	0.211
89	-0.212	-0.127	-0.042	0.042	0.127	0.212
90	-0.213	-0.128	-0.043	0.043	0.128	0.213
91	-0.213	-0.128	-0.043	0.043	0.128	0.213
92	-0.214	-0.128	-0.043	0.043	0.128	0.214
93	-0.215	-0.129	-0.043	0.043	0.129	0.215

Row	260	240	220	200	180	160
94	-0.215	-0.129	-0.043	0.043	0.129	0.215
95	-0.216	-0.130	-0.043	0.043	0.130	0.216
96	-0.217	-0.130	-0.043	0.043	0.130	0.217
97	-0.217	-0.130	-0.043	0.043	0.130	0.217
98	-0.218	-0.131	-0.044	0.044	0.131	0.218
99	-0.219	-0.131	-0.044	0.044	0.131	0.219
100	-0.219	-0.132	-0.044	0.044	0.132	0.219
101	-0.220	-0.132	-0.044	0.044	0.132	0.220
102	-0.221	-0.132	-0.044	0.044	0.132	0.221
103	-0.222	-0.133	-0.044	0.044	0.133	0.222
104	-0.222	-0.133	-0.044	0.044	0.133	0.222
105	-0.223	-0.134	-0.045	0.045	0.134	0.223
106	-0.224	-0.134	-0.045	0.045	0.134	0.224
107	-0.224	-0.135	-0.045	0.045	0.135	0.224
108	-0.225	-0.135	-0.045	0.045	0.135	0.225
109	-0.226	-0.135	-0.045	0.045	0.135	0.226
110	-0.226	-0.136	-0.045	0.045	0.136	0.226
111	-0.227	-0.136	-0.045	0.045	0.136	0.227
112	-0.228	-0.137	-0.046	0.046	0.137	0.228
113	-0.229	-0.137	-0.046	0.046	0.137	0.229
114	-0.229	-0.138	-0.046	0.046	0.138	0.229
115	-0.230	-0.138	-0.046	0.046	0.138	0.230
116	-0.231	-0.138	-0.046	0.046	0.138	0.231
117	-0.232	-0.139	-0.046	0.046	0.139	0.232
118	-0.232	-0.139	-0.046	0.046	0.139	0.232
119	-0.233	-0.140	-0.047	0.047	0.140	0.233
120	-0.234	-0.140	-0.047	0.047	0.140	0.234
121	-0.234	-0.141	-0.047	0.047	0.141	0.234
122	-0.235	-0.141	-0.047	0.047	0.141	0.235
123	-0.236	-0.142	-0.047	0.047	0.142	0.236
124	-0.237	-0.142	-0.047	0.047	0.142	0.237
125	-0.237	-0.142	-0.047	0.047	0.142	0.237
126	-0.238	-0.143	-0.048	0.048	0.143	0.238
127	-0.239	-0.143	-0.048	0.048	0.143	0.239
128	-0.240	-0.144	-0.048	0.048	0.144	0.240
129	-0.240	-0.144	-0.048	0.048	0.144	0.240
130	-0.241	-0.145	-0.048	0.048	0.145	0.241
131	-0.242	-0.145	-0.048	0.048	0.145	0.242
132	-0.243	-0.146	-0.049	0.049	0.146	0.243
133	-0.243	-0.146	-0.049	0.049	0.146	0.243
134	-0.244	-0.147	-0.049	0.049	0.147	0.244
135	-0.245	-0.147	-0.049	0.049	0.147	0.245
136	-0.246	-0.147	-0.049	0.049	0.147	0.246
137	-0.247	-0.148	-0.049	0.049	0.148	0.247
138	-0.247	-0.148	-0.049	0.049	0.148	0.247
139	-0.248	-0.149	-0.050	0.050	0.149	0.248
140	-0.249	-0.149	-0.050	0.050	0.149	0.249
141	-0.250	-0.150	-0.050	0.050	0.150	0.250

Row	260	240	220	200	180	160
142	-0.250	-0.150	-0.050	0.050	0.150	0.250
143	-0.251	-0.151	-0.050	0.050	0.151	0.251
144	-0.252	-0.151	-0.050	0.050	0.151	0.252
145	-0.253	-0.152	-0.051	0.051	0.152	0.253
146	-0.254	-0.152	-0.051	0.051	0.152	0.254
147	-0.254	-0.153	-0.051	0.051	0.153	0.254
148	-0.255	-0.153	-0.051	0.051	0.153	0.255
149	-0.256	-0.154	-0.051	0.051	0.154	0.256
150	-0.257	-0.154	-0.051	0.051	0.154	0.257
151	-0.258	-0.155	-0.052	0.052	0.155	0.258
152	-0.258	-0.155	-0.052	0.052	0.155	0.258
153	-0.259	-0.156	-0.052	0.052	0.156	0.259
154	-0.260	-0.156	-0.052	0.052	0.156	0.260
155	-0.261	-0.157	-0.052	0.052	0.157	0.261
156	-0.262	-0.157	-0.052	0.052	0.157	0.262
157	-0.263	-0.158	-0.053	0.053	0.158	0.263
158	-0.263	-0.158	-0.053	0.053	0.158	0.263
159	-0.264	-0.159	-0.053	0.053	0.159	0.264
160	-0.265	-0.159	-0.053	0.053	0.159	0.265
161	-0.266	-0.160	-0.053	0.053	0.160	0.266
162	-0.267	-0.160	-0.053	0.053	0.160	0.267
163	-0.268	-0.161	-0.054	0.054	0.161	0.268
164	-0.268	-0.161	-0.054	0.054	0.161	0.268
165	-0.269	-0.162	-0.054	0.054	0.162	0.269
166	-0.270	-0.162	-0.054	0.054	0.162	0.270
167	-0.271	-0.163	-0.054	0.054	0.163	0.271
168	-0.272	-0.163	-0.054	0.054	0.163	0.272
169	-0.273	-0.164	-0.055	0.055	0.164	0.273
170	-0.273	-0.164	-0.055	0.055	0.164	0.273
171	-0.274	-0.165	-0.055	0.055	0.165	0.274
172	-0.275	-0.165	-0.055	0.055	0.165	0.275
173	-0.276	-0.166	-0.055	0.055	0.166	0.276
174	-0.277	-0.166	-0.055	0.055	0.166	0.277
175	-0.278	-0.167	-0.056	0.056	0.167	0.278
176	-0.279	-0.167	-0.056	0.056	0.167	0.279
177	-0.279	-0.168	-0.056	0.056	0.168	0.279
178	-0.280	-0.168	-0.056	0.056	0.168	0.280
179	-0.281	-0.169	-0.056	0.056	0.169	0.281
180	-0.282	-0.169	-0.056	0.056	0.169	0.282
181	-0.283	-0.170	-0.057	0.057	0.170	0.283
182	-0.284	-0.170	-0.057	0.057	0.170	0.284
183	-0.285	-0.171	-0.057	0.057	0.171	0.285
184	-0.286	-0.171	-0.057	0.057	0.171	0.286
185	-0.286	-0.172	-0.057	0.057	0.172	0.286
186	-0.287	-0.172	-0.057	0.057	0.172	0.287
187	-0.288	-0.173	-0.058	0.058	0.173	0.288
188	-0.289	-0.174	-0.058	0.058	0.174	0.289
189	-0.290	-0.174	-0.058	0.058	0.174	0.290

Row	260	240	220	200	180	160
190	-0.291	-0.175	-0.058	0.058	0.175	0.291
191	-0.292	-0.175	-0.058	0.058	0.175	0.292
192	-0.293	-0.176	-0.059	0.059	0.176	0.293
193	-0.294	-0.176	-0.059	0.059	0.176	0.294
194	-0.295	-0.177	-0.059	0.059	0.177	0.295
195	-0.295	-0.177	-0.059	0.059	0.177	0.295
196	-0.296	-0.178	-0.059	0.059	0.178	0.296
197	-0.297	-0.178	-0.059	0.059	0.178	0.297
198	-0.298	-0.179	-0.060	0.060	0.179	0.298
199	-0.299	-0.179	-0.060	0.060	0.179	0.299

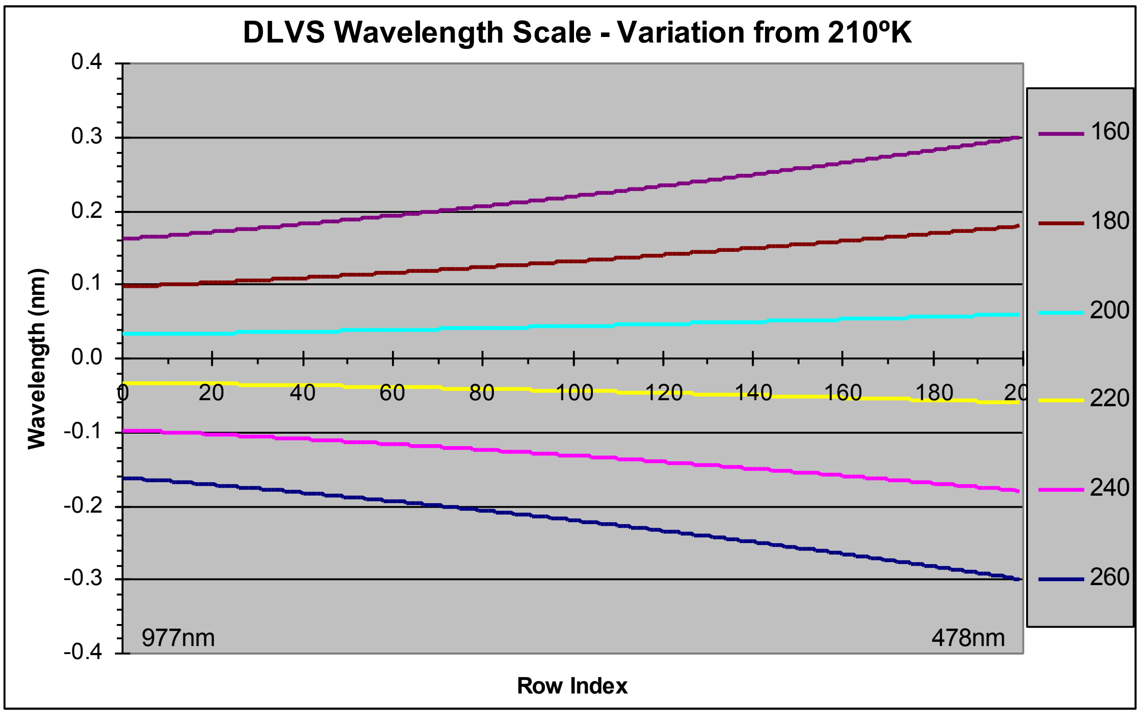


Figure - Plot of the values from the preceding table (DLVS wavelength scale variation with optics temperature).

Table - The wavelengths corresponding to each DLVS pixel at 210ºK

Col-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	975.96	976.04	976.12	976.19	976.27	976.35	976.42	976.50	976.58	976.65	976.73	976.81	976.88	976.96	977.04	977.11	977.19	977.27	977.34	977.42
1	973.65	973.73	973.81	973.88	973.96	974.04	974.11	974.19	974.27	974.34	974.42	974.50	974.57	974.65	974.73	974.81	974.88	974.96	975.04	975.11
2	971.34	971.41	971.49	971.57	971.65	971.72	971.80	971.88	971.96	972.03	972.11	972.19	972.26	972.34	972.42	972.50	972.57	972.65	972.73	972.81
3	969.02	969.10	969.18	969.25	969.33	969.41	969.49	969.56	969.64	969.72	969.80	969.87	969.95	970.03	970.11	970.19	970.26	970.34	970.42	970.50
4	966.70	966.78	966.86	966.94	967.01	967.09	967.17	967.25	967.33	967.40	967.48	967.56	967.64	967.72	967.79	967.87	967.95	968.03	968.11	968.18
5	964.38	964.46	964.54	964.62	964.70	964.77	964.85	964.93	965.01	965.09	965.17	965.24	965.32	965.40	965.48	965.56	965.64	965.71	965.79	965.87
6	962.06	962.14	962.22	962.30	962.37	962.45	962.53	962.61	962.69	962.77	962.85	962.92	963.00	963.08	963.16	963.24	963.32	963.40	963.48	963.55
7	959.73	959.81	959.89	959.97	960.05	960.13	960.21	960.29	960.37	960.45	960.53	960.60	960.68	960.76	960.84	960.92	961.00	961.08	961.16	961.24
8	957.41	957.49	957.57	957.65	957.73	957.81	957.88	957.96	958.04	958.12	958.20	958.28	958.36	958.44	958.52	958.60	958.68	958.76	958.84	958.92
9	955.08	955.16	955.24	955.32	955.40	955.48	955.56	955.64	955.72	955.80	955.88	955.96	956.04	956.12	956.20	956.28	956.36	956.43	956.51	956.59
10	952.75	952.83	952.91	952.99	953.07	953.15	953.23	953.31	953.39	953.47	953.55	953.63	953.71	953.79	953.87	953.95	954.03	954.11	954.19	954.27
11	950.42	950.50	950.58	950.66	950.74	950.82	950.90	950.98	951.06	951.14	951.22	951.30	951.38	951.46	951.54	951.62	951.70	951.78	951.86	951.94
12	948.08	948.16	948.24	948.32	948.41	948.49	948.57	948.65	948.73	948.81	948.89	948.97	949.05	949.13	949.21	949.29	949.37	949.45	949.54	949.62
13	945.75	945.83	945.91	945.99	946.07	946.15	946.23	946.31	946.39	946.48	946.56	946.64	946.72	946.80	946.88	946.96	947.04	947.12	947.20	947.29
14	943.41	943.49	943.57	943.65	943.73	943.81	943.90	943.98	944.06	944.14	944.22	944.30	944.38	944.47	944.55	944.63	944.71	944.79	944.87	944.95
15	941.07	941.15	941.23	941.31	941.39	941.48	941.56	941.64	941.72	941.80	941.88	941.97	942.05	942.13	942.21	942.29	942.37	942.46	942.54	942.62
16	938.72	938.81	938.89	938.97	939.05	939.13	939.22	939.30	939.38	939.46	939.54	939.63	939.71	939.79	939.87	939.96	940.04	940.12	940.20	940.28
17	936.38	936.46	936.54	936.63	936.71	936.79	936.87	936.96	937.04	937.12	937.20	937.29	937.37	937.45	937.53	937.62	937.70	937.78	937.86	937.95
18	934.03	934.11	934.20	934.28	934.36	934.45	934.53	934.61	934.69	934.78	934.86	934.94	935.03	935.11	935.19	935.27	935.36	935.44	935.52	935.61
19	931.68	931.77	931.85	931.93	932.02	932.10	932.18	932.27	932.35	932.43	932.51	932.60	932.68	932.76	932.85	932.93	933.01	933.10	933.18	933.26
20	929.33	929.42	929.50	929.58	929.67	929.75	929.83	929.92	930.00	930.08	930.17	930.25	930.33	930.42	930.50	930.59	930.67	930.75	930.84	930.92
21	926.98	927.06	927.15	927.23	927.32	927.40	927.48	927.57	927.65	927.73	927.82	927.90	927.99	928.07	928.15	928.24	928.32	928.41	928.49	928.57
22	924.62	924.71	924.79	924.88	924.96	925.05	925.13	925.21	925.30	925.38	925.47	925.55	925.64	925.72	925.80	925.89	925.97	926.06	926.14	926.22
23	922.27	922.35	922.44	922.52	922.61	922.69	922.78	922.86	922.94	923.03	923.11	923.20	923.28	923.37	923.45	923.54	923.62	923.71	923.79	923.87
24	919.91	919.99	920.08	920.16	920.25	920.33	920.42	920.50	920.59	920.67	920.76	920.84	920.93	921.01	921.10	921.18	921.27	921.35	921.44	921.52
25	917.55	917.63	917.72	917.80	917.89	917.97	918.06	918.14	918.23	918.32	918.40	918.49	918.57	918.66	918.74	918.83	918.91	919.00	919.08	919.17
26	915.19	915.27	915.36	915.44	915.53	915.61	915.70	915.78	915.87	915.96	916.04	916.13	916.21	916.30	916.38	916.47	916.55	916.64	916.73	916.81
27	912.82	912.91	912.99	913.08	913.16	913.25	913.34	913.42	913.51	913.59	913.68	913.77	913.85	913.94	914.02	914.11	914.20	914.28	914.37	914.45
28	910.45	910.54	910.63	910.71	910.80	910.88	910.97	911.06	911.14	911.23	911.32	911.40	911.49	911.58	911.66	911.75	911.83	911.92	912.01	912.09
29	908.08	908.17	908.26	908.34	908.43	908.52	908.60	908.69	908.78	908.86	908.95	909.04	909.12	909.21	909.30	909.38	909.47	909.56	909.64	909.73
30	905.71	905.80	905.89	905.97	906.06	906.15	906.24	906.32	906.41	906.50	906.58	906.67	906.76	906.84	906.93	907.02	907.11	907.19	907.28	907.37

Col-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
31	903.34	903.43	903.51	903.60	903.69	903.78	903.86	903.95	904.04	904.13	904.21	904.30	904.39	904.48	904.56	904.65	904.74	904.83	904.91	905.00
32	900.97	901.05	901.14	901.23	901.32	901.40	901.49	901.58	901.67	901.75	901.84	901.93	902.02	902.11	902.19	902.28	902.37	902.46	902.54	902.63
33	898.59	898.68	898.76	898.85	898.94	899.03	899.12	899.20	899.29	899.38	899.47	899.56	899.64	899.73	899.82	899.91	900.00	900.09	900.17	900.26
34	896.21	896.30	896.39	896.47	896.56	896.65	896.74	896.83	896.92	897.00	897.09	897.18	897.27	897.36	897.45	897.54	897.62	897.71	897.80	897.89
35	893.83	893.92	894.01	894.09	894.18	894.27	894.36	894.45	894.54	894.63	894.72	894.80	894.89	894.98	895.07	895.16	895.25	895.34	895.43	895.51
36	891.44	891.53	891.62	891.71	891.80	891.89	891.98	892.07	892.16	892.25	892.34	892.43	892.51	892.60	892.69	892.78	892.87	892.96	893.05	893.14
37	889.06	889.15	889.24	889.33	889.42	889.51	889.60	889.69	889.78	889.86	889.95	890.04	890.13	890.22	890.31	890.40	890.49	890.58	890.67	890.76
38	886.67	886.76	886.85	886.94	887.03	887.12	887.21	887.30	887.39	887.48	887.57	887.66	887.75	887.84	887.93	888.02	888.11	888.20	888.29	888.38
39	884.28	884.37	884.46	884.55	884.64	884.73	884.82	884.91	885.00	885.09	885.18	885.28	885.37	885.46	885.55	885.64	885.73	885.82	885.91	886.00
40	881.89	881.98	882.07	882.16	882.25	882.34	882.44	882.53	882.62	882.71	882.80	882.89	882.98	883.07	883.16	883.25	883.34	883.43	883.52	883.61
41	879.50	879.59	879.68	879.77	879.86	879.95	880.04	880.13	880.23	880.32	880.41	880.50	880.59	880.68	880.77	880.86	880.95	881.04	881.13	881.23
42	877.10	877.19	877.29	877.38	877.47	877.56	877.65	877.74	877.83	877.92	878.02	878.11	878.20	878.29	878.38	878.47	878.56	878.65	878.75	878.84
43	874.71	874.80	874.89	874.98	875.07	875.16	875.26	875.35	875.44	875.53	875.62	875.71	875.81	875.90	875.99	876.08	876.17	876.26	876.36	876.45
44	872.31	872.40	872.49	872.58	872.67	872.77	872.86	872.95	873.04	873.13	873.23	873.32	873.41	873.50	873.59	873.69	873.78	873.87	873.96	874.05
45	869.91	870.00	870.09	870.18	870.27	870.37	870.46	870.55	870.64	870.74	870.83	870.92	871.01	871.11	871.20	871.29	871.38	871.47	871.57	871.66
46	867.50	867.59	867.69	867.78	867.87	867.97	868.06	868.15	868.24	868.34	868.43	868.52	868.61	868.71	868.80	868.89	868.98	869.08	869.17	869.26
47	865.10	865.19	865.28	865.38	865.47	865.56	865.65	865.75	865.84	865.93	866.03	866.12	866.21	866.31	866.40	866.49	866.59	866.68	866.77	866.86
48	862.69	862.78	862.88	862.97	863.06	863.16	863.25	863.34	863.44	863.53	863.62	863.72	863.81	863.90	864.00	864.09	864.18	864.28	864.37	864.46
49	860.28	860.37	860.47	860.56	860.65	860.75	860.84	860.94	861.03	861.12	861.22	861.31	861.40	861.50	861.59	861.69	861.78	861.87	861.97	862.06
50	857.87	857.96	858.06	858.15	858.24	858.34	858.43	858.53	858.62	858.72	858.81	858.90	859.00	859.09	859.19	859.28	859.37	859.47	859.56	859.66
51	855.45	855.55	855.64	855.74	855.83	855.93	856.02	856.12	856.21	856.30	856.40	856.49	856.59	856.68	856.78	856.87	856.97	857.06	857.16	857.25
52	853.04	853.13	853.23	853.32	853.42	853.51	853.61	853.70	853.80	853.89	853.99	854.08	854.18	854.27	854.37	854.46	854.56	854.65	854.75	854.84
53	850.62	850.72	850.81	850.91	851.00	851.10	851.19	851.29	851.38	851.48	851.57	851.67	851.76	851.86	851.95	852.05	852.14	852.24	852.34	852.43
54	848.20	848.30	848.39	848.49	848.58	848.68	848.78	848.87	848.97	849.06	849.16	849.25	849.35	849.44	849.54	849.64	849.73	849.83	849.92	850.02
55	845.78	845.88	845.97	846.07	846.16	846.26	846.36	846.45	846.55	846.64	846.74	846.84	846.93	847.03	847.12	847.22	847.32	847.41	847.51	847.60
56	843.36	843.45	843.55	843.65	843.74	843.84	843.93	844.03	844.13	844.22	844.32	844.42	844.51	844.61	844.70	844.80	844.90	844.99	845.09	845.19
57	840.93	841.03	841.12	841.22	841.32	841.41	841.51	841.61	841.70	841.80	841.90	841.99	842.09	842.19	842.28	842.38	842.48	842.57	842.67	842.77
58	838.50	838.60	838.70	838.79	838.89	838.99	839.09	839.18	839.28	839.38	839.47	839.57	839.67	839.76	839.86	839.96	840.06	840.15	840.25	840.35
59	836.07	836.17	836.27	836.37	836.46	836.56	836.66	836.75	836.85	836.95	837.05	837.14	837.24	837.34	837.44	837.53	837.63	837.73	837.83	837.92
60	833.64	833.74	833.84	833.93	834.03	834.13	834.23	834.33	834.42	834.52	834.62	834.72	834.81	834.91	835.01	835.11	835.21	835.30	835.40	835.50
61	831.21	831.31	831.40	831.50	831.60	831.70	831.80	831.89	831.99	832.09	832.19	832.29	832.39	832.48	832.58	832.68	832.78	832.88	832.97	833.07
62	828.77	828.87	828.97	829.07	829.17	829.26	829.36	829.46	829.56	829.66	829.76	829.86	829.95	830.05	830.15	830.25	830.35	830.45	830.54	830.64

Col-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
63	826.33	826.43	826.53	826.63	826.73	826.83	826.93	827.03	827.12	827.22	827.32	827.42	827.52	827.62	827.72	827.82	827.92	828.01	828.11	828.21
64	823.89	823.99	824.09	824.19	824.29	824.39	824.49	824.59	824.69	824.79	824.89	824.99	825.08	825.18	825.28	825.38	825.48	825.58	825.68	825.78
65	821.45	821.55	821.65	821.75	821.85	821.95	822.05	822.15	822.25	822.35	822.45	822.55	822.65	822.75	822.85	822.95	823.05	823.15	823.25	823.34
66	819.01	819.11	819.21	819.31	819.41	819.51	819.61	819.71	819.81	819.91	820.01	820.11	820.21	820.31	820.41	820.51	820.61	820.71	820.81	820.91
67	816.56	816.66	816.76	816.86	816.96	817.06	817.16	817.26	817.37	817.47	817.57	817.67	817.77	817.87	817.97	818.07	818.17	818.27	818.37	818.47
68	814.11	814.22	814.32	814.42	814.52	814.62	814.72	814.82	814.92	815.02	815.12	815.22	815.32	815.42	815.52	815.63	815.73	815.83	815.93	816.03
69	811.66	811.77	811.87	811.97	812.07	812.17	812.27	812.37	812.47	812.57	812.68	812.78	812.88	812.98	813.08	813.18	813.28	813.38	813.48	813.58
70	809.21	809.31	809.42	809.52	809.62	809.72	809.82	809.92	810.02	810.13	810.23	810.33	810.43	810.53	810.63	810.73	810.84	810.94	811.04	811.14
71	806.76	806.86	806.96	807.06	807.17	807.27	807.37	807.47	807.57	807.67	807.78	807.88	807.98	808.08	808.18	808.29	808.39	808.49	808.59	808.69
72	804.30	804.40	804.51	804.61	804.71	804.81	804.92	805.02	805.12	805.22	805.32	805.43	805.53	805.63	805.73	805.84	805.94	806.04	806.14	806.24
73	801.84	801.95	802.05	802.15	802.25	802.36	802.46	802.56	802.66	802.77	802.87	802.97	803.08	803.18	803.28	803.38	803.49	803.59	803.69	803.79
74	799.38	799.49	799.59	799.69	799.80	799.90	800.00	800.10	800.21	800.31	800.41	800.52	800.62	800.72	800.83	800.93	801.03	801.13	801.24	801.34
75	796.92	797.03	797.13	797.23	797.34	797.44	797.54	797.65	797.75	797.85	797.96	798.06	798.16	798.27	798.37	798.47	798.58	798.68	798.78	798.88
76	794.46	794.56	794.67	794.77	794.87	794.98	795.08	795.18	795.29	795.39	795.49	795.60	795.70	795.81	795.91	796.01	796.12	796.22	796.32	796.43
77	791.99	792.10	792.20	792.30	792.41	792.51	792.62	792.72	792.82	792.93	793.03	793.14	793.24	793.34	793.45	793.55	793.66	793.76	793.86	793.97
78	789.52	789.63	789.73	789.84	789.94	790.05	790.15	790.25	790.36	790.46	790.57	790.67	790.78	790.88	790.99	791.09	791.19	791.30	791.40	791.51
79	787.05	787.16	787.26	787.37	787.47	787.58	787.68	787.79	787.89	788.00	788.10	788.21	788.31	788.42	788.52	788.63	788.73	788.83	788.94	789.04
80	784.58	784.69	784.79	784.90	785.00	785.11	785.21	785.32	785.42	785.53	785.63	785.74	785.84	785.95	786.05	786.16	786.26	786.37	786.47	786.58
81	782.11	782.21	782.32	782.42	782.53	782.63	782.74	782.85	782.95	783.06	783.16	783.27	783.37	783.48	783.58	783.69	783.80	783.90	784.01	784.11
82	779.63	779.74	779.84	779.95	780.05	780.16	780.27	780.37	780.48	780.58	780.69	780.80	780.90	781.01	781.11	781.22	781.33	781.43	781.54	781.64
83	777.15	777.26	777.37	777.47	777.58	777.68	777.79	777.90	778.00	778.11	778.22	778.32	778.43	778.53	778.64	778.75	778.85	778.96	779.07	779.17
84	774.67	774.78	774.89	774.99	775.10	775.21	775.31	775.42	775.53	775.63	775.74	775.85	775.95	776.06	776.17	776.27	776.38	776.49	776.59	776.70
85	772.19	772.30	772.40	772.51	772.62	772.73	772.83	772.94	773.05	773.15	773.26	773.37	773.47	773.58	773.69	773.80	773.90	774.01	774.12	774.22
86	769.71	769.81	769.92	770.03	770.14	770.24	770.35	770.46	770.56	770.67	770.78	770.89	770.99	771.10	771.21	771.32	771.42	771.53	771.64	771.75
87	767.22	767.33	767.43	767.54	767.65	767.76	767.87	767.97	768.08	768.19	768.30	768.40	768.51	768.62	768.73	768.84	768.94	769.05	769.16	769.27
88	764.73	764.84	764.95	765.06	765.16	765.27	765.38	765.49	765.60	765.70	765.81	765.92	766.03	766.14	766.25	766.35	766.46	766.57	766.68	766.79
89	762.24	762.35	762.46	762.57	762.67	762.78	762.89	763.00	763.11	763.22	763.33	763.43	763.54	763.65	763.76	763.87	763.98	764.09	764.19	764.30
90	759.75	759.86	759.97	760.07	760.18	760.29	760.40	760.51	760.62	760.73	760.84	760.95	761.05	761.16	761.27	761.38	761.49	761.60	761.71	761.82
91	757.25	757.36	757.47	757.58	757.69	757.80	757.91	758.02	758.13	758.24	758.35	758.46	758.56	758.67	758.78	758.89	759.00	759.11	759.22	759.33
92	754.76	754.87	754.98	755.09	755.20	755.31	755.42	755.52	755.63	755.74	755.85	755.96	756.07	756.18	756.29	756.40	756.51	756.62	756.73	756.84
93	752.26	752.37	752.48	752.59	752.70	752.81	752.92	753.03	753.14	753.25	753.36	753.47	753.58	753.69	753.80	753.91	754.02	754.13	754.24	754.35
94	749.76	749.87	749.98	750.09	750.20	750.31	750.42	750.53	750.64	750.75	750.86	750.97	751.08	751.19	751.30	751.41	751.52	751.64	751.75	751.86

Col-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
95	747.26	747.37	747.48	747.59	747.70	747.81	747.92	748.03	748.14	748.25	748.36	748.47	748.58	748.70	748.81	748.92	749.03	749.14	749.25	749.36
96	744.75	744.86	744.97	745.08	745.20	745.31	745.42	745.53	745.64	745.75	745.86	745.97	746.08	746.20	746.31	746.42	746.53	746.64	746.75	746.86
97	742.24	742.36	742.47	742.58	742.69	742.80	742.91	743.03	743.14	743.25	743.36	743.47	743.58	743.69	743.81	743.92	744.03	744.14	744.25	744.36
98	739.74	739.85	739.96	740.07	740.18	740.30	740.41	740.52	740.63	740.74	740.85	740.97	741.08	741.19	741.30	741.41	741.53	741.64	741.75	741.86
99	737.22	737.34	737.45	737.56	737.67	737.79	737.90	738.01	738.12	738.24	738.35	738.46	738.57	738.69	738.80	738.91	739.02	739.13	739.25	739.36
100	734.71	734.82	734.94	735.05	735.16	735.28	735.39	735.50	735.61	735.73	735.84	735.95	736.06	736.18	736.29	736.40	736.52	736.63	736.74	736.85
101	732.20	732.31	732.42	732.54	732.65	732.76	732.88	732.99	733.10	733.22	733.33	733.44	733.55	733.67	733.78	733.89	734.01	734.12	734.23	734.35
102	729.68	729.79	729.91	730.02	730.13	730.25	730.36	730.47	730.59	730.70	730.82	730.93	731.04	731.16	731.27	731.38	731.50	731.61	731.72	731.84
103	727.16	727.28	727.39	727.50	727.62	727.73	727.85	727.96	728.07	728.19	728.30	728.41	728.53	728.64	728.76	728.87	728.98	729.10	729.21	729.32
104	724.64	724.76	724.87	724.98	725.10	725.21	725.33	725.44	725.56	725.67	725.78	725.90	726.01	726.13	726.24	726.35	726.47	726.58	726.70	726.81
105	722.12	722.23	722.35	722.46	722.58	722.69	722.81	722.92	723.04	723.15	723.26	723.38	723.49	723.61	723.72	723.84	723.95	724.07	724.18	724.30
106	719.59	719.71	719.82	719.94	720.05	720.17	720.28	720.40	720.51	720.63	720.74	720.86	720.97	721.09	721.20	721.32	721.43	721.55	721.66	721.78
107	717.07	717.18	717.30	717.41	717.53	717.64	717.76	717.87	717.99	718.11	718.22	718.34	718.45	718.57	718.68	718.80	718.91	719.03	719.14	719.26
108	714.54	714.65	714.77	714.89	715.00	715.12	715.23	715.35	715.46	715.58	715.70	715.81	715.93	716.04	716.16	716.27	716.39	716.51	716.62	716.74
109	712.01	712.12	712.24	712.36	712.47	712.59	712.70	712.82	712.94	713.05	713.17	713.28	713.40	713.52	713.63	713.75	713.87	713.98	714.10	714.21
110	709.47	709.59	709.71	709.82	709.94	710.06	710.17	710.29	710.41	710.52	710.64	710.76	710.87	710.99	711.11	711.22	711.34	711.45	711.57	711.69
111	706.94	707.06	707.17	707.29	707.41	707.52	707.64	707.76	707.87	707.99	708.11	708.23	708.34	708.46	708.58	708.69	708.81	708.93	709.04	709.16
112	704.40	704.52	704.64	704.75	704.87	704.99	705.11	705.22	705.34	705.46	705.58	705.69	705.81	705.93	706.04	706.16	706.28	706.40	706.51	706.63
113	701.86	701.98	702.10	702.22	702.33	702.45	702.57	702.69	702.80	702.92	703.04	703.16	703.28	703.39	703.51	703.63	703.75	703.86	703.98	704.10
114	699.32	699.44	699.56	699.68	699.79	699.91	700.03	700.15	700.27	700.38	700.50	700.62	700.74	700.86	700.98	701.09	701.21	701.33	701.45	701.57
115	696.78	696.90	697.02	697.13	697.25	697.37	697.49	697.61	697.73	697.85	697.96	698.08	698.20	698.32	698.44	698.56	698.67	698.79	698.91	699.03
116	694.23	694.35	694.47	694.59	694.71	694.83	694.95	695.07	695.18	695.30	695.42	695.54	695.66	695.78	695.90	696.02	696.14	696.25	696.37	696.49
117	691.69	691.81	691.93	692.04	692.16	692.28	692.40	692.52	692.64	692.76	692.88	693.00	693.12	693.24	693.36	693.48	693.59	693.71	693.83	693.95
118	689.14	689.26	689.38	689.50	689.62	689.74	689.86	689.98	690.09	690.21	690.33	690.45	690.57	690.69	690.81	690.93	691.05	691.17	691.29	691.41
119	686.59	686.71	686.83	686.95	687.07	687.19	687.31	687.43	687.55	687.67	687.79	687.91	688.03	688.15	688.27	688.39	688.51	688.63	688.75	688.87
120	684.03	684.15	684.27	684.39	684.52	684.64	684.76	684.88	685.00	685.12	685.24	685.36	685.48	685.60	685.72	685.84	685.96	686.08	686.20	686.32
121	681.48	681.60	681.72	681.84	681.96	682.08	682.20	682.32	682.44	682.57	682.69	682.81	682.93	683.05	683.17	683.29	683.41	683.53	683.65	683.77
122	678.92	679.04	679.16	679.28	679.41	679.53	679.65	679.77	679.89	680.01	680.13	680.25	680.38	680.50	680.62	680.74	680.86	680.98	681.10	681.22
123	676.36	676.48	676.60	676.73	676.85	676.97	677.09	677.21	677.33	677.46	677.58	677.70	677.82	677.94	678.06	678.19	678.31	678.43	678.55	678.67
124	673.80	673.92	674.04	674.17	674.29	674.41	674.53	674.65	674.78	674.90	675.02	675.14	675.26	675.39	675.51	675.63	675.75	675.87	676.00	676.12
125	671.24	671.36	671.48	671.60	671.73	671.85	671.97	672.09	672.22	672.34	672.46	672.58	672.71	672.83	672.95	673.07	673.19	673.32	673.44	673.56
126	668.67	668.79	668.92	669.04	669.16	669.29	669.41	669.53	669.65	669.78	669.90	670.02	670.14	670.27	670.39	670.51	670.64	670.76	670.88	671.00

Col-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
127	666.10	666.23	666.35	666.47	666.60	666.72	666.84	666.97	667.09	667.21	667.34	667.46	667.58	667.71	667.83	667.95	668.07	668.20	668.32	668.44
128	663.54	663.66	663.78	663.91	664.03	664.15	664.28	664.40	664.52	664.65	664.77	664.89	665.02	665.14	665.26	665.39	665.51	665.64	665.76	665.88
129	660.96	661.09	661.21	661.34	661.46	661.58	661.71	661.83	661.96	662.08	662.20	662.33	662.45	662.57	662.70	662.82	662.95	663.07	663.19	663.32
130	658.39	658.51	658.64	658.76	658.89	659.01	659.14	659.26	659.38	659.51	659.63	659.76	659.88	660.01	660.13	660.26	660.38	660.50	660.63	660.75
131	655.81	655.94	656.06	656.19	656.31	656.44	656.56	656.69	656.81	656.94	657.06	657.19	657.31	657.44	657.56	657.69	657.81	657.94	658.06	658.18
132	653.24	653.36	653.49	653.61	653.74	653.86	653.99	654.11	654.24	654.36	654.49	654.61	654.74	654.86	654.99	655.11	655.24	655.36	655.49	655.61
133	650.66	650.78	650.91	651.03	651.16	651.29	651.41	651.54	651.66	651.79	651.91	652.04	652.16	652.29	652.42	652.54	652.67	652.79	652.92	653.04
134	648.08	648.20	648.33	648.45	648.58	648.71	648.83	648.96	649.08	649.21	649.34	649.46	649.59	649.71	649.84	649.97	650.09	650.22	650.34	650.47
135	645.49	645.62	645.75	645.87	646.00	646.12	646.25	646.38	646.50	646.63	646.76	646.88	647.01	647.13	647.26	647.39	647.51	647.64	647.77	647.89
136	642.91	643.03	643.16	643.29	643.41	643.54	643.67	643.79	643.92	644.05	644.17	644.30	644.43	644.55	644.68	644.81	644.93	645.06	645.19	645.31
137	640.32	640.45	640.57	640.70	640.83	640.96	641.08	641.21	641.34	641.46	641.59	641.72	641.84	641.97	642.10	642.23	642.35	642.48	642.61	642.73
138	637.73	637.86	637.99	638.11	638.24	638.37	638.50	638.62	638.75	638.88	639.01	639.13	639.26	639.39	639.52	639.64	639.77	639.90	640.03	640.15
139	635.14	635.27	635.39	635.52	635.65	635.78	635.91	636.03	636.16	636.29	636.42	636.55	636.67	636.80	636.93	637.06	637.18	637.31	637.44	637.57
140	632.55	632.67	632.80	632.93	633.06	633.19	633.31	633.44	633.57	633.70	633.83	633.96	634.08	634.21	634.34	634.47	634.60	634.73	634.85	634.98
141	629.95	630.08	630.21	630.34	630.46	630.59	630.72	630.85	630.98	631.11	631.24	631.36	631.49	631.62	631.75	631.88	632.01	632.14	632.27	632.39
142	627.35	627.48	627.61	627.74	627.87	628.00	628.13	628.26	628.38	628.51	628.64	628.77	628.90	629.03	629.16	629.29	629.42	629.55	629.68	629.80
143	624.75	624.88	625.01	625.14	625.27	625.40	625.53	625.66	625.79	625.92	626.05	626.18	626.31	626.44	626.56	626.69	626.82	626.95	627.08	627.21
144	622.15	622.28	622.41	622.54	622.67	622.80	622.93	623.06	623.19	623.32	623.45	623.58	623.71	623.84	623.97	624.10	624.23	624.36	624.49	624.62
145	619.55	619.68	619.81	619.94	620.07	620.20	620.33	620.46	620.59	620.72	620.85	620.98	621.11	621.24	621.37	621.50	621.63	621.76	621.89	622.02
146	616.94	617.07	617.20	617.33	617.46	617.59	617.72	617.86	617.99	618.12	618.25	618.38	618.51	618.64	618.77	618.90	619.03	619.16	619.29	619.42
147	614.33	614.46	614.59	614.73	614.86	614.99	615.12	615.25	615.38	615.51	615.64	615.77	615.91	616.04	616.17	616.30	616.43	616.56	616.69	616.82
148	611.72	611.85	611.99	612.12	612.25	612.38	612.51	612.64	612.77	612.91	613.04	613.17	613.30	613.43	613.56	613.70	613.83	613.96	614.09	614.22
149	609.11	609.24	609.37	609.51	609.64	609.77	609.90	610.03	610.17	610.30	610.43	610.56	610.69	610.83	610.96	611.09	611.22	611.35	611.49	611.62
150	606.50	606.63	606.76	606.89	607.03	607.16	607.29	607.42	607.56	607.69	607.82	607.95	608.08	608.22	608.35	608.48	608.61	608.75	608.88	609.01
151	603.88	604.01	604.15	604.28	604.41	604.54	604.68	604.81	604.94	605.08	605.21	605.34	605.47	605.61	605.74	605.87	606.00	606.14	606.27	606.40
152	601.26	601.40	601.53	601.66	601.80	601.93	602.06	602.20	602.33	602.46	602.59	602.73	602.86	602.99	603.13	603.26	603.39	603.53	603.66	603.79
153	598.64	598.78	598.91	599.04	599.18	599.31	599.44	599.58	599.71	599.84	599.98	600.11	600.25	600.38	600.51	600.65	600.78	600.91	601.05	601.18
154	596.02	596.16	596.29	596.42	596.56	596.69	596.82	596.96	597.09	597.23	597.36	597.49	597.63	597.76	597.90	598.03	598.16	598.30	598.43	598.57
155	593.40	593.53	593.67	593.80	593.93	594.07	594.20	594.34	594.47	594.61	594.74	594.87	595.01	595.14	595.28	595.41	595.55	595.68	595.81	595.95
156	590.77	590.91	591.04	591.18	591.31	591.44	591.58	591.71	591.85	591.98	592.12	592.25	592.39	592.52	592.66	592.79	592.93	593.06	593.20	593.33
157	588.14	588.28	588.41	588.55	588.68	588.82	588.95	589.09	589.22	589.36	589.49	589.63	589.76	589.90	590.03	590.17	590.31	590.44	590.58	590.71
158	585.51	585.65	585.78	585.92	586.06	586.19	586.33	586.46	586.60	586.73	586.87	587.00	587.14	587.28	587.41	587.55	587.68	587.82	587.95	588.09

Col-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
159	582.88	583.02	583.15	583.29	583.42	583.56	583.70	583.83	583.97	584.10	584.24	584.38	584.51	584.65	584.78	584.92	585.06	585.19	585.33	585.46
160	580.25	580.38	580.52	580.66	580.79	580.93	581.07	581.20	581.34	581.47	581.61	581.75	581.88	582.02	582.16	582.29	582.43	582.56	582.70	582.84
161	577.61	577.75	577.88	578.02	578.16	578.29	578.43	578.57	578.70	578.84	578.98	579.12	579.25	579.39	579.53	579.66	579.80	579.94	580.07	580.21
162	574.97	575.11	575.25	575.38	575.52	575.66	575.80	575.93	576.07	576.21	576.34	576.48	576.62	576.76	576.89	577.03	577.17	577.30	577.44	577.58
163	572.33	572.47	572.61	572.75	572.88	573.02	573.16	573.30	573.43	573.57	573.71	573.85	573.98	574.12	574.26	574.40	574.53	574.67	574.81	574.95
164	569.69	569.83	569.97	570.10	570.24	570.38	570.52	570.66	570.79	570.93	571.07	571.21	571.35	571.48	571.62	571.76	571.90	572.04	572.17	572.31
165	567.05	567.18	567.32	567.46	567.60	567.74	567.88	568.01	568.15	568.29	568.43	568.57	568.71	568.84	568.98	569.12	569.26	569.40	569.54	569.68
166	564.40	564.54	564.68	564.82	564.95	565.09	565.23	565.37	565.51	565.65	565.79	565.93	566.07	566.20	566.34	566.48	566.62	566.76	566.90	567.04
167	561.75	561.89	562.03	562.17	562.31	562.45	562.59	562.73	562.87	563.00	563.14	563.28	563.42	563.56	563.70	563.84	563.98	564.12	564.26	564.40
168	559.10	559.24	559.38	559.52	559.66	559.80	559.94	560.08	560.22	560.36	560.50	560.64	560.78	560.92	561.06	561.20	561.33	561.47	561.61	561.75
169	556.45	556.59	556.73	556.87	557.01	557.15	557.29	557.43	557.57	557.71	557.85	557.99	558.13	558.27	558.41	558.55	558.69	558.83	558.97	559.11
170	553.79	553.93	554.08	554.22	554.36	554.50	554.64	554.78	554.92	555.06	555.20	555.34	555.48	555.62	555.76	555.90	556.04	556.18	556.32	556.46
171	551.14	551.28	551.42	551.56	551.70	551.84	551.98	552.12	552.26	552.41	552.55	552.69	552.83	552.97	553.11	553.25	553.39	553.53	553.67	553.81
172	548.48	548.62	548.76	548.90	549.04	549.19	549.33	549.47	549.61	549.75	549.89	550.03	550.17	550.32	550.46	550.60	550.74	550.88	551.02	551.16
173	545.82	545.96	546.10	546.24	546.39	546.53	546.67	546.81	546.95	547.09	547.24	547.38	547.52	547.66	547.80	547.94	548.09	548.23	548.37	548.51
174	543.16	543.30	543.44	543.58	543.73	543.87	544.01	544.15	544.29	544.44	544.58	544.72	544.86	545.00	545.15	545.29	545.43	545.57	545.71	545.86
175	540.49	540.63	540.78	540.92	541.06	541.20	541.35	541.49	541.63	541.77	541.92	542.06	542.20	542.34	542.49	542.63	542.77	542.91	543.06	543.20
176	537.83	537.97	538.11	538.25	538.40	538.54	538.68	538.83	538.97	539.11	539.25	539.40	539.54	539.68	539.83	539.97	540.11	540.25	540.40	540.54
177	535.16	535.30	535.44	535.59	535.73	535.87	536.02	536.16	536.30	536.45	536.59	536.73	536.88	537.02	537.16	537.31	537.45	537.59	537.74	537.88
178	532.49	532.63	532.77	532.92	533.06	533.21	533.35	533.49	533.64	533.78	533.92	534.07	534.21	534.36	534.50	534.64	534.79	534.93	535.07	535.22
179	529.81	529.96	530.10	530.25	530.39	530.53	530.68	530.82	530.97	531.11	531.26	531.40	531.54	531.69	531.83	531.98	532.12	532.26	532.41	532.55
180	527.14	527.28	527.43	527.57	527.72	527.86	528.01	528.15	528.30	528.44	528.59	528.73	528.87	529.02	529.16	529.31	529.45	529.60	529.74	529.89
181	524.46	524.61	524.75	524.90	525.04	525.19	525.33	525.48	525.62	525.77	525.91	526.06	526.20	526.35	526.49	526.64	526.78	526.93	527.07	527.22
182	521.78	521.93	522.08	522.22	522.37	522.51	522.66	522.80	522.95	523.09	523.24	523.38	523.53	523.67	523.82	523.96	524.11	524.26	524.40	524.55
183	519.10	519.25	519.40	519.54	519.69	519.83	519.98	520.12	520.27	520.42	520.56	520.71	520.85	521.00	521.14	521.29	521.44	521.58	521.73	521.87
184	516.42	516.57	516.71	516.86	517.01	517.15	517.30	517.44	517.59	517.74	517.88	518.03	518.18	518.32	518.47	518.61	518.76	518.91	519.05	519.20
185	513.74	513.88	514.03	514.18	514.32	514.47	514.62	514.76	514.91	515.06	515.20	515.35	515.50	515.64	515.79	515.94	516.08	516.23	516.38	516.52
186	511.05	511.20	511.34	511.49	511.64	511.78	511.93	512.08	512.23	512.37	512.52	512.67	512.81	512.96	513.11	513.26	513.40	513.55	513.70	513.84
187	508.36	508.51	508.66	508.80	508.95	509.10	509.25	509.39	509.54	509.69	509.84	509.98	510.13	510.28	510.43	510.57	510.72	510.87	511.01	511.16
188	505.67	505.82	505.97	506.11	506.26	506.41	506.56	506.71	506.85	507.00	507.15	507.30	507.44	507.59	507.74	507.89	508.04	508.18	508.33	508.48
189	502.98	503.13	503.27	503.42	503.57	503.72	503.87	504.02	504.16	504.31	504.46	504.61	504.76	504.90	505.05	505.20	505.35	505.50	505.65	505.79
190	500.28	500.43	500.58	500.73	500.88	501.03	501.17	501.32	501.47	501.62	501.77	501.92	502.07	502.22	502.36	502.51	502.66	502.81	502.96	503.11

Col-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
191	497.59	497.73	497.88	498.03	498.18	498.33	498.48	498.63	498.78	498.93	499.08	499.23	499.38	499.52	499.67	499.82	499.97	500.12	500.27	500.42
192	494.89	495.04	495.19	495.34	495.48	495.63	495.78	495.93	496.08	496.23	496.38	496.53	496.68	496.83	496.98	497.13	497.28	497.43	497.58	497.73
193	492.19	492.34	492.49	492.64	492.79	492.94	493.09	493.24	493.39	493.54	493.69	493.84	493.99	494.14	494.29	494.44	494.59	494.74	494.89	495.04
194	489.48	489.63	489.78	489.93	490.08	490.23	490.39	490.54	490.69	490.84	490.99	491.14	491.29	491.44	491.59	491.74	491.89	492.04	492.19	492.34
195	486.78	486.93	487.08	487.23	487.38	487.53	487.68	487.83	487.98	488.14	488.29	488.44	488.59	488.74	488.89	489.04	489.19	489.34	489.49	489.64
196	484.07	484.22	484.37	484.52	484.68	484.83	484.98	485.13	485.28	485.43	485.58	485.73	485.89	486.04	486.19	486.34	486.49	486.64	486.79	486.94
197	481.36	481.51	481.67	481.82	481.97	482.12	482.27	482.42	482.58	482.73	482.88	483.03	483.18	483.33	483.48	483.64	483.79	483.94	484.09	484.24
198	478.65	478.80	478.95	479.11	479.26	479.41	479.56	479.72	479.87	480.02	480.17	480.32	480.48	480.63	480.78	480.93	481.08	481.24	481.39	481.54
199	475.94	476.09	476.24	476.40	476.55	476.70	476.85	477.01	477.16	477.31	477.46	477.62	477.77	477.92	478.07	478.23	478.38	478.53	478.68	478.84

Table - The wavelength shear across the 20 DLVS columns. This table presents the offset from the column average wavelength for each DLVS pixel (in nanometers). These offsets can be used to determine the wavelength corresponding to any DLVS pixel once the column average has been calculated (as above).

Col.-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	0.73	0.65	0.57	0.50	0.42	0.34	0.27	0.19	0.11	0.04	-0.04	-0.11	-0.19	-0.27	-0.34	-0.42	-0.50	-0.57	-0.65	-0.73
1	0.73	0.65	0.58	0.50	0.42	0.35	0.27	0.19	0.12	0.04	-0.04	-0.12	-0.19	-0.27	-0.35	-0.42	-0.50	-0.58	-0.65	-0.73
2	0.73	0.66	0.58	0.50	0.43	0.35	0.27	0.19	0.12	0.04	-0.04	-0.12	-0.19	-0.27	-0.35	-0.43	-0.50	-0.58	-0.66	-0.73
3	0.74	0.66	0.58	0.50	0.43	0.35	0.27	0.19	0.12	0.04	-0.04	-0.12	-0.19	-0.27	-0.35	-0.43	-0.50	-0.58	-0.66	-0.74
4	0.74	0.66	0.58	0.51	0.43	0.35	0.27	0.19	0.12	0.04	-0.04	-0.12	-0.19	-0.27	-0.35	-0.43	-0.51	-0.58	-0.66	-0.74
5	0.74	0.67	0.59	0.51	0.43	0.35	0.27	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.27	-0.35	-0.43	-0.51	-0.59	-0.67	-0.74
6	0.75	0.67	0.59	0.51	0.43	0.35	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.35	-0.43	-0.51	-0.59	-0.67	-0.75
7	0.75	0.67	0.59	0.51	0.43	0.36	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.36	-0.43	-0.51	-0.59	-0.67	-0.75
8	0.75	0.67	0.60	0.52	0.44	0.36	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.36	-0.44	-0.52	-0.60	-0.67	-0.75
9	0.76	0.68	0.60	0.52	0.44	0.36	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.36	-0.44	-0.52	-0.60	-0.68	-0.76
10	0.76	0.68	0.60	0.52	0.44	0.36	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.36	-0.44	-0.52	-0.60	-0.68	-0.76
11	0.76	0.68	0.60	0.52	0.44	0.36	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.36	-0.44	-0.52	-0.60	-0.68	-0.76
12	0.77	0.69	0.61	0.52	0.44	0.36	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.36	-0.44	-0.52	-0.61	-0.69	-0.77
13	0.77	0.69	0.61	0.53	0.45	0.36	0.28	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.28	-0.36	-0.45	-0.53	-0.61	-0.69	-0.77
14	0.77	0.69	0.61	0.53	0.45	0.37	0.29	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.29	-0.37	-0.45	-0.53	-0.61	-0.69	-0.77

Col.-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
15	0.78	0.70	0.61	0.53	0.45	0.37	0.29	0.20	0.12	0.04	-0.04	-0.12	-0.20	-0.29	-0.37	-0.45	-0.53	-0.61	-0.70	-0.78
16	0.78	0.70	0.62	0.53	0.45	0.37	0.29	0.21	0.12	0.04	-0.04	-0.12	-0.21	-0.29	-0.37	-0.45	-0.53	-0.62	-0.70	-0.78
17	0.78	0.70	0.62	0.54	0.45	0.37	0.29	0.21	0.12	0.04	-0.04	-0.12	-0.21	-0.29	-0.37	-0.45	-0.54	-0.62	-0.70	-0.78
18	0.79	0.70	0.62	0.54	0.46	0.37	0.29	0.21	0.12	0.04	-0.04	-0.12	-0.21	-0.29	-0.37	-0.46	-0.54	-0.62	-0.70	-0.79
19	0.79	0.71	0.62	0.54	0.46	0.37	0.29	0.21	0.12	0.04	-0.04	-0.12	-0.21	-0.29	-0.37	-0.46	-0.54	-0.62	-0.71	-0.79
20	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.29	-0.38	-0.46	-0.54	-0.63	-0.71	-0.79
21	0.80	0.71	0.63	0.55	0.46	0.38	0.29	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.29	-0.38	-0.46	-0.55	-0.63	-0.71	-0.80
22	0.80	0.72	0.63	0.55	0.46	0.38	0.29	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.29	-0.38	-0.46	-0.55	-0.63	-0.72	-0.80
23	0.80	0.72	0.63	0.55	0.47	0.38	0.30	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.30	-0.38	-0.47	-0.55	-0.63	-0.72	-0.80
24	0.81	0.72	0.64	0.55	0.47	0.38	0.30	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.30	-0.38	-0.47	-0.55	-0.64	-0.72	-0.81
25	0.81	0.72	0.64	0.55	0.47	0.38	0.30	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.30	-0.38	-0.47	-0.55	-0.64	-0.72	-0.81
26	0.81	0.73	0.64	0.56	0.47	0.39	0.30	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.30	-0.39	-0.47	-0.56	-0.64	-0.73	-0.81
27	0.82	0.73	0.64	0.56	0.47	0.39	0.30	0.21	0.13	0.04	-0.04	-0.13	-0.21	-0.30	-0.39	-0.47	-0.56	-0.64	-0.73	-0.82
28	0.82	0.73	0.65	0.56	0.47	0.39	0.30	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.30	-0.39	-0.47	-0.56	-0.65	-0.73	-0.82
29	0.82	0.74	0.65	0.56	0.48	0.39	0.30	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.30	-0.39	-0.48	-0.56	-0.65	-0.74	-0.82
30	0.83	0.74	0.65	0.57	0.48	0.39	0.30	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.30	-0.39	-0.48	-0.57	-0.65	-0.74	-0.83
31	0.83	0.74	0.66	0.57	0.48	0.39	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.39	-0.48	-0.57	-0.66	-0.74	-0.83
32	0.83	0.75	0.66	0.57	0.48	0.39	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.39	-0.48	-0.57	-0.66	-0.75	-0.83
33	0.84	0.75	0.66	0.57	0.48	0.40	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.40	-0.48	-0.57	-0.66	-0.75	-0.84
34	0.84	0.75	0.66	0.57	0.49	0.40	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.40	-0.49	-0.57	-0.66	-0.75	-0.84
35	0.84	0.75	0.67	0.58	0.49	0.40	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.40	-0.49	-0.58	-0.67	-0.75	-0.84
36	0.85	0.76	0.67	0.58	0.49	0.40	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.40	-0.49	-0.58	-0.67	-0.76	-0.85
37	0.85	0.76	0.67	0.58	0.49	0.40	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.40	-0.49	-0.58	-0.67	-0.76	-0.85
38	0.85	0.76	0.67	0.58	0.49	0.40	0.31	0.22	0.13	0.04	-0.04	-0.13	-0.22	-0.31	-0.40	-0.49	-0.58	-0.67	-0.76	-0.85
39	0.86	0.77	0.68	0.59	0.50	0.41	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.41	-0.50	-0.59	-0.68	-0.77	-0.86
40	0.86	0.77	0.68	0.59	0.50	0.41	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.41	-0.50	-0.59	-0.68	-0.77	-0.86
41	0.86	0.77	0.68	0.59	0.50	0.41	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.41	-0.50	-0.59	-0.68	-0.77	-0.86
42	0.87	0.78	0.68	0.59	0.50	0.41	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.41	-0.50	-0.59	-0.68	-0.78	-0.87
43	0.87	0.78	0.69	0.60	0.50	0.41	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.41	-0.50	-0.60	-0.69	-0.78	-0.87
44	0.87	0.78	0.69	0.60	0.51	0.41	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.41	-0.51	-0.60	-0.69	-0.78	-0.87
45	0.88	0.78	0.69	0.60	0.51	0.42	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.42	-0.51	-0.60	-0.69	-0.78	-0.88
46	0.88	0.79	0.70	0.60	0.51	0.42	0.32	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.32	-0.42	-0.51	-0.60	-0.70	-0.79	-0.88
47	0.88	0.79	0.70	0.60	0.51	0.42	0.33	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.33	-0.42	-0.51	-0.60	-0.70	-0.79	-0.88

Col.- Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
48	0.89	0.79	0.70	0.61	0.51	0.42	0.33	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.33	-0.42	-0.51	-0.61	-0.70	-0.79	-0.89
49	0.89	0.80	0.70	0.61	0.52	0.42	0.33	0.23	0.14	0.05	-0.05	-0.14	-0.23	-0.33	-0.42	-0.52	-0.61	-0.70	-0.80	-0.89
50	0.89	0.80	0.71	0.61	0.52	0.42	0.33	0.24	0.14	0.05	-0.05	-0.14	-0.24	-0.33	-0.42	-0.52	-0.61	-0.71	-0.80	-0.89
51	0.90	0.80	0.71	0.61	0.52	0.43	0.33	0.24	0.14	0.05	-0.05	-0.14	-0.24	-0.33	-0.43	-0.52	-0.61	-0.71	-0.80	-0.90
52	0.90	0.81	0.71	0.62	0.52	0.43	0.33	0.24	0.14	0.05	-0.05	-0.14	-0.24	-0.33	-0.43	-0.52	-0.62	-0.71	-0.81	-0.90
53	0.90	0.81	0.71	0.62	0.52	0.43	0.33	0.24	0.14	0.05	-0.05	-0.14	-0.24	-0.33	-0.43	-0.52	-0.62	-0.71	-0.81	-0.90
54	0.91	0.81	0.72	0.62	0.53	0.43	0.33	0.24	0.14	0.05	-0.05	-0.14	-0.24	-0.33	-0.43	-0.53	-0.62	-0.72	-0.81	-0.91
55	0.91	0.82	0.72	0.62	0.53	0.43	0.34	0.24	0.14	0.05	-0.05	-0.14	-0.24	-0.34	-0.43	-0.53	-0.62	-0.72	-0.82	-0.91
56	0.91	0.82	0.72	0.63	0.53	0.43	0.34	0.24	0.14	0.05	-0.05	-0.14	-0.24	-0.34	-0.43	-0.53	-0.63	-0.72	-0.82	-0.91
57	0.92	0.82	0.73	0.63	0.53	0.44	0.34	0.24	0.15	0.05	-0.05	-0.15	-0.24	-0.34	-0.44	-0.53	-0.63	-0.73	-0.82	-0.92
58	0.92	0.82	0.73	0.63	0.53	0.44	0.34	0.24	0.15	0.05	-0.05	-0.15	-0.24	-0.34	-0.44	-0.53	-0.63	-0.73	-0.82	-0.92
59	0.93	0.83	0.73	0.63	0.54	0.44	0.34	0.24	0.15	0.05	-0.05	-0.15	-0.24	-0.34	-0.44	-0.54	-0.63	-0.73	-0.83	-0.93
60	0.93	0.83	0.73	0.64	0.54	0.44	0.34	0.24	0.15	0.05	-0.05	-0.15	-0.24	-0.34	-0.44	-0.54	-0.64	-0.73	-0.83	-0.93
61	0.93	0.83	0.74	0.64	0.54	0.44	0.34	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.34	-0.44	-0.54	-0.64	-0.74	-0.83	-0.93
62	0.94	0.84	0.74	0.64	0.54	0.44	0.34	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.34	-0.44	-0.54	-0.64	-0.74	-0.84	-0.94
63	0.94	0.84	0.74	0.64	0.54	0.44	0.35	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.35	-0.44	-0.54	-0.64	-0.74	-0.84	-0.94
64	0.94	0.84	0.74	0.65	0.55	0.45	0.35	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.35	-0.45	-0.55	-0.65	-0.74	-0.84	-0.94
65	0.95	0.85	0.75	0.65	0.55	0.45	0.35	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.35	-0.45	-0.55	-0.65	-0.75	-0.85	-0.95
66	0.95	0.85	0.75	0.65	0.55	0.45	0.35	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.35	-0.45	-0.55	-0.65	-0.75	-0.85	-0.95
67	0.95	0.85	0.75	0.65	0.55	0.45	0.35	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.35	-0.45	-0.55	-0.65	-0.75	-0.85	-0.95
68	0.96	0.86	0.76	0.65	0.55	0.45	0.35	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.35	-0.45	-0.55	-0.65	-0.76	-0.86	-0.96
69	0.96	0.86	0.76	0.66	0.56	0.45	0.35	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.35	-0.45	-0.56	-0.66	-0.76	-0.86	-0.96
70	0.96	0.86	0.76	0.66	0.56	0.46	0.36	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.36	-0.46	-0.56	-0.66	-0.76	-0.86	-0.96
71	0.97	0.87	0.76	0.66	0.56	0.46	0.36	0.25	0.15	0.05	-0.05	-0.15	-0.25	-0.36	-0.46	-0.56	-0.66	-0.76	-0.87	-0.97
72	0.97	0.87	0.77	0.66	0.56	0.46	0.36	0.26	0.15	0.05	-0.05	-0.15	-0.26	-0.36	-0.46	-0.56	-0.66	-0.77	-0.87	-0.97
73	0.97	0.87	0.77	0.67	0.56	0.46	0.36	0.26	0.15	0.05	-0.05	-0.15	-0.26	-0.36	-0.46	-0.56	-0.67	-0.77	-0.87	-0.97
74	0.98	0.87	0.77	0.67	0.57	0.46	0.36	0.26	0.15	0.05	-0.05	-0.15	-0.26	-0.36	-0.46	-0.57	-0.67	-0.77	-0.87	-0.98
75	0.98	0.88	0.77	0.67	0.57	0.46	0.36	0.26	0.15	0.05	-0.05	-0.15	-0.26	-0.36	-0.46	-0.57	-0.67	-0.77	-0.88	-0.98
76	0.98	0.88	0.78	0.67	0.57	0.47	0.36	0.26	0.16	0.05	-0.05	-0.16	-0.26	-0.36	-0.47	-0.57	-0.67	-0.78	-0.88	-0.98
77	0.99	0.88	0.78	0.68	0.57	0.47	0.36	0.26	0.16	0.05	-0.05	-0.16	-0.26	-0.36	-0.47	-0.57	-0.68	-0.78	-0.88	-0.99
78	0.99	0.89	0.78	0.68	0.57	0.47	0.37	0.26	0.16	0.05	-0.05	-0.16	-0.26	-0.37	-0.47	-0.57	-0.68	-0.78	-0.89	-0.99
79	1.00	0.89	0.79	0.68	0.58	0.47	0.37	0.26	0.16	0.05	-0.05	-0.16	-0.26	-0.37	-0.47	-0.58	-0.68	-0.79	-0.89	-1.00
80	1.00	0.89	0.79	0.68	0.58	0.47	0.37	0.26	0.16	0.05	-0.05	-0.16	-0.26	-0.37	-0.47	-0.58	-0.68	-0.79	-0.89	-1.00

Col.-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
81	1.00	0.90	0.79	0.69	0.58	0.47	0.37	0.26	0.16	0.05	-0.05	-0.16	-0.26	-0.37	-0.47	-0.58	-0.69	-0.79	-0.90	-1.00
82	1.01	0.90	0.79	0.69	0.58	0.48	0.37	0.26	0.16	0.05	-0.05	-0.16	-0.26	-0.37	-0.48	-0.58	-0.69	-0.79	-0.90	-1.01
83	1.01	0.90	0.80	0.69	0.58	0.48	0.37	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.37	-0.48	-0.58	-0.69	-0.80	-0.90	-1.01
84	1.01	0.91	0.80	0.69	0.59	0.48	0.37	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.37	-0.48	-0.59	-0.69	-0.80	-0.91	-1.01
85	1.02	0.91	0.80	0.70	0.59	0.48	0.37	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.37	-0.48	-0.59	-0.70	-0.80	-0.91	-1.02
86	1.02	0.91	0.81	0.70	0.59	0.48	0.38	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.38	-0.48	-0.59	-0.70	-0.81	-0.91	-1.02
87	1.02	0.92	0.81	0.70	0.59	0.48	0.38	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.38	-0.48	-0.59	-0.70	-0.81	-0.92	-1.02
88	1.03	0.92	0.81	0.70	0.59	0.49	0.38	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.38	-0.49	-0.59	-0.70	-0.81	-0.92	-1.03
89	1.03	0.92	0.81	0.71	0.60	0.49	0.38	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.38	-0.49	-0.60	-0.71	-0.81	-0.92	-1.03
90	1.03	0.93	0.82	0.71	0.60	0.49	0.38	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.38	-0.49	-0.60	-0.71	-0.82	-0.93	-1.03
91	1.04	0.93	0.82	0.71	0.60	0.49	0.38	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.38	-0.49	-0.60	-0.71	-0.82	-0.93	-1.04
92	1.04	0.93	0.82	0.71	0.60	0.49	0.38	0.27	0.16	0.05	-0.05	-0.16	-0.27	-0.38	-0.49	-0.60	-0.71	-0.82	-0.93	-1.04
93	1.05	0.94	0.83	0.72	0.61	0.50	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.50	-0.61	-0.72	-0.83	-0.94	-1.05
94	1.05	0.94	0.83	0.72	0.61	0.50	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.50	-0.61	-0.72	-0.83	-0.94	-1.05
95	1.05	0.94	0.83	0.72	0.61	0.50	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.50	-0.61	-0.72	-0.83	-0.94	-1.05
96	1.06	0.94	0.83	0.72	0.61	0.50	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.50	-0.61	-0.72	-0.83	-0.94	-1.06
97	1.06	0.95	0.84	0.73	0.61	0.50	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.50	-0.61	-0.73	-0.84	-0.95	-1.06
98	1.06	0.95	0.84	0.73	0.62	0.50	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.50	-0.62	-0.73	-0.84	-0.95	-1.06
99	1.07	0.95	0.84	0.73	0.62	0.51	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.51	-0.62	-0.73	-0.84	-0.95	-1.07
100	1.07	0.96	0.85	0.73	0.62	0.51	0.39	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.39	-0.51	-0.62	-0.73	-0.85	-0.96	-1.07
101	1.07	0.96	0.85	0.73	0.62	0.51	0.40	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.40	-0.51	-0.62	-0.73	-0.85	-0.96	-1.07
102	1.08	0.96	0.85	0.74	0.62	0.51	0.40	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.40	-0.51	-0.62	-0.74	-0.85	-0.96	-1.08
103	1.08	0.97	0.85	0.74	0.63	0.51	0.40	0.28	0.17	0.06	-0.06	-0.17	-0.28	-0.40	-0.51	-0.63	-0.74	-0.85	-0.97	-1.08
104	1.09	0.97	0.86	0.74	0.63	0.51	0.40	0.29	0.17	0.06	-0.06	-0.17	-0.29	-0.40	-0.51	-0.63	-0.74	-0.86	-0.97	-1.09
105	1.09	0.97	0.86	0.74	0.63	0.52	0.40	0.29	0.17	0.06	-0.06	-0.17	-0.29	-0.40	-0.52	-0.63	-0.74	-0.86	-0.97	-1.09
106	1.09	0.98	0.86	0.75	0.63	0.52	0.40	0.29	0.17	0.06	-0.06	-0.17	-0.29	-0.40	-0.52	-0.63	-0.75	-0.86	-0.98	-1.09
107	1.10	0.98	0.87	0.75	0.63	0.52	0.40	0.29	0.17	0.06	-0.06	-0.17	-0.29	-0.40	-0.52	-0.63	-0.75	-0.87	-0.98	-1.10
108	1.10	0.98	0.87	0.75	0.64	0.52	0.41	0.29	0.17	0.06	-0.06	-0.17	-0.29	-0.41	-0.52	-0.64	-0.75	-0.87	-0.98	-1.10
109	1.10	0.99	0.87	0.75	0.64	0.52	0.41	0.29	0.17	0.06	-0.06	-0.17	-0.29	-0.41	-0.52	-0.64	-0.75	-0.87	-0.99	-1.10
110	1.11	0.99	0.87	0.76	0.64	0.52	0.41	0.29	0.17	0.06	-0.06	-0.17	-0.29	-0.41	-0.52	-0.64	-0.76	-0.87	-0.99	-1.11
111	1.11	0.99	0.88	0.76	0.64	0.53	0.41	0.29	0.18	0.06	-0.06	-0.18	-0.29	-0.41	-0.53	-0.64	-0.76	-0.88	-0.99	-1.11
112	1.11	1.00	0.88	0.76	0.65	0.53	0.41	0.29	0.18	0.06	-0.06	-0.18	-0.29	-0.41	-0.53	-0.65	-0.76	-0.88	-1.00	-1.11
113	1.12	1.00	0.88	0.76	0.65	0.53	0.41	0.29	0.18	0.06	-0.06	-0.18	-0.29	-0.41	-0.53	-0.65	-0.76	-0.88	-1.00	-1.12

Col.-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
114	1.12	1.00	0.89	0.77	0.65	0.53	0.41	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.41	-0.53	-0.65	-0.77	-0.89	-1.00	-1.12
115	1.13	1.01	0.89	0.77	0.65	0.53	0.41	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.41	-0.53	-0.65	-0.77	-0.89	-1.01	-1.13
116	1.13	1.01	0.89	0.77	0.65	0.53	0.42	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.42	-0.53	-0.65	-0.77	-0.89	-1.01	-1.13
117	1.13	1.01	0.89	0.78	0.66	0.54	0.42	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.42	-0.54	-0.66	-0.78	-0.89	-1.01	-1.13
118	1.14	1.02	0.90	0.78	0.66	0.54	0.42	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.42	-0.54	-0.66	-0.78	-0.90	-1.02	-1.14
119	1.14	1.02	0.90	0.78	0.66	0.54	0.42	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.42	-0.54	-0.66	-0.78	-0.90	-1.02	-1.14
120	1.14	1.02	0.90	0.78	0.66	0.54	0.42	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.42	-0.54	-0.66	-0.78	-0.90	-1.02	-1.14
121	1.15	1.03	0.91	0.79	0.66	0.54	0.42	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.42	-0.54	-0.66	-0.79	-0.91	-1.03	-1.15
122	1.15	1.03	0.91	0.79	0.67	0.55	0.42	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.42	-0.55	-0.67	-0.79	-0.91	-1.03	-1.15
123	1.15	1.03	0.91	0.79	0.67	0.55	0.43	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.43	-0.55	-0.67	-0.79	-0.91	-1.03	-1.15
124	1.16	1.04	0.91	0.79	0.67	0.55	0.43	0.30	0.18	0.06	-0.06	-0.18	-0.30	-0.43	-0.55	-0.67	-0.79	-0.91	-1.04	-1.16
125	1.16	1.04	0.92	0.80	0.67	0.55	0.43	0.31	0.18	0.06	-0.06	-0.18	-0.31	-0.43	-0.55	-0.67	-0.80	-0.92	-1.04	-1.16
126	1.17	1.04	0.92	0.80	0.68	0.55	0.43	0.31	0.18	0.06	-0.06	-0.18	-0.31	-0.43	-0.55	-0.68	-0.80	-0.92	-1.04	-1.17
127	1.17	1.05	0.92	0.80	0.68	0.55	0.43	0.31	0.18	0.06	-0.06	-0.18	-0.31	-0.43	-0.55	-0.68	-0.80	-0.92	-1.05	-1.17
128	1.17	1.05	0.93	0.80	0.68	0.56	0.43	0.31	0.19	0.06	-0.06	-0.19	-0.31	-0.43	-0.56	-0.68	-0.80	-0.93	-1.05	-1.17
129	1.18	1.05	0.93	0.81	0.68	0.56	0.43	0.31	0.19	0.06	-0.06	-0.19	-0.31	-0.43	-0.56	-0.68	-0.81	-0.93	-1.05	-1.18
130	1.18	1.06	0.93	0.81	0.68	0.56	0.44	0.31	0.19	0.06	-0.06	-0.19	-0.31	-0.44	-0.56	-0.68	-0.81	-0.93	-1.06	-1.18
131	1.18	1.06	0.94	0.81	0.69	0.56	0.44	0.31	0.19	0.06	-0.06	-0.19	-0.31	-0.44	-0.56	-0.69	-0.81	-0.94	-1.06	-1.18
132	1.19	1.06	0.94	0.81	0.69	0.56	0.44	0.31	0.19	0.06	-0.06	-0.19	-0.31	-0.44	-0.56	-0.69	-0.81	-0.94	-1.06	-1.19
133	1.19	1.07	0.94	0.82	0.69	0.56	0.44	0.31	0.19	0.06	-0.06	-0.19	-0.31	-0.44	-0.56	-0.69	-0.82	-0.94	-1.07	-1.19
134	1.20	1.07	0.94	0.82	0.69	0.57	0.44	0.31	0.19	0.06	-0.06	-0.19	-0.31	-0.44	-0.57	-0.69	-0.82	-0.94	-1.07	-1.20
135	1.20	1.07	0.95	0.82	0.69	0.57	0.44	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.44	-0.57	-0.69	-0.82	-0.95	-1.07	-1.20
136	1.20	1.08	0.95	0.82	0.70	0.57	0.44	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.44	-0.57	-0.70	-0.82	-0.95	-1.08	-1.20
137	1.21	1.08	0.95	0.83	0.70	0.57	0.44	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.44	-0.57	-0.70	-0.83	-0.95	-1.08	-1.21
138	1.21	1.08	0.96	0.83	0.70	0.57	0.45	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.45	-0.57	-0.70	-0.83	-0.96	-1.08	-1.21
139	1.21	1.09	0.96	0.83	0.70	0.58	0.45	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.45	-0.58	-0.70	-0.83	-0.96	-1.09	-1.21
140	1.22	1.09	0.96	0.83	0.71	0.58	0.45	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.45	-0.58	-0.71	-0.83	-0.96	-1.09	-1.22
141	1.22	1.09	0.97	0.84	0.71	0.58	0.45	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.45	-0.58	-0.71	-0.84	-0.97	-1.09	-1.22
142	1.23	1.10	0.97	0.84	0.71	0.58	0.45	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.45	-0.58	-0.71	-0.84	-0.97	-1.10	-1.23
143	1.23	1.10	0.97	0.84	0.71	0.58	0.45	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.45	-0.58	-0.71	-0.84	-0.97	-1.10	-1.23
144	1.23	1.10	0.97	0.84	0.71	0.58	0.45	0.32	0.19	0.06	-0.06	-0.19	-0.32	-0.45	-0.58	-0.71	-0.84	-0.97	-1.10	-1.23
145	1.24	1.11	0.98	0.85	0.72	0.59	0.46	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.46	-0.59	-0.72	-0.85	-0.98	-1.11	-1.24
146	1.24	1.11	0.98	0.85	0.72	0.59	0.46	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.46	-0.59	-0.72	-0.85	-0.98	-1.11	-1.24

Col.-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
147	1.25	1.11	0.98	0.85	0.72	0.59	0.46	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.46	-0.59	-0.72	-0.85	-0.98	-1.11	-1.25
148	1.25	1.12	0.99	0.85	0.72	0.59	0.46	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.46	-0.59	-0.72	-0.85	-0.99	-1.12	-1.25
149	1.25	1.12	0.99	0.86	0.73	0.59	0.46	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.46	-0.59	-0.73	-0.86	-0.99	-1.12	-1.25
150	1.26	1.12	0.99	0.86	0.73	0.60	0.46	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.46	-0.60	-0.73	-0.86	-0.99	-1.12	-1.26
151	1.26	1.13	1.00	0.86	0.73	0.60	0.46	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.46	-0.60	-0.73	-0.86	-1.00	-1.13	-1.26
152	1.26	1.13	1.00	0.87	0.73	0.60	0.47	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.47	-0.60	-0.73	-0.87	-1.00	-1.13	-1.26
153	1.27	1.13	1.00	0.87	0.73	0.60	0.47	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.47	-0.60	-0.73	-0.87	-1.00	-1.13	-1.27
154	1.27	1.14	1.00	0.87	0.74	0.60	0.47	0.33	0.20	0.07	-0.07	-0.20	-0.33	-0.47	-0.60	-0.74	-0.87	-1.00	-1.14	-1.27
155	1.28	1.14	1.01	0.87	0.74	0.60	0.47	0.34	0.20	0.07	-0.07	-0.20	-0.34	-0.47	-0.60	-0.74	-0.87	-1.01	-1.14	-1.28
156	1.28	1.14	1.01	0.88	0.74	0.61	0.47	0.34	0.20	0.07	-0.07	-0.20	-0.34	-0.47	-0.61	-0.74	-0.88	-1.01	-1.14	-1.28
157	1.28	1.15	1.01	0.88	0.74	0.61	0.47	0.34	0.20	0.07	-0.07	-0.20	-0.34	-0.47	-0.61	-0.74	-0.88	-1.01	-1.15	-1.28
158	1.29	1.15	1.02	0.88	0.75	0.61	0.47	0.34	0.20	0.07	-0.07	-0.20	-0.34	-0.47	-0.61	-0.75	-0.88	-1.02	-1.15	-1.29
159	1.29	1.16	1.02	0.88	0.75	0.61	0.48	0.34	0.20	0.07	-0.07	-0.20	-0.34	-0.48	-0.61	-0.75	-0.88	-1.02	-1.16	-1.29
160	1.30	1.16	1.02	0.89	0.75	0.61	0.48	0.34	0.20	0.07	-0.07	-0.20	-0.34	-0.48	-0.61	-0.75	-0.89	-1.02	-1.16	-1.30
161	1.30	1.16	1.03	0.89	0.75	0.62	0.48	0.34	0.21	0.07	-0.07	-0.21	-0.34	-0.48	-0.62	-0.75	-0.89	-1.03	-1.16	-1.30
162	1.30	1.17	1.03	0.89	0.75	0.62	0.48	0.34	0.21	0.07	-0.07	-0.21	-0.34	-0.48	-0.62	-0.75	-0.89	-1.03	-1.17	-1.30
163	1.31	1.17	1.03	0.89	0.76	0.62	0.48	0.34	0.21	0.07	-0.07	-0.21	-0.34	-0.48	-0.62	-0.76	-0.89	-1.03	-1.17	-1.31
164	1.31	1.17	1.03	0.90	0.76	0.62	0.48	0.34	0.21	0.07	-0.07	-0.21	-0.34	-0.48	-0.62	-0.76	-0.90	-1.03	-1.17	-1.31
165	1.31	1.18	1.04	0.90	0.76	0.62	0.48	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.48	-0.62	-0.76	-0.90	-1.04	-1.18	-1.31
166	1.32	1.18	1.04	0.90	0.76	0.62	0.49	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.49	-0.62	-0.76	-0.90	-1.04	-1.18	-1.32
167	1.32	1.18	1.04	0.90	0.77	0.63	0.49	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.49	-0.63	-0.77	-0.90	-1.04	-1.18	-1.32
168	1.33	1.19	1.05	0.91	0.77	0.63	0.49	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.49	-0.63	-0.77	-0.91	-1.05	-1.19	-1.33
169	1.33	1.19	1.05	0.91	0.77	0.63	0.49	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.49	-0.63	-0.77	-0.91	-1.05	-1.19	-1.33
170	1.33	1.19	1.05	0.91	0.77	0.63	0.49	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.49	-0.63	-0.77	-0.91	-1.05	-1.19	-1.33
171	1.34	1.20	1.06	0.92	0.77	0.63	0.49	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.49	-0.63	-0.77	-0.92	-1.06	-1.20	-1.34
172	1.34	1.20	1.06	0.92	0.78	0.64	0.49	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.49	-0.64	-0.78	-0.92	-1.06	-1.20	-1.34
173	1.35	1.20	1.06	0.92	0.78	0.64	0.50	0.35	0.21	0.07	-0.07	-0.21	-0.35	-0.50	-0.64	-0.78	-0.92	-1.06	-1.20	-1.35
174	1.35	1.21	1.07	0.92	0.78	0.64	0.50	0.36	0.21	0.07	-0.07	-0.21	-0.36	-0.50	-0.64	-0.78	-0.92	-1.07	-1.21	-1.35
175	1.35	1.21	1.07	0.93	0.78	0.64	0.50	0.36	0.21	0.07	-0.07	-0.21	-0.36	-0.50	-0.64	-0.78	-0.93	-1.07	-1.21	-1.35
176	1.36	1.21	1.07	0.93	0.79	0.64	0.50	0.36	0.21	0.07	-0.07	-0.21	-0.36	-0.50	-0.64	-0.79	-0.93	-1.07	-1.21	-1.36
177	1.36	1.22	1.07	0.93	0.79	0.64	0.50	0.36	0.21	0.07	-0.07	-0.21	-0.36	-0.50	-0.64	-0.79	-0.93	-1.07	-1.22	-1.36
178	1.37	1.22	1.08	0.93	0.79	0.65	0.50	0.36	0.22	0.07	-0.07	-0.22	-0.36	-0.50	-0.65	-0.79	-0.93	-1.08	-1.22	-1.37
179	1.37	1.23	1.08	0.94	0.79	0.65	0.50	0.36	0.22	0.07	-0.07	-0.22	-0.36	-0.50	-0.65	-0.79	-0.94	-1.08	-1.23	-1.37

Col.-Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
180	1.37	1.23	1.08	0.94	0.79	0.65	0.51	0.36	0.22	0.07	-0.07	-0.22	-0.36	-0.51	-0.65	-0.79	-0.94	-1.08	-1.23	-1.37
181	1.38	1.23	1.09	0.94	0.80	0.65	0.51	0.36	0.22	0.07	-0.07	-0.22	-0.36	-0.51	-0.65	-0.80	-0.94	-1.09	-1.23	-1.38
182	1.38	1.24	1.09	0.94	0.80	0.65	0.51	0.36	0.22	0.07	-0.07	-0.22	-0.36	-0.51	-0.65	-0.80	-0.94	-1.09	-1.24	-1.38
183	1.38	1.24	1.09	0.95	0.80	0.66	0.51	0.36	0.22	0.07	-0.07	-0.22	-0.36	-0.51	-0.66	-0.80	-0.95	-1.09	-1.24	-1.38
184	1.39	1.24	1.10	0.95	0.80	0.66	0.51	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.51	-0.66	-0.80	-0.95	-1.10	-1.24	-1.39
185	1.39	1.25	1.10	0.95	0.81	0.66	0.51	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.51	-0.66	-0.81	-0.95	-1.10	-1.25	-1.39
186	1.40	1.25	1.10	0.96	0.81	0.66	0.51	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.51	-0.66	-0.81	-0.96	-1.10	-1.25	-1.40
187	1.40	1.25	1.11	0.96	0.81	0.66	0.52	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.52	-0.66	-0.81	-0.96	-1.11	-1.25	-1.40
188	1.40	1.26	1.11	0.96	0.81	0.67	0.52	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.52	-0.67	-0.81	-0.96	-1.11	-1.26	-1.40
189	1.41	1.26	1.11	0.96	0.82	0.67	0.52	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.52	-0.67	-0.82	-0.96	-1.11	-1.26	-1.41
190	1.41	1.26	1.12	0.97	0.82	0.67	0.52	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.52	-0.67	-0.82	-0.97	-1.12	-1.26	-1.41
191	1.42	1.27	1.12	0.97	0.82	0.67	0.52	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.52	-0.67	-0.82	-0.97	-1.12	-1.27	-1.42
192	1.42	1.27	1.12	0.97	0.82	0.67	0.52	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.52	-0.67	-0.82	-0.97	-1.12	-1.27	-1.42
193	1.42	1.27	1.12	0.97	0.82	0.67	0.52	0.37	0.22	0.07	-0.07	-0.22	-0.37	-0.52	-0.67	-0.82	-0.97	-1.12	-1.27	-1.42
194	1.43	1.28	1.13	0.98	0.83	0.68	0.53	0.38	0.23	0.08	-0.08	-0.23	-0.38	-0.53	-0.68	-0.83	-0.98	-1.13	-1.28	-1.43
195	1.43	1.28	1.13	0.98	0.83	0.68	0.53	0.38	0.23	0.08	-0.08	-0.23	-0.38	-0.53	-0.68	-0.83	-0.98	-1.13	-1.28	-1.43
196	1.44	1.29	1.13	0.98	0.83	0.68	0.53	0.38	0.23	0.08	-0.08	-0.23	-0.38	-0.53	-0.68	-0.83	-0.98	-1.13	-1.29	-1.44
197	1.44	1.29	1.14	0.99	0.83	0.68	0.53	0.38	0.23	0.08	-0.08	-0.23	-0.38	-0.53	-0.68	-0.83	-0.99	-1.14	-1.29	-1.44
198	1.44	1.29	1.14	0.99	0.84	0.68	0.53	0.38	0.23	0.08	-0.08	-0.23	-0.38	-0.53	-0.68	-0.84	-0.99	-1.14	-1.29	-1.44
199	1.45	1.30	1.14	0.99	0.84	0.69	0.53	0.38	0.23	0.08	-0.08	-0.23	-0.38	-0.53	-0.69	-0.84	-0.99	-1.14	-1.30	-1.45

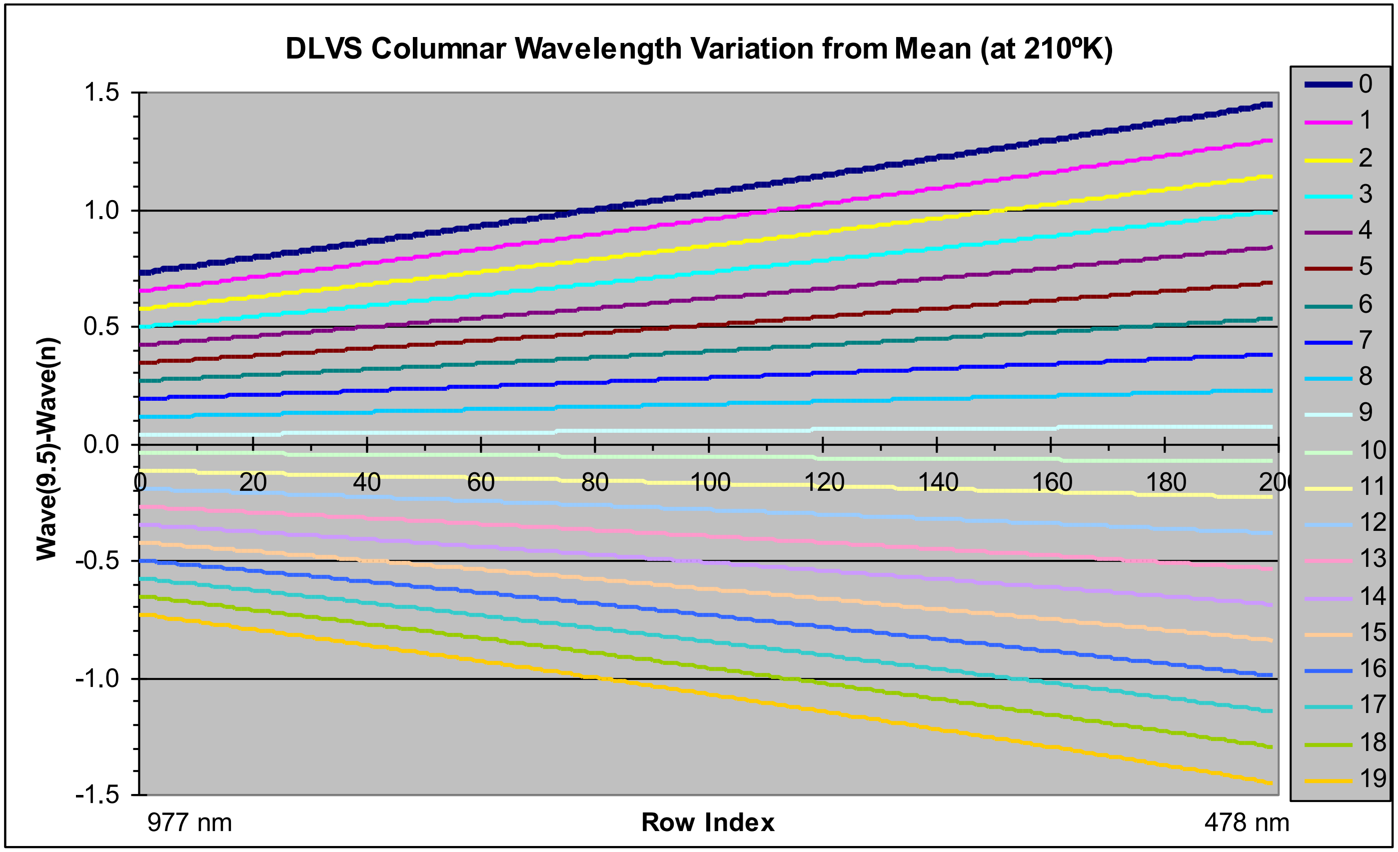


Figure - A plot of the data from the previous table, the offset (by row) from the column average for each column of the DLVS.

Table - ULVS Column Average Wavelength vs. Optics Temperature. The first row presents the DISR Optics temperature, the 2nd thru 4th contain the temperature dependent coefficients, and the remainder of the table presents the column average wavelength for each row of the DISR ULVS data.

Optics T =	260	240	220	210	200	180	160
a =	966.766	966.708	966.649	966.620	966.591	966.532	966.474
b =	-2.3284	-2.3285	-2.3286	-2.3287	-2.3287	-2.3289	-2.3290
c =	-0.00101	-0.00101	-0.00101	-0.00101	-0.00101	-0.00101	-0.00101
0	966.77	966.71	966.65	966.62	966.59	966.53	966.47
1	964.44	964.38	964.32	964.29	964.26	964.20	964.14
2	962.11	962.05	961.99	961.96	961.93	961.87	961.81
3	959.77	959.71	959.65	959.63	959.60	959.54	959.48
4	957.44	957.38	957.32	957.29	957.26	957.20	957.14
5	955.10	955.04	954.98	954.95	954.92	954.86	954.80
6	952.76	952.70	952.64	952.61	952.58	952.52	952.46
7	950.42	950.36	950.30	950.27	950.24	950.18	950.12
8	948.07	948.01	947.96	947.93	947.90	947.84	947.78
9	945.73	945.67	945.61	945.58	945.55	945.49	945.43
10	943.38	943.32	943.26	943.23	943.20	943.14	943.08
11	941.03	940.97	940.91	940.88	940.85	940.79	940.73
12	938.68	938.62	938.56	938.53	938.50	938.44	938.38
13	936.33	936.27	936.21	936.18	936.15	936.09	936.03
14	933.97	933.91	933.85	933.82	933.79	933.73	933.67
15	931.61	931.55	931.49	931.46	931.43	931.37	931.31
16	929.25	929.19	929.13	929.10	929.07	929.01	928.95
17	926.89	926.83	926.77	926.74	926.71	926.65	926.59
18	924.53	924.47	924.41	924.38	924.35	924.28	924.22
19	922.16	922.10	922.04	922.01	921.98	921.92	921.86
20	919.79	919.73	919.67	919.64	919.61	919.55	919.49
21	917.42	917.36	917.30	917.27	917.24	917.18	917.12
22	915.05	914.99	914.93	914.90	914.87	914.81	914.75
23	912.68	912.62	912.56	912.52	912.49	912.43	912.37
24	910.30	910.24	910.18	910.15	910.12	910.06	910.00
25	907.92	907.86	907.80	907.77	907.74	907.68	907.62
26	905.54	905.48	905.42	905.39	905.36	905.30	905.24
27	903.16	903.10	903.04	903.01	902.98	902.91	902.85
28	900.78	900.72	900.65	900.62	900.59	900.53	900.47
29	898.39	898.33	898.27	898.24	898.21	898.14	898.08
30	896.00	895.94	895.88	895.85	895.82	895.76	895.69
31	893.61	893.55	893.49	893.46	893.43	893.36	893.30
32	891.22	891.16	891.10	891.07	891.03	890.97	890.91
33	888.83	888.76	888.70	888.67	888.64	888.58	888.51
34	886.43	886.37	886.31	886.27	886.24	886.18	886.12
35	884.03	883.97	883.91	883.88	883.84	883.78	883.72
36	881.63	881.57	881.51	881.48	881.44	881.38	881.32
37	879.23	879.17	879.10	879.07	879.04	878.98	878.91

Optics T =	260	240	220	210	200	180	160
38	876.83	876.76	876.70	876.67	876.64	876.57	876.51
39	874.42	874.36	874.29	874.26	874.23	874.17	874.10
40	872.01	871.95	871.88	871.85	871.82	871.76	871.69
41	869.60	869.54	869.47	869.44	869.41	869.35	869.28
42	867.19	867.13	867.06	867.03	867.00	866.93	866.87
43	864.77	864.71	864.65	864.61	864.58	864.52	864.45
44	862.36	862.29	862.23	862.20	862.17	862.10	862.04
45	859.94	859.88	859.81	859.78	859.75	859.68	859.62
46	857.52	857.45	857.39	857.36	857.33	857.26	857.20
47	855.10	855.03	854.97	854.94	854.90	854.84	854.77
48	852.67	852.61	852.54	852.51	852.48	852.41	852.35
49	850.25	850.18	850.12	850.08	850.05	849.99	849.92
50	847.82	847.75	847.69	847.65	847.62	847.56	847.49
51	845.39	845.32	845.26	845.22	845.19	845.13	845.06
52	842.95	842.89	842.82	842.79	842.76	842.69	842.63
53	840.52	840.45	840.39	840.36	840.32	840.26	840.19
54	838.08	838.02	837.95	837.92	837.89	837.82	837.75
55	835.64	835.58	835.51	835.48	835.45	835.38	835.32
56	833.20	833.14	833.07	833.04	833.01	832.94	832.87
57	830.76	830.69	830.63	830.60	830.56	830.50	830.43
58	828.32	828.25	828.18	828.15	828.12	828.05	827.98
59	825.87	825.80	825.74	825.70	825.67	825.60	825.54
60	823.42	823.35	823.29	823.25	823.22	823.15	823.09
61	820.97	820.90	820.84	820.80	820.77	820.70	820.64
62	818.52	818.45	818.38	818.35	818.32	818.25	818.18
63	816.06	816.00	815.93	815.89	815.86	815.79	815.73
64	813.61	813.54	813.47	813.44	813.40	813.34	813.27
65	811.15	811.08	811.01	810.98	810.94	810.88	810.81
66	808.69	808.62	808.55	808.52	808.48	808.42	808.35
67	806.22	806.16	806.09	806.05	806.02	805.95	805.88
68	803.76	803.69	803.62	803.59	803.55	803.49	803.42
69	801.29	801.22	801.15	801.12	801.09	801.02	800.95
70	798.82	798.75	798.69	798.65	798.62	798.55	798.48
71	796.35	796.28	796.21	796.18	796.15	796.08	796.01
72	793.88	793.81	793.74	793.71	793.67	793.60	793.53
73	791.40	791.33	791.27	791.23	791.20	791.13	791.06
74	788.93	788.86	788.79	788.75	788.72	788.65	788.58
75	786.45	786.38	786.31	786.27	786.24	786.17	786.10
76	783.97	783.90	783.83	783.79	783.76	783.69	783.62
77	781.48	781.41	781.34	781.31	781.27	781.20	781.13
78	779.00	778.93	778.86	778.82	778.79	778.72	778.65
79	776.51	776.44	776.37	776.34	776.30	776.23	776.16
80	774.02	773.95	773.88	773.85	773.81	773.74	773.67
81	771.53	771.46	771.39	771.35	771.32	771.25	771.18
82	769.04	768.97	768.90	768.86	768.83	768.75	768.68
83	766.54	766.47	766.40	766.36	766.33	766.26	766.19

Optics T =	260	240	220	210	200	180	160
84	764.04	763.97	763.90	763.87	763.83	763.76	763.69
85	761.55	761.47	761.40	761.37	761.33	761.26	761.19
86	759.04	758.97	758.90	758.87	758.83	758.76	758.69
87	756.54	756.47	756.40	756.36	756.33	756.25	756.18
88	754.04	753.96	753.89	753.86	753.82	753.75	753.68
89	751.53	751.46	751.38	751.35	751.31	751.24	751.17
90	749.02	748.95	748.87	748.84	748.80	748.73	748.66
91	746.51	746.43	746.36	746.33	746.29	746.22	746.14
92	743.99	743.92	743.85	743.81	743.78	743.70	743.63
93	741.48	741.41	741.33	741.30	741.26	741.19	741.11
94	738.96	738.89	738.81	738.78	738.74	738.67	738.60
95	736.44	736.37	736.29	736.26	736.22	736.15	736.07
96	733.92	733.85	733.77	733.74	733.70	733.63	733.55
97	731.40	731.32	731.25	731.21	731.17	731.10	731.03
98	728.87	728.80	728.72	728.69	728.65	728.57	728.50
99	726.34	726.27	726.19	726.16	726.12	726.05	725.97
100	723.81	723.74	723.66	723.63	723.59	723.52	723.44
101	721.28	721.21	721.13	721.10	721.06	720.98	720.91
102	718.75	718.67	718.60	718.56	718.52	718.45	718.37
103	716.21	716.14	716.06	716.02	715.99	715.91	715.84
104	713.67	713.60	713.52	713.49	713.45	713.37	713.30
105	711.13	711.06	710.98	710.95	710.91	710.83	710.76
106	708.59	708.52	708.44	708.40	708.37	708.29	708.22
107	706.05	705.97	705.90	705.86	705.82	705.75	705.67
108	703.50	703.43	703.35	703.31	703.28	703.20	703.12
109	700.96	700.88	700.80	700.76	700.73	700.65	700.57
110	698.41	698.33	698.25	698.21	698.18	698.10	698.02
111	695.85	695.78	695.70	695.66	695.62	695.55	695.47
112	693.30	693.22	693.15	693.11	693.07	692.99	692.92
113	690.74	690.67	690.59	690.55	690.51	690.44	690.36
114	688.19	688.11	688.03	687.99	687.95	687.88	687.80
115	685.63	685.55	685.47	685.43	685.39	685.32	685.24
116	683.06	682.99	682.91	682.87	682.83	682.75	682.68
117	680.50	680.42	680.34	680.31	680.27	680.19	680.11
118	677.93	677.86	677.78	677.74	677.70	677.62	677.54
119	675.37	675.29	675.21	675.17	675.13	675.05	674.97
120	672.80	672.72	672.64	672.60	672.56	672.48	672.40
121	670.22	670.14	670.07	670.03	669.99	669.91	669.83
122	667.65	667.57	667.49	667.45	667.41	667.33	667.25
123	665.07	664.99	664.91	664.88	664.84	664.76	664.68
124	662.50	662.42	662.34	662.30	662.26	662.18	662.10
125	659.92	659.84	659.76	659.72	659.68	659.60	659.52
126	657.33	657.25	657.17	657.13	657.09	657.01	656.93
127	654.75	654.67	654.59	654.55	654.51	654.43	654.35
128	652.16	652.08	652.00	651.96	651.92	651.84	651.76
129	649.57	649.49	649.41	649.37	649.33	649.25	649.17

Optics T =	260	240	220	210	200	180	160
130	646.98	646.90	646.82	646.78	646.74	646.66	646.58
131	644.39	644.31	644.23	644.19	644.15	644.07	643.99
132	641.80	641.72	641.63	641.59	641.55	641.47	641.39
133	639.20	639.12	639.04	639.00	638.96	638.87	638.79
134	636.60	636.52	636.44	636.40	636.36	636.27	636.19
135	634.00	633.92	633.84	633.80	633.76	633.67	633.59
136	631.40	631.32	631.23	631.19	631.15	631.07	630.99
137	628.80	628.71	628.63	628.59	628.55	628.46	628.38
138	626.19	626.11	626.02	625.98	625.94	625.86	625.77
139	623.58	623.50	623.41	623.37	623.33	623.25	623.16
140	620.97	620.89	620.80	620.76	620.72	620.64	620.55
141	618.36	618.27	618.19	618.15	618.11	618.02	617.94
142	615.74	615.66	615.57	615.53	615.49	615.41	615.32
143	613.13	613.04	612.96	612.92	612.87	612.79	612.71
144	610.51	610.42	610.34	610.30	610.25	610.17	610.09
145	607.89	607.80	607.72	607.68	607.63	607.55	607.46
146	605.26	605.18	605.09	605.05	605.01	604.92	604.84
147	602.64	602.55	602.47	602.43	602.38	602.30	602.21
148	600.01	599.93	599.84	599.80	599.76	599.67	599.59
149	597.38	597.30	597.21	597.17	597.13	597.04	596.96
150	594.75	594.67	594.58	594.54	594.50	594.41	594.32
151	592.12	592.03	591.95	591.91	591.86	591.78	591.69
152	589.49	589.40	589.31	589.27	589.23	589.14	589.05
153	586.85	586.76	586.68	586.63	586.59	586.50	586.42
154	584.21	584.12	584.04	583.99	583.95	583.86	583.77
155	581.57	581.48	581.39	581.35	581.31	581.22	581.13
156	578.93	578.84	578.75	578.71	578.66	578.58	578.49
157	576.28	576.19	576.11	576.06	576.02	575.93	575.84
158	573.63	573.55	573.46	573.41	573.37	573.28	573.19
159	570.99	570.90	570.81	570.76	570.72	570.63	570.54
160	568.34	568.25	568.16	568.11	568.07	567.98	567.89
161	565.68	565.59	565.50	565.46	565.42	565.33	565.24
162	563.03	562.94	562.85	562.80	562.76	562.67	562.58
163	560.37	560.28	560.19	560.15	560.10	560.01	559.92
164	557.71	557.62	557.53	557.49	557.44	557.35	557.26
165	555.05	554.96	554.87	554.82	554.78	554.69	554.60
166	552.39	552.30	552.21	552.16	552.12	552.03	551.93
167	549.72	549.63	549.54	549.50	549.45	549.36	549.27
168	547.05	546.96	546.87	546.83	546.78	546.69	546.60
169	544.39	544.29	544.20	544.16	544.11	544.02	543.93
170	541.71	541.62	541.53	541.49	541.44	541.35	541.26
171	539.04	538.95	538.86	538.81	538.77	538.67	538.58
172	536.37	536.27	536.18	536.14	536.09	536.00	535.91
173	533.69	533.60	533.50	533.46	533.41	533.32	533.23
174	531.01	530.92	530.82	530.78	530.73	530.64	530.55
175	528.33	528.24	528.14	528.10	528.05	527.96	527.86

Optics T =	260	240	220	210	200	180	160
176	525.64	525.55	525.46	525.41	525.37	525.27	525.18
177	522.96	522.87	522.77	522.73	522.68	522.59	522.49
178	520.27	520.18	520.08	520.04	519.99	519.90	519.80
179	517.58	517.49	517.39	517.35	517.30	517.21	517.11
180	514.89	514.80	514.70	514.66	514.61	514.51	514.42
181	512.20	512.10	512.01	511.96	511.91	511.82	511.72
182	509.50	509.41	509.31	509.27	509.22	509.12	509.03
183	506.81	506.71	506.61	506.57	506.52	506.42	506.33
184	504.11	504.01	503.91	503.87	503.82	503.72	503.63
185	501.40	501.31	501.21	501.16	501.12	501.02	500.92
186	498.70	498.60	498.51	498.46	498.41	498.32	498.22
187	496.00	495.90	495.80	495.75	495.71	495.61	495.51
188	493.29	493.19	493.09	493.05	493.00	492.90	492.80
189	490.58	490.48	490.38	490.34	490.29	490.19	490.09
190	487.87	487.77	487.67	487.62	487.57	487.48	487.38
191	485.15	485.05	484.96	484.91	484.86	484.76	484.66
192	482.44	482.34	482.24	482.19	482.14	482.05	481.95
193	479.72	479.62	479.52	479.47	479.42	479.33	479.23
194	477.00	476.90	476.80	476.75	476.70	476.61	476.51
195	474.28	474.18	474.08	474.03	473.98	473.88	473.78
196	471.55	471.45	471.36	471.31	471.26	471.16	471.06
197	468.83	468.73	468.63	468.58	468.53	468.43	468.33
198	466.10	466.00	465.90	465.85	465.80	465.70	465.60
199	463.37	463.27	463.17	463.12	463.07	462.97	462.87

Table - Deviation in the ULVS column average wavelength scale (in nm) with optics temperature (from 160ºK to 260ºK) from the value at 210ºK (by row).

Row	260	240	220	200	180	160
0	-0.146	-0.088	-0.029	0.029	0.088	0.146
1	-0.146	-0.088	-0.029	0.029	0.088	0.146
2	-0.147	-0.088	-0.029	0.029	0.088	0.147
3	-0.147	-0.088	-0.029	0.029	0.088	0.147
4	-0.147	-0.088	-0.029	0.029	0.088	0.147
5	-0.148	-0.089	-0.030	0.030	0.089	0.148
6	-0.148	-0.089	-0.030	0.030	0.089	0.148
7	-0.148	-0.089	-0.030	0.030	0.089	0.148
8	-0.148	-0.089	-0.030	0.030	0.089	0.148
9	-0.149	-0.089	-0.030	0.030	0.089	0.149
10	-0.149	-0.089	-0.030	0.030	0.089	0.149
11	-0.149	-0.090	-0.030	0.030	0.090	0.149
12	-0.150	-0.090	-0.030	0.030	0.090	0.150
13	-0.150	-0.090	-0.030	0.030	0.090	0.150
14	-0.150	-0.090	-0.030	0.030	0.090	0.150
15	-0.150	-0.090	-0.030	0.030	0.090	0.150
16	-0.151	-0.090	-0.030	0.030	0.090	0.151
17	-0.151	-0.091	-0.030	0.030	0.091	0.151

Row	260	240	220	200	180	160
18	-0.151	-0.091	-0.030	0.030	0.091	0.151
19	-0.152	-0.091	-0.030	0.030	0.091	0.152
20	-0.152	-0.091	-0.030	0.030	0.091	0.152
21	-0.152	-0.091	-0.030	0.030	0.091	0.152
22	-0.153	-0.092	-0.031	0.031	0.092	0.153
23	-0.153	-0.092	-0.031	0.031	0.092	0.153
24	-0.153	-0.092	-0.031	0.031	0.092	0.153
25	-0.154	-0.092	-0.031	0.031	0.092	0.154
26	-0.154	-0.092	-0.031	0.031	0.092	0.154
27	-0.154	-0.093	-0.031	0.031	0.093	0.154
28	-0.155	-0.093	-0.031	0.031	0.093	0.155
29	-0.155	-0.093	-0.031	0.031	0.093	0.155
30	-0.155	-0.093	-0.031	0.031	0.093	0.155
31	-0.156	-0.093	-0.031	0.031	0.093	0.156
32	-0.156	-0.094	-0.031	0.031	0.094	0.156
33	-0.156	-0.094	-0.031	0.031	0.094	0.156
34	-0.157	-0.094	-0.031	0.031	0.094	0.157
35	-0.157	-0.094	-0.031	0.031	0.094	0.157
36	-0.157	-0.094	-0.031	0.031	0.094	0.157
37	-0.158	-0.095	-0.032	0.032	0.095	0.158
38	-0.158	-0.095	-0.032	0.032	0.095	0.158
39	-0.158	-0.095	-0.032	0.032	0.095	0.158
40	-0.159	-0.095	-0.032	0.032	0.095	0.159
41	-0.159	-0.096	-0.032	0.032	0.096	0.159
42	-0.160	-0.096	-0.032	0.032	0.096	0.160
43	-0.160	-0.096	-0.032	0.032	0.096	0.160
44	-0.160	-0.096	-0.032	0.032	0.096	0.160
45	-0.161	-0.096	-0.032	0.032	0.096	0.161
46	-0.161	-0.097	-0.032	0.032	0.097	0.161
47	-0.161	-0.097	-0.032	0.032	0.097	0.161
48	-0.162	-0.097	-0.032	0.032	0.097	0.162
49	-0.162	-0.097	-0.032	0.032	0.097	0.162
50	-0.163	-0.098	-0.033	0.033	0.098	0.163
51	-0.163	-0.098	-0.033	0.033	0.098	0.163
52	-0.163	-0.098	-0.033	0.033	0.098	0.163
53	-0.164	-0.098	-0.033	0.033	0.098	0.164
54	-0.164	-0.099	-0.033	0.033	0.099	0.164
55	-0.165	-0.099	-0.033	0.033	0.099	0.165
56	-0.165	-0.099	-0.033	0.033	0.099	0.165
57	-0.165	-0.099	-0.033	0.033	0.099	0.165
58	-0.166	-0.100	-0.033	0.033	0.100	0.166
59	-0.166	-0.100	-0.033	0.033	0.100	0.166
60	-0.167	-0.100	-0.033	0.033	0.100	0.167
61	-0.167	-0.100	-0.033	0.033	0.100	0.167
62	-0.168	-0.101	-0.034	0.034	0.101	0.168
63	-0.168	-0.101	-0.034	0.034	0.101	0.168
64	-0.168	-0.101	-0.034	0.034	0.101	0.168
65	-0.169	-0.101	-0.034	0.034	0.101	0.169

Row	260	240	220	200	180	160
66	-0.169	-0.102	-0.034	0.034	0.102	0.169
67	-0.170	-0.102	-0.034	0.034	0.102	0.170
68	-0.170	-0.102	-0.034	0.034	0.102	0.170
69	-0.171	-0.102	-0.034	0.034	0.102	0.171
70	-0.171	-0.103	-0.034	0.034	0.103	0.171
71	-0.171	-0.103	-0.034	0.034	0.103	0.171
72	-0.172	-0.103	-0.034	0.034	0.103	0.172
73	-0.172	-0.103	-0.034	0.034	0.103	0.172
74	-0.173	-0.104	-0.035	0.035	0.104	0.173
75	-0.173	-0.104	-0.035	0.035	0.104	0.173
76	-0.174	-0.104	-0.035	0.035	0.104	0.174
77	-0.174	-0.105	-0.035	0.035	0.105	0.174
78	-0.175	-0.105	-0.035	0.035	0.105	0.175
79	-0.175	-0.105	-0.035	0.035	0.105	0.175
80	-0.176	-0.105	-0.035	0.035	0.105	0.176
81	-0.176	-0.106	-0.035	0.035	0.106	0.176
82	-0.177	-0.106	-0.035	0.035	0.106	0.177
83	-0.177	-0.106	-0.035	0.035	0.106	0.177
84	-0.178	-0.107	-0.036	0.036	0.107	0.178
85	-0.178	-0.107	-0.036	0.036	0.107	0.178
86	-0.179	-0.107	-0.036	0.036	0.107	0.179
87	-0.179	-0.107	-0.036	0.036	0.107	0.179
88	-0.180	-0.108	-0.036	0.036	0.108	0.180
89	-0.180	-0.108	-0.036	0.036	0.108	0.180
90	-0.181	-0.108	-0.036	0.036	0.108	0.181
91	-0.181	-0.109	-0.036	0.036	0.109	0.181
92	-0.182	-0.109	-0.036	0.036	0.109	0.182
93	-0.182	-0.109	-0.036	0.036	0.109	0.182
94	-0.183	-0.110	-0.037	0.037	0.110	0.183
95	-0.183	-0.110	-0.037	0.037	0.110	0.183
96	-0.184	-0.110	-0.037	0.037	0.110	0.184
97	-0.184	-0.110	-0.037	0.037	0.110	0.184
98	-0.185	-0.111	-0.037	0.037	0.111	0.185
99	-0.185	-0.111	-0.037	0.037	0.111	0.185
100	-0.186	-0.111	-0.037	0.037	0.111	0.186
101	-0.186	-0.112	-0.037	0.037	0.112	0.186
102	-0.187	-0.112	-0.037	0.037	0.112	0.187
103	-0.187	-0.112	-0.037	0.037	0.112	0.187
104	-0.188	-0.113	-0.038	0.038	0.113	0.188
105	-0.188	-0.113	-0.038	0.038	0.113	0.188
106	-0.189	-0.113	-0.038	0.038	0.113	0.189
107	-0.189	-0.114	-0.038	0.038	0.114	0.189
108	-0.190	-0.114	-0.038	0.038	0.114	0.190
109	-0.190	-0.114	-0.038	0.038	0.114	0.190
110	-0.191	-0.115	-0.038	0.038	0.115	0.191
111	-0.192	-0.115	-0.038	0.038	0.115	0.192
112	-0.192	-0.115	-0.038	0.038	0.115	0.192
113	-0.193	-0.116	-0.039	0.039	0.116	0.193

Row	260	240	220	200	180	160
114	-0.193	-0.116	-0.039	0.039	0.116	0.193
115	-0.194	-0.116	-0.039	0.039	0.116	0.194
116	-0.194	-0.117	-0.039	0.039	0.117	0.194
117	-0.195	-0.117	-0.039	0.039	0.117	0.195
118	-0.195	-0.117	-0.039	0.039	0.117	0.195
119	-0.196	-0.118	-0.039	0.039	0.118	0.196
120	-0.197	-0.118	-0.039	0.039	0.118	0.197
121	-0.197	-0.118	-0.039	0.039	0.118	0.197
122	-0.198	-0.119	-0.040	0.040	0.119	0.198
123	-0.198	-0.119	-0.040	0.040	0.119	0.198
124	-0.199	-0.119	-0.040	0.040	0.119	0.199
125	-0.200	-0.120	-0.040	0.040	0.120	0.200
126	-0.200	-0.120	-0.040	0.040	0.120	0.200
127	-0.201	-0.120	-0.040	0.040	0.120	0.201
128	-0.201	-0.121	-0.040	0.040	0.121	0.201
129	-0.202	-0.121	-0.040	0.040	0.121	0.202
130	-0.203	-0.122	-0.041	0.041	0.122	0.203
131	-0.203	-0.122	-0.041	0.041	0.122	0.203
132	-0.204	-0.122	-0.041	0.041	0.122	0.204
133	-0.204	-0.123	-0.041	0.041	0.123	0.204
134	-0.205	-0.123	-0.041	0.041	0.123	0.205
135	-0.206	-0.123	-0.041	0.041	0.123	0.206
136	-0.206	-0.124	-0.041	0.041	0.124	0.206
137	-0.207	-0.124	-0.041	0.041	0.124	0.207
138	-0.207	-0.124	-0.041	0.041	0.124	0.207
139	-0.208	-0.125	-0.042	0.042	0.125	0.208
140	-0.209	-0.125	-0.042	0.042	0.125	0.209
141	-0.209	-0.126	-0.042	0.042	0.126	0.209
142	-0.210	-0.126	-0.042	0.042	0.126	0.210
143	-0.211	-0.126	-0.042	0.042	0.126	0.211
144	-0.211	-0.127	-0.042	0.042	0.127	0.211
145	-0.212	-0.127	-0.042	0.042	0.127	0.212
146	-0.213	-0.128	-0.043	0.043	0.128	0.213
147	-0.213	-0.128	-0.043	0.043	0.128	0.213
148	-0.214	-0.128	-0.043	0.043	0.128	0.214
149	-0.214	-0.129	-0.043	0.043	0.129	0.214
150	-0.215	-0.129	-0.043	0.043	0.129	0.215
151	-0.216	-0.129	-0.043	0.043	0.129	0.216
152	-0.216	-0.130	-0.043	0.043	0.130	0.216
153	-0.217	-0.130	-0.043	0.043	0.130	0.217
154	-0.218	-0.131	-0.044	0.044	0.131	0.218
155	-0.218	-0.131	-0.044	0.044	0.131	0.218
156	-0.219	-0.131	-0.044	0.044	0.131	0.219
157	-0.220	-0.132	-0.044	0.044	0.132	0.220
158	-0.220	-0.132	-0.044	0.044	0.132	0.220
159	-0.221	-0.133	-0.044	0.044	0.133	0.221
160	-0.222	-0.133	-0.044	0.044	0.133	0.222
161	-0.223	-0.134	-0.045	0.045	0.134	0.223

Row	260	240	220	200	180	160
162	-0.223	-0.134	-0.045	0.045	0.134	0.223
163	-0.224	-0.134	-0.045	0.045	0.134	0.224
164	-0.225	-0.135	-0.045	0.045	0.135	0.225
165	-0.225	-0.135	-0.045	0.045	0.135	0.225
166	-0.226	-0.136	-0.045	0.045	0.136	0.226
167	-0.227	-0.136	-0.045	0.045	0.136	0.227
168	-0.227	-0.136	-0.045	0.045	0.136	0.227
169	-0.228	-0.137	-0.046	0.046	0.137	0.228
170	-0.229	-0.137	-0.046	0.046	0.137	0.229
171	-0.229	-0.138	-0.046	0.046	0.138	0.229
172	-0.230	-0.138	-0.046	0.046	0.138	0.230
173	-0.231	-0.139	-0.046	0.046	0.139	0.231
174	-0.232	-0.139	-0.046	0.046	0.139	0.232
175	-0.232	-0.139	-0.046	0.046	0.139	0.232
176	-0.233	-0.140	-0.047	0.047	0.140	0.233
177	-0.234	-0.140	-0.047	0.047	0.140	0.234
178	-0.235	-0.141	-0.047	0.047	0.141	0.235
179	-0.235	-0.141	-0.047	0.047	0.141	0.235
180	-0.236	-0.142	-0.047	0.047	0.142	0.236
181	-0.237	-0.142	-0.047	0.047	0.142	0.237
182	-0.237	-0.142	-0.047	0.047	0.142	0.237
183	-0.238	-0.143	-0.048	0.048	0.143	0.238
184	-0.239	-0.143	-0.048	0.048	0.143	0.239
185	-0.240	-0.144	-0.048	0.048	0.144	0.240
186	-0.240	-0.144	-0.048	0.048	0.144	0.240
187	-0.241	-0.145	-0.048	0.048	0.145	0.241
188	-0.242	-0.145	-0.048	0.048	0.145	0.242
189	-0.243	-0.146	-0.049	0.049	0.146	0.243
190	-0.243	-0.146	-0.049	0.049	0.146	0.243
191	-0.244	-0.147	-0.049	0.049	0.147	0.244
192	-0.245	-0.147	-0.049	0.049	0.147	0.245
193	-0.246	-0.147	-0.049	0.049	0.147	0.246
194	-0.247	-0.148	-0.049	0.049	0.148	0.247
195	-0.247	-0.148	-0.049	0.049	0.148	0.247
196	-0.248	-0.149	-0.050	0.050	0.149	0.248
197	-0.249	-0.149	-0.050	0.050	0.149	0.249
198	-0.250	-0.150	-0.050	0.050	0.150	0.250
199	-0.250	-0.150	-0.050	0.050	0.150	0.250

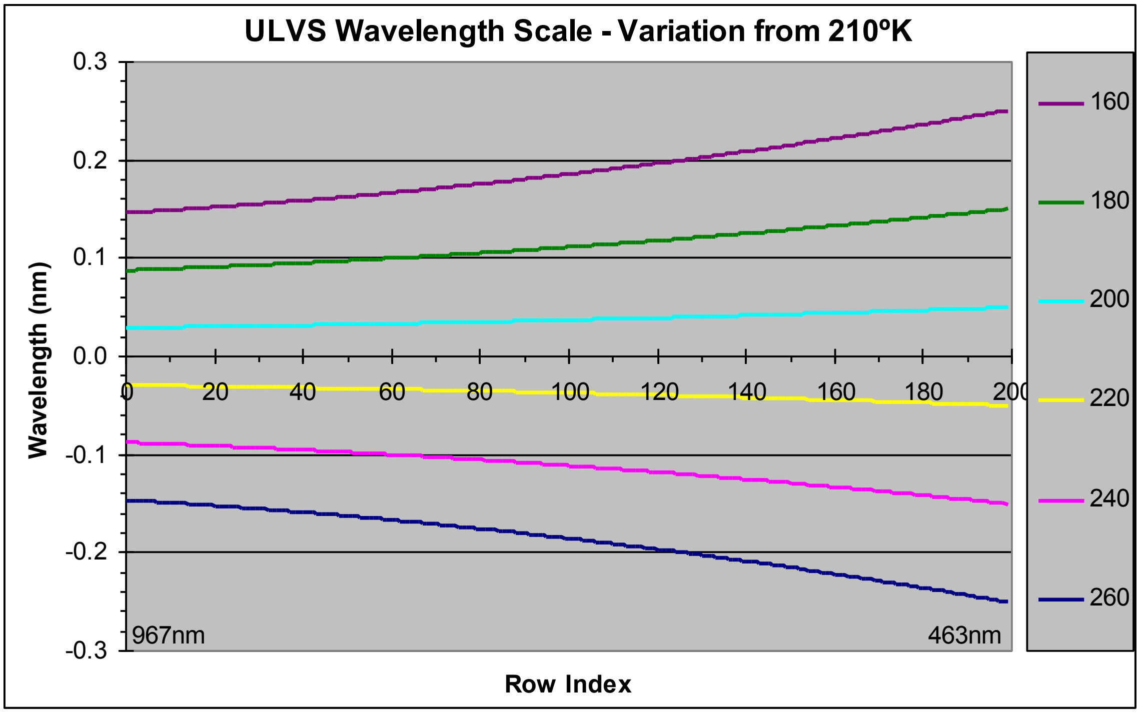


Figure - A plot of the values in the preceding table (wavelength variation with DISR optics temperature).

Table - The wavelengths corresponding to each ULIS pixel at 210ºK

Row\Col.	0	1	2	3	4	5	6	7
0	966.97	966.87	966.77	966.67	966.57	966.47	966.37	966.27
1	964.64	964.54	964.44	964.34	964.24	964.14	964.04	963.94
2	962.31	962.21	962.11	962.01	961.91	961.81	961.71	961.61
3	959.97	959.87	959.77	959.67	959.58	959.48	959.38	959.28
4	957.64	957.54	957.44	957.34	957.24	957.14	957.04	956.94
5	955.30	955.20	955.10	955.00	954.90	954.80	954.70	954.60
6	952.96	952.86	952.76	952.66	952.56	952.46	952.36	952.26
7	950.62	950.52	950.42	950.32	950.22	950.12	950.02	949.92
8	948.27	948.17	948.07	947.98	947.88	947.78	947.68	947.58
9	945.93	945.83	945.73	945.63	945.53	945.43	945.33	945.23
10	943.58	943.48	943.38	943.28	943.18	943.08	942.98	942.88
11	941.23	941.13	941.03	940.93	940.83	940.73	940.63	940.53
12	938.88	938.78	938.68	938.58	938.48	938.38	938.28	938.18
13	936.52	936.43	936.33	936.23	936.13	936.03	935.93	935.83
14	934.17	934.07	933.97	933.87	933.77	933.67	933.57	933.47
15	931.81	931.71	931.61	931.51	931.41	931.31	931.21	931.11
16	929.45	929.35	929.25	929.15	929.05	928.95	928.85	928.75
17	927.09	926.99	926.89	926.79	926.69	926.59	926.49	926.39
18	924.73	924.63	924.53	924.43	924.33	924.23	924.13	924.02
19	922.36	922.26	922.16	922.06	921.96	921.86	921.76	921.66
20	919.99	919.89	919.79	919.69	919.59	919.49	919.39	919.29
21	917.62	917.52	917.42	917.32	917.22	917.12	917.02	916.92
22	915.25	915.15	915.05	914.95	914.85	914.75	914.65	914.55

23	912.88	912.78	912.68	912.58	912.47	912.37	912.27	912.17
24	910.50	910.40	910.30	910.20	910.10	910.00	909.90	909.79
25	908.12	908.02	907.92	907.82	907.72	907.62	907.52	907.42
26	905.75	905.64	905.54	905.44	905.34	905.24	905.14	905.03
27	903.36	903.26	903.16	903.06	902.96	902.85	902.75	902.65
28	900.98	900.88	900.78	900.67	900.57	900.47	900.37	900.27
29	898.59	898.49	898.39	898.29	898.19	898.08	897.98	897.88
30	896.21	896.10	896.00	895.90	895.80	895.69	895.59	895.49
31	893.82	893.71	893.61	893.51	893.41	893.30	893.20	893.10
32	891.43	891.32	891.22	891.12	891.01	890.91	890.81	890.71
33	889.03	888.93	888.83	888.72	888.62	888.52	888.41	888.31
34	886.64	886.53	886.43	886.33	886.22	886.12	886.02	885.91
35	884.24	884.13	884.03	883.93	883.82	883.72	883.62	883.51
36	881.84	881.73	881.63	881.53	881.42	881.32	881.22	881.11
37	879.44	879.33	879.23	879.12	879.02	878.92	878.81	878.71
38	877.03	876.93	876.82	876.72	876.62	876.51	876.41	876.30
39	874.63	874.52	874.42	874.31	874.21	874.10	874.00	873.90
40	872.22	872.12	872.01	871.91	871.80	871.70	871.59	871.49
41	869.81	869.71	869.60	869.49	869.39	869.28	869.18	869.07
42	867.40	867.29	867.19	867.08	866.98	866.87	866.77	866.66
43	864.98	864.88	864.77	864.67	864.56	864.46	864.35	864.24
44	862.57	862.46	862.36	862.25	862.14	862.04	861.93	861.83
45	860.15	860.05	859.94	859.83	859.73	859.62	859.51	859.41
46	857.73	857.63	857.52	857.41	857.30	857.20	857.09	856.98
47	855.31	855.20	855.10	854.99	854.88	854.77	854.67	854.56
48	852.89	852.78	852.67	852.56	852.46	852.35	852.24	852.13
49	850.46	850.35	850.25	850.14	850.03	849.92	849.81	849.71
50	848.03	847.93	847.82	847.71	847.60	847.49	847.38	847.28
51	845.60	845.50	845.39	845.28	845.17	845.06	844.95	844.84
52	843.17	843.06	842.95	842.85	842.74	842.63	842.52	842.41
53	840.74	840.63	840.52	840.41	840.30	840.19	840.08	839.97
54	838.30	838.19	838.08	837.97	837.86	837.75	837.64	837.53
55	835.87	835.76	835.64	835.53	835.42	835.31	835.20	835.09
56	833.43	833.31	833.20	833.09	832.98	832.87	832.76	832.65
57	830.98	830.87	830.76	830.65	830.54	830.43	830.32	830.21
58	828.54	828.43	828.32	828.21	828.09	827.98	827.87	827.76
59	826.09	825.98	825.87	825.76	825.65	825.54	825.42	825.31
60	823.65	823.53	823.42	823.31	823.20	823.09	822.97	822.86
61	821.20	821.08	820.97	820.86	820.75	820.63	820.52	820.41
62	818.75	818.63	818.52	818.41	818.29	818.18	818.07	817.95
63	816.29	816.18	816.06	815.95	815.84	815.72	815.61	815.50
64	813.84	813.72	813.61	813.49	813.38	813.27	813.15	813.04
65	811.38	811.26	811.15	811.04	810.92	810.81	810.69	810.58
66	808.92	808.80	808.69	808.57	808.46	808.34	808.23	808.11
67	806.46	806.34	806.23	806.11	806.00	805.88	805.76	805.65
68	803.99	803.88	803.76	803.65	803.53	803.41	803.30	803.18
69	801.53	801.41	801.30	801.18	801.06	800.95	800.83	800.71

70	799.06	798.94	798.83	798.71	798.59	798.48	798.36	798.24
71	796.59	796.47	796.36	796.24	796.12	796.00	795.89	795.77
72	794.12	794.00	793.88	793.77	793.65	793.53	793.41	793.29
73	791.65	791.53	791.41	791.29	791.17	791.05	790.93	790.82
74	789.17	789.05	788.93	788.81	788.69	788.57	788.46	788.34
75	786.69	786.57	786.45	786.33	786.21	786.09	785.97	785.86
76	784.21	784.09	783.97	783.85	783.73	783.61	783.49	783.37
77	781.73	781.61	781.49	781.37	781.25	781.13	781.01	780.89
78	779.25	779.13	779.00	778.88	778.76	778.64	778.52	778.40
79	776.76	776.64	776.52	776.40	776.27	776.15	776.03	775.91
80	774.27	774.15	774.03	773.91	773.78	773.66	773.54	773.42
81	771.78	771.66	771.54	771.42	771.29	771.17	771.05	770.92
82	769.29	769.17	769.05	768.92	768.80	768.68	768.55	768.43
83	766.80	766.67	766.55	766.43	766.30	766.18	766.05	765.93
84	764.30	764.18	764.05	763.93	763.80	763.68	763.56	763.43
85	761.81	761.68	761.56	761.43	761.30	761.18	761.05	760.93
86	759.31	759.18	759.05	758.93	758.80	758.68	758.55	758.42
87	756.80	756.68	756.55	756.42	756.30	756.17	756.05	755.92
88	754.30	754.17	754.05	753.92	753.79	753.66	753.54	753.41
89	751.80	751.67	751.54	751.41	751.28	751.16	751.03	750.90
90	749.29	749.16	749.03	748.90	748.77	748.65	748.52	748.39
91	746.78	746.65	746.52	746.39	746.26	746.13	746.00	745.87
92	744.27	744.14	744.01	743.88	743.75	743.62	743.49	743.36
93	741.75	741.62	741.49	741.36	741.23	741.10	740.97	740.84
94	739.24	739.11	738.97	738.84	738.71	738.58	738.45	738.32
95	736.72	736.59	736.46	736.32	736.19	736.06	735.93	735.80
96	734.20	734.07	733.93	733.80	733.67	733.54	733.40	733.27
97	731.68	731.54	731.41	731.28	731.15	731.01	730.88	730.75
98	729.15	729.02	728.89	728.75	728.62	728.48	728.35	728.22
99	726.63	726.49	726.36	726.22	726.09	725.96	725.82	725.69
100	724.10	723.97	723.83	723.70	723.56	723.42	723.29	723.15
101	721.57	721.44	721.30	721.16	721.03	720.89	720.76	720.62
102	719.04	718.90	718.77	718.63	718.49	718.36	718.22	718.08
103	716.51	716.37	716.23	716.09	715.96	715.82	715.68	715.54
104	713.97	713.83	713.69	713.56	713.42	713.28	713.14	713.00
105	711.43	711.29	711.15	711.02	710.88	710.74	710.60	710.46
106	708.89	708.75	708.61	708.47	708.33	708.19	708.05	707.91
107	706.35	706.21	706.07	705.93	705.79	705.65	705.51	705.37
108	703.81	703.67	703.53	703.38	703.24	703.10	702.96	702.82
109	701.26	701.12	700.98	700.84	700.69	700.55	700.41	700.27
110	698.71	698.57	698.43	698.29	698.14	698.00	697.86	697.71
111	696.17	696.02	695.88	695.73	695.59	695.45	695.30	695.16
112	693.61	693.47	693.32	693.18	693.04	692.89	692.75	692.60
113	691.06	690.91	690.77	690.62	690.48	690.33	690.19	690.04
114	688.50	688.36	688.21	688.07	687.92	687.77	687.63	687.48
115	685.95	685.80	685.65	685.51	685.36	685.21	685.06	684.92
116	683.39	683.24	683.09	682.94	682.80	682.65	682.50	682.35

117	680.83	680.68	680.53	680.38	680.23	680.08	679.93	679.78
118	678.26	678.11	677.96	677.81	677.66	677.51	677.36	677.22
119	675.70	675.55	675.40	675.25	675.09	674.94	674.79	674.64
120	673.13	672.98	672.83	672.67	672.52	672.37	672.22	672.07
121	670.56	670.41	670.25	670.10	669.95	669.80	669.65	669.49
122	667.99	667.83	667.68	667.53	667.38	667.22	667.07	666.92
123	665.41	665.26	665.11	664.95	664.80	664.64	664.49	664.34
124	662.84	662.68	662.53	662.37	662.22	662.06	661.91	661.75
125	660.26	660.10	659.95	659.79	659.64	659.48	659.33	659.17
126	657.68	657.52	657.37	657.21	657.05	656.90	656.74	656.59
127	655.10	654.94	654.78	654.63	654.47	654.31	654.15	654.00
128	652.52	652.36	652.20	652.04	651.88	651.72	651.57	651.41
129	649.93	649.77	649.61	649.45	649.29	649.13	648.97	648.81
130	647.34	647.18	647.02	646.86	646.70	646.54	646.38	646.22
131	644.75	644.59	644.43	644.27	644.11	643.95	643.79	643.62
132	642.16	642.00	641.84	641.67	641.51	641.35	641.19	641.03
133	639.57	639.40	639.24	639.08	638.92	638.75	638.59	638.43
134	636.97	636.81	636.64	636.48	636.32	636.15	635.99	635.82
135	634.37	634.21	634.04	633.88	633.71	633.55	633.38	633.22
136	631.77	631.61	631.44	631.28	631.11	630.94	630.78	630.61
137	629.17	629.01	628.84	628.67	628.51	628.34	628.17	628.00
138	626.57	626.40	626.23	626.07	625.90	625.73	625.56	625.39
139	623.96	623.79	623.63	623.46	623.29	623.12	622.95	622.78
140	621.36	621.19	621.02	620.85	620.68	620.51	620.34	620.17
141	618.75	618.58	618.40	618.23	618.06	617.89	617.72	617.55
142	616.13	615.96	615.79	615.62	615.45	615.27	615.10	614.93
143	613.52	613.35	613.18	613.00	612.83	612.66	612.48	612.31
144	610.91	610.73	610.56	610.38	610.21	610.04	609.86	609.69
145	608.29	608.11	607.94	607.76	607.59	607.41	607.24	607.06
146	605.67	605.49	605.32	605.14	604.96	604.79	604.61	604.44
147	603.05	602.87	602.69	602.52	602.34	602.16	601.98	601.81
148	600.42	600.24	600.07	599.89	599.71	599.53	599.35	599.18
149	597.80	597.62	597.44	597.26	597.08	596.90	596.72	596.54
150	595.17	594.99	594.81	594.63	594.45	594.27	594.09	593.91
151	592.54	592.36	592.18	592.00	591.81	591.63	591.45	591.27
152	589.91	589.73	589.54	589.36	589.18	589.00	588.81	588.63
153	587.27	587.09	586.91	586.72	586.54	586.36	586.17	585.99
154	584.64	584.45	584.27	584.09	583.90	583.72	583.53	583.35
155	582.00	581.82	581.63	581.44	581.26	581.07	580.89	580.70
156	579.36	579.17	578.99	578.80	578.61	578.43	578.24	578.05
157	576.72	576.53	576.34	576.16	575.97	575.78	575.59	575.40
158	574.08	573.89	573.70	573.51	573.32	573.13	572.94	572.75
159	571.43	571.24	571.05	570.86	570.67	570.48	570.29	570.10
160	568.78	568.59	568.40	568.21	568.02	567.83	567.63	567.44
161	566.13	565.94	565.75	565.56	565.36	565.17	564.98	564.79
162	563.48	563.29	563.09	562.90	562.71	562.51	562.32	562.13
163	560.83	560.63	560.44	560.24	560.05	559.85	559.66	559.46

164	558.17	557.98	557.78	557.58	557.39	557.19	557.00	556.80
165	555.52	555.32	555.12	554.92	554.73	554.53	554.33	554.13
166	552.86	552.66	552.46	552.26	552.06	551.86	551.66	551.47
167	550.19	549.99	549.79	549.59	549.40	549.20	549.00	548.80
168	547.53	547.33	547.13	546.93	546.73	546.53	546.33	546.12
169	544.86	544.66	544.46	544.26	544.06	543.85	543.65	543.45
170	542.20	541.99	541.79	541.59	541.38	541.18	540.98	540.77
171	539.53	539.32	539.12	538.91	538.71	538.50	538.30	538.10
172	536.86	536.65	536.44	536.24	536.03	535.83	535.62	535.42
173	534.18	533.98	533.77	533.56	533.35	533.15	532.94	532.73
174	531.51	531.30	531.09	530.88	530.67	530.47	530.26	530.05
175	528.83	528.62	528.41	528.20	527.99	527.78	527.57	527.36
176	526.15	525.94	525.73	525.52	525.31	525.10	524.88	524.67
177	523.47	523.26	523.04	522.83	522.62	522.41	522.20	521.98
178	520.78	520.57	520.36	520.14	519.93	519.72	519.50	519.29
179	518.10	517.88	517.67	517.45	517.24	517.03	516.81	516.60
180	515.41	515.20	514.98	514.76	514.55	514.33	514.12	513.90
181	512.72	512.50	512.29	512.07	511.85	511.64	511.42	511.20
182	510.03	509.81	509.59	509.37	509.16	508.94	508.72	508.50
183	507.34	507.12	506.90	506.68	506.46	506.24	506.02	505.80
184	504.64	504.42	504.20	503.98	503.76	503.54	503.31	503.09
185	501.94	501.72	501.50	501.28	501.05	500.83	500.61	500.39
186	499.24	499.02	498.80	498.57	498.35	498.12	497.90	497.68
187	496.54	496.32	496.09	495.87	495.64	495.42	495.19	494.97
188	493.84	493.61	493.39	493.16	492.93	492.71	492.48	492.25
189	491.13	490.90	490.68	490.45	490.22	489.99	489.77	489.54
190	488.42	488.20	487.97	487.74	487.51	487.28	487.05	486.82
191	485.72	485.48	485.25	485.02	484.79	484.56	484.33	484.10
192	483.00	482.77	482.54	482.31	482.08	481.84	481.61	481.38
193	480.29	480.06	479.82	479.59	479.36	479.12	478.89	478.66
194	477.57	477.34	477.11	476.87	476.64	476.40	476.17	475.93
195	474.86	474.62	474.38	474.15	473.91	473.68	473.44	473.20
196	472.14	471.90	471.66	471.42	471.19	470.95	470.71	470.47
197	469.42	469.18	468.94	468.70	468.46	468.22	467.98	467.74
198	466.69	466.45	466.21	465.97	465.73	465.49	465.25	465.01
199	463.97	463.72	463.48	463.24	463.00	462.76	462.52	462.27

Table - The wavelength shear across the 8 ULVS columns. This table presents the offset from the column average wavelength for each ULVS pixel (in nanometers). These offsets can be used to determine the wavelength corresponding to any ULVS pixel once the column average has been calculated (as above).

Row\Col.	0	1	2	3	4	5	6	7
0	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
1	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
2	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
3	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35

4	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
5	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
6	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
7	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
8	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
9	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
10	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
11	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
12	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
13	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
14	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
15	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
16	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
17	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
18	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
19	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
20	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
21	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
22	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
23	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
24	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
25	-0.35	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.35
26	-0.36	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.36
27	-0.36	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.36
28	-0.36	-0.25	-0.15	-0.05	0.05	0.15	0.25	0.36
29	-0.36	-0.26	-0.15	-0.05	0.05	0.15	0.26	0.36
30	-0.36	-0.26	-0.15	-0.05	0.05	0.15	0.26	0.36
31	-0.36	-0.26	-0.15	-0.05	0.05	0.15	0.26	0.36
32	-0.36	-0.26	-0.15	-0.05	0.05	0.15	0.26	0.36
33	-0.36	-0.26	-0.15	-0.05	0.05	0.15	0.26	0.36
34	-0.36	-0.26	-0.15	-0.05	0.05	0.15	0.26	0.36
35	-0.36	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.36
36	-0.36	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.36
37	-0.36	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.36
38	-0.37	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.37
39	-0.37	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.37
40	-0.37	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.37
41	-0.37	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.37
42	-0.37	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.37
43	-0.37	-0.26	-0.16	-0.05	0.05	0.16	0.26	0.37
44	-0.37	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.37
45	-0.37	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.37
46	-0.37	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.37
47	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38
48	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38
49	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38
50	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38

51	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38
52	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38
53	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38
54	-0.38	-0.27	-0.16	-0.05	0.05	0.16	0.27	0.38
55	-0.39	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.39
56	-0.39	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.39
57	-0.39	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.39
58	-0.39	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.39
59	-0.39	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.39
60	-0.39	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.39
61	-0.39	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.39
62	-0.40	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.40
63	-0.40	-0.28	-0.17	-0.06	0.06	0.17	0.28	0.40
64	-0.40	-0.29	-0.17	-0.06	0.06	0.17	0.29	0.40
65	-0.40	-0.29	-0.17	-0.06	0.06	0.17	0.29	0.40
66	-0.40	-0.29	-0.17	-0.06	0.06	0.17	0.29	0.40
67	-0.40	-0.29	-0.17	-0.06	0.06	0.17	0.29	0.40
68	-0.41	-0.29	-0.17	-0.06	0.06	0.17	0.29	0.41
69	-0.41	-0.29	-0.17	-0.06	0.06	0.17	0.29	0.41
70	-0.41	-0.29	-0.18	-0.06	0.06	0.18	0.29	0.41
71	-0.41	-0.29	-0.18	-0.06	0.06	0.18	0.29	0.41
72	-0.41	-0.29	-0.18	-0.06	0.06	0.18	0.29	0.41
73	-0.41	-0.30	-0.18	-0.06	0.06	0.18	0.30	0.41
74	-0.42	-0.30	-0.18	-0.06	0.06	0.18	0.30	0.42
75	-0.42	-0.30	-0.18	-0.06	0.06	0.18	0.30	0.42
76	-0.42	-0.30	-0.18	-0.06	0.06	0.18	0.30	0.42
77	-0.42	-0.30	-0.18	-0.06	0.06	0.18	0.30	0.42
78	-0.42	-0.30	-0.18	-0.06	0.06	0.18	0.30	0.42
79	-0.43	-0.30	-0.18	-0.06	0.06	0.18	0.30	0.43
80	-0.43	-0.31	-0.18	-0.06	0.06	0.18	0.31	0.43
81	-0.43	-0.31	-0.18	-0.06	0.06	0.18	0.31	0.43
82	-0.43	-0.31	-0.19	-0.06	0.06	0.19	0.31	0.43
83	-0.43	-0.31	-0.19	-0.06	0.06	0.19	0.31	0.43
84	-0.44	-0.31	-0.19	-0.06	0.06	0.19	0.31	0.44
85	-0.44	-0.31	-0.19	-0.06	0.06	0.19	0.31	0.44
86	-0.44	-0.31	-0.19	-0.06	0.06	0.19	0.31	0.44
87	-0.44	-0.32	-0.19	-0.06	0.06	0.19	0.32	0.44
88	-0.45	-0.32	-0.19	-0.06	0.06	0.19	0.32	0.45
89	-0.45	-0.32	-0.19	-0.06	0.06	0.19	0.32	0.45
90	-0.45	-0.32	-0.19	-0.06	0.06	0.19	0.32	0.45
91	-0.45	-0.32	-0.19	-0.06	0.06	0.19	0.32	0.45
92	-0.45	-0.32	-0.19	-0.06	0.06	0.19	0.32	0.45
93	-0.46	-0.33	-0.20	-0.07	0.07	0.20	0.33	0.46
94	-0.46	-0.33	-0.20	-0.07	0.07	0.20	0.33	0.46
95	-0.46	-0.33	-0.20	-0.07	0.07	0.20	0.33	0.46
96	-0.46	-0.33	-0.20	-0.07	0.07	0.20	0.33	0.46
97	-0.47	-0.33	-0.20	-0.07	0.07	0.20	0.33	0.47

98	-0.47	-0.33	-0.20	-0.07	0.07	0.20	0.33	0.47
99	-0.47	-0.34	-0.20	-0.07	0.07	0.20	0.34	0.47
100	-0.47	-0.34	-0.20	-0.07	0.07	0.20	0.34	0.47
101	-0.48	-0.34	-0.20	-0.07	0.07	0.20	0.34	0.48
102	-0.48	-0.34	-0.21	-0.07	0.07	0.21	0.34	0.48
103	-0.48	-0.34	-0.21	-0.07	0.07	0.21	0.34	0.48
104	-0.48	-0.35	-0.21	-0.07	0.07	0.21	0.35	0.48
105	-0.49	-0.35	-0.21	-0.07	0.07	0.21	0.35	0.49
106	-0.49	-0.35	-0.21	-0.07	0.07	0.21	0.35	0.49
107	-0.49	-0.35	-0.21	-0.07	0.07	0.21	0.35	0.49
108	-0.49	-0.35	-0.21	-0.07	0.07	0.21	0.35	0.49
109	-0.50	-0.36	-0.21	-0.07	0.07	0.21	0.36	0.50
110	-0.50	-0.36	-0.21	-0.07	0.07	0.21	0.36	0.50
111	-0.50	-0.36	-0.22	-0.07	0.07	0.22	0.36	0.50
112	-0.51	-0.36	-0.22	-0.07	0.07	0.22	0.36	0.51
113	-0.51	-0.36	-0.22	-0.07	0.07	0.22	0.36	0.51
114	-0.51	-0.37	-0.22	-0.07	0.07	0.22	0.37	0.51
115	-0.51	-0.37	-0.22	-0.07	0.07	0.22	0.37	0.51
116	-0.52	-0.37	-0.22	-0.07	0.07	0.22	0.37	0.52
117	-0.52	-0.37	-0.22	-0.07	0.07	0.22	0.37	0.52
118	-0.52	-0.37	-0.22	-0.07	0.07	0.22	0.37	0.52
119	-0.53	-0.38	-0.23	-0.08	0.08	0.23	0.38	0.53
120	-0.53	-0.38	-0.23	-0.08	0.08	0.23	0.38	0.53
121	-0.53	-0.38	-0.23	-0.08	0.08	0.23	0.38	0.53
122	-0.54	-0.38	-0.23	-0.08	0.08	0.23	0.38	0.54
123	-0.54	-0.38	-0.23	-0.08	0.08	0.23	0.38	0.54
124	-0.54	-0.39	-0.23	-0.08	0.08	0.23	0.39	0.54
125	-0.54	-0.39	-0.23	-0.08	0.08	0.23	0.39	0.54
126	-0.55	-0.39	-0.23	-0.08	0.08	0.23	0.39	0.55
127	-0.55	-0.39	-0.24	-0.08	0.08	0.24	0.39	0.55
128	-0.55	-0.40	-0.24	-0.08	0.08	0.24	0.40	0.55
129	-0.56	-0.40	-0.24	-0.08	0.08	0.24	0.40	0.56
130	-0.56	-0.40	-0.24	-0.08	0.08	0.24	0.40	0.56
131	-0.56	-0.40	-0.24	-0.08	0.08	0.24	0.40	0.56
132	-0.57	-0.41	-0.24	-0.08	0.08	0.24	0.41	0.57
133	-0.57	-0.41	-0.24	-0.08	0.08	0.24	0.41	0.57
134	-0.57	-0.41	-0.25	-0.08	0.08	0.25	0.41	0.57
135	-0.58	-0.41	-0.25	-0.08	0.08	0.25	0.41	0.58
136	-0.58	-0.41	-0.25	-0.08	0.08	0.25	0.41	0.58
137	-0.58	-0.42	-0.25	-0.08	0.08	0.25	0.42	0.58
138	-0.59	-0.42	-0.25	-0.08	0.08	0.25	0.42	0.59
139	-0.59	-0.42	-0.25	-0.08	0.08	0.25	0.42	0.59
140	-0.59	-0.42	-0.25	-0.08	0.08	0.25	0.42	0.59
141	-0.60	-0.43	-0.26	-0.09	0.09	0.26	0.43	0.60
142	-0.60	-0.43	-0.26	-0.09	0.09	0.26	0.43	0.60
143	-0.61	-0.43	-0.26	-0.09	0.09	0.26	0.43	0.61
144	-0.61	-0.43	-0.26	-0.09	0.09	0.26	0.43	0.61

145	-0.61	-0.44	-0.26	-0.09	0.09	0.26	0.44	0.61
146	-0.62	-0.44	-0.26	-0.09	0.09	0.26	0.44	0.62
147	-0.62	-0.44	-0.27	-0.09	0.09	0.27	0.44	0.62
148	-0.62	-0.45	-0.27	-0.09	0.09	0.27	0.45	0.62
149	-0.63	-0.45	-0.27	-0.09	0.09	0.27	0.45	0.63
150	-0.63	-0.45	-0.27	-0.09	0.09	0.27	0.45	0.63
151	-0.63	-0.45	-0.27	-0.09	0.09	0.27	0.45	0.63
152	-0.64	-0.46	-0.27	-0.09	0.09	0.27	0.46	0.64
153	-0.64	-0.46	-0.28	-0.09	0.09	0.28	0.46	0.64
154	-0.65	-0.46	-0.28	-0.09	0.09	0.28	0.46	0.65
155	-0.65	-0.46	-0.28	-0.09	0.09	0.28	0.46	0.65
156	-0.65	-0.47	-0.28	-0.09	0.09	0.28	0.47	0.65
157	-0.66	-0.47	-0.28	-0.09	0.09	0.28	0.47	0.66
158	-0.66	-0.47	-0.28	-0.09	0.09	0.28	0.47	0.66
159	-0.67	-0.48	-0.29	-0.10	0.10	0.29	0.48	0.67
160	-0.67	-0.48	-0.29	-0.10	0.10	0.29	0.48	0.67
161	-0.67	-0.48	-0.29	-0.10	0.10	0.29	0.48	0.67
162	-0.68	-0.48	-0.29	-0.10	0.10	0.29	0.48	0.68
163	-0.68	-0.49	-0.29	-0.10	0.10	0.29	0.49	0.68
164	-0.69	-0.49	-0.29	-0.10	0.10	0.29	0.49	0.69
165	-0.69	-0.49	-0.30	-0.10	0.10	0.30	0.49	0.69
166	-0.69	-0.50	-0.30	-0.10	0.10	0.30	0.50	0.69
167	-0.70	-0.50	-0.30	-0.10	0.10	0.30	0.50	0.70
168	-0.70	-0.50	-0.30	-0.10	0.10	0.30	0.50	0.70
169	-0.71	-0.51	-0.30	-0.10	0.10	0.30	0.51	0.71
170	-0.71	-0.51	-0.30	-0.10	0.10	0.30	0.51	0.71
171	-0.72	-0.51	-0.31	-0.10	0.10	0.31	0.51	0.72
172	-0.72	-0.51	-0.31	-0.10	0.10	0.31	0.51	0.72
173	-0.72	-0.52	-0.31	-0.10	0.10	0.31	0.52	0.72
174	-0.73	-0.52	-0.31	-0.10	0.10	0.31	0.52	0.73
175	-0.73	-0.52	-0.31	-0.10	0.10	0.31	0.52	0.73
176	-0.74	-0.53	-0.32	-0.11	0.11	0.32	0.53	0.74
177	-0.74	-0.53	-0.32	-0.11	0.11	0.32	0.53	0.74
178	-0.75	-0.53	-0.32	-0.11	0.11	0.32	0.53	0.75
179	-0.75	-0.54	-0.32	-0.11	0.11	0.32	0.54	0.75
180	-0.76	-0.54	-0.32	-0.11	0.11	0.32	0.54	0.76
181	-0.76	-0.54	-0.33	-0.11	0.11	0.33	0.54	0.76
182	-0.76	-0.55	-0.33	-0.11	0.11	0.33	0.55	0.76
183	-0.77	-0.55	-0.33	-0.11	0.11	0.33	0.55	0.77
184	-0.77	-0.55	-0.33	-0.11	0.11	0.33	0.55	0.77
185	-0.78	-0.56	-0.33	-0.11	0.11	0.33	0.56	0.78
186	-0.78	-0.56	-0.34	-0.11	0.11	0.34	0.56	0.78
187	-0.79	-0.56	-0.34	-0.11	0.11	0.34	0.56	0.79
188	-0.79	-0.57	-0.34	-0.11	0.11	0.34	0.57	0.79
189	-0.80	-0.57	-0.34	-0.11	0.11	0.34	0.57	0.80
190	-0.80	-0.57	-0.34	-0.11	0.11	0.34	0.57	0.80
191	-0.81	-0.58	-0.35	-0.12	0.12	0.35	0.58	0.81

192	-0.81	-0.58	-0.35	-0.12	0.12	0.35	0.58	0.81
193	-0.82	-0.58	-0.35	-0.12	0.12	0.35	0.58	0.82
194	-0.82	-0.59	-0.35	-0.12	0.12	0.35	0.59	0.82
195	-0.83	-0.59	-0.35	-0.12	0.12	0.35	0.59	0.83
196	-0.83	-0.59	-0.36	-0.12	0.12	0.36	0.59	0.83
197	-0.84	-0.60	-0.36	-0.12	0.12	0.36	0.60	0.84
198	-0.84	-0.60	-0.36	-0.12	0.12	0.36	0.60	0.84
199	-0.85	-0.60	-0.36	-0.12	0.12	0.36	0.60	0.85

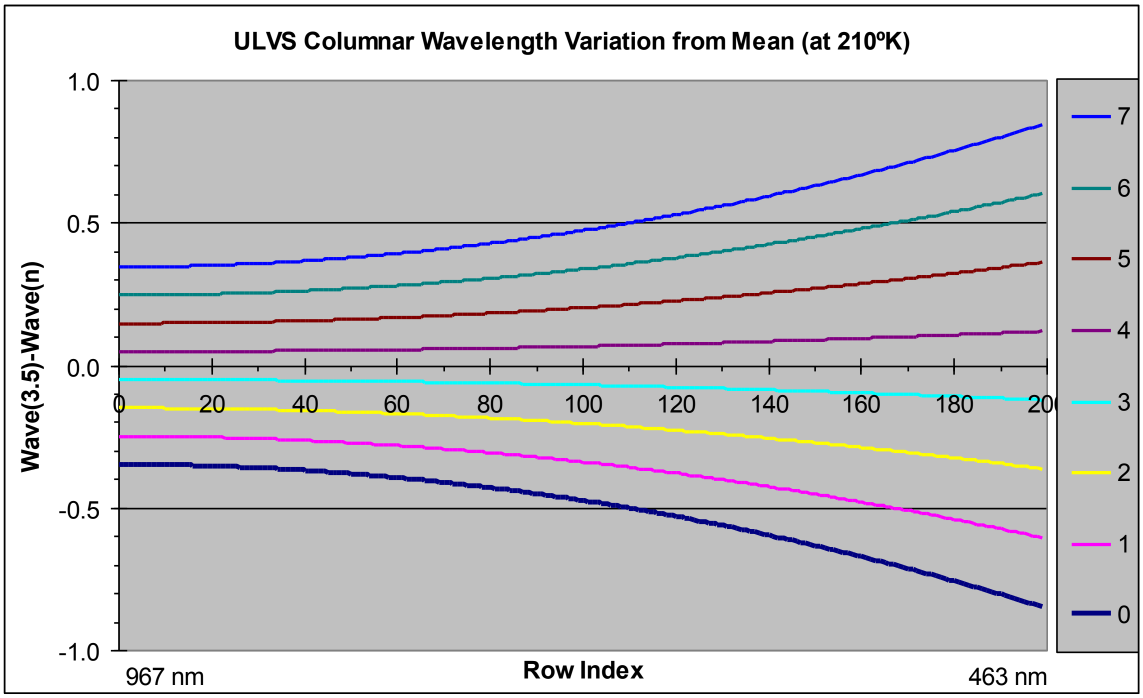


Figure - Plot of the data in the preceding table.

Appendix 30 - Visible Spectrometer Spectral Resolution

Table - This table presents the FWHM dispersion of each DLVS pixel at 210ºK (in nm).

Col - Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
1	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
2	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
3	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
4	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
5	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
6	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
7	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
8	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
9	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
10	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
11	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.12
12	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.18	2.17	2.16	2.15	2.14	2.13	2.12
13	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.17	2.16	2.15	2.14	2.13	2.12
14	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.16	2.15	2.14	2.13	2.12
15	2.33	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.15	2.14	2.13	2.12
16	2.33	2.32	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.14	2.13	2.12
17	2.33	2.32	2.31	2.30	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.13	2.12
18	2.33	2.32	2.31	2.30	2.29	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.12
19	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13
20	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13
21	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13
22	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.13
23	2.34	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.18	2.17	2.16	2.15	2.14	2.13
24	2.34	2.33	2.32	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.16	2.15	2.14	2.13
25	2.34	2.33	2.32	2.31	2.30	2.29	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.14	2.13
26	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14
27	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15	2.14
28	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15	2.14

Col - Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
29	2.35	2.34	2.33	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.18	2.17	2.16	2.15	2.14
30	2.35	2.34	2.33	2.32	2.31	2.30	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.16	2.15	2.14
31	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15
32	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.15
33	2.36	2.35	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17	2.16	2.15
34	2.36	2.35	2.34	2.33	2.32	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.18	2.17	2.16	2.15
35	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.15
36	2.37	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17	2.16
37	2.37	2.36	2.35	2.34	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.21	2.20	2.19	2.18	2.17	2.16
38	2.37	2.36	2.35	2.34	2.33	2.32	2.31	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.18	2.17	2.16
39	2.37	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.17
40	2.38	2.37	2.36	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.23	2.22	2.21	2.20	2.19	2.18	2.17
41	2.38	2.37	2.36	2.35	2.34	2.33	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.20	2.19	2.18	2.17
42	2.38	2.37	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.17
43	2.39	2.38	2.37	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.18
44	2.39	2.38	2.37	2.36	2.35	2.34	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.21	2.20	2.19	2.18
45	2.40	2.38	2.37	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.20	2.18
46	2.40	2.39	2.38	2.37	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.25	2.24	2.23	2.22	2.21	2.20	2.19
47	2.40	2.39	2.38	2.37	2.36	2.35	2.34	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.22	2.21	2.20	2.19
48	2.41	2.40	2.38	2.37	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.19
49	2.41	2.40	2.39	2.38	2.37	2.36	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.25	2.24	2.23	2.22	2.21	2.20
50	2.42	2.40	2.39	2.38	2.37	2.36	2.35	2.34	2.33	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.22	2.21	2.20
51	2.42	2.41	2.40	2.39	2.37	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.28	2.27	2.26	2.25	2.24	2.23	2.22	2.21
52	2.42	2.41	2.40	2.39	2.38	2.37	2.36	2.35	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.24	2.23	2.22	2.21
53	2.43	2.42	2.41	2.40	2.38	2.37	2.36	2.35	2.34	2.33	2.32	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.23	2.21
54	2.43	2.42	2.41	2.40	2.39	2.38	2.37	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.26	2.25	2.24	2.23	2.22
55	2.44	2.43	2.42	2.40	2.39	2.38	2.37	2.36	2.35	2.34	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.25	2.23	2.22
56	2.44	2.43	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.28	2.27	2.26	2.25	2.24	2.23
57	2.45	2.44	2.43	2.41	2.40	2.39	2.38	2.37	2.36	2.35	2.33	2.32	2.31	2.30	2.29	2.28	2.27	2.25	2.24	2.23
58	2.45	2.44	2.43	2.42	2.41	2.40	2.38	2.37	2.36	2.35	2.34	2.33	2.32	2.30	2.29	2.28	2.27	2.26	2.25	2.24
59	2.46	2.45	2.44	2.42	2.41	2.40	2.39	2.38	2.37	2.36	2.34	2.33	2.32	2.31	2.30	2.29	2.28	2.26	2.25	2.24
60	2.46	2.45	2.44	2.43	2.42	2.41	2.39	2.38	2.37	2.36	2.35	2.34	2.33	2.31	2.30	2.29	2.28	2.27	2.26	2.25
61	2.47	2.46	2.45	2.43	2.42	2.41	2.40	2.39	2.38	2.37	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.27	2.26	2.25

Col - Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
62	2.47	2.46	2.45	2.44	2.43	2.42	2.41	2.39	2.38	2.37	2.36	2.35	2.34	2.32	2.31	2.30	2.29	2.28	2.27	2.26
63	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33	2.32	2.31	2.30	2.28	2.27	2.26
64	2.49	2.47	2.46	2.45	2.44	2.43	2.42	2.40	2.39	2.38	2.37	2.36	2.35	2.34	2.32	2.31	2.30	2.29	2.28	2.27
65	2.49	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33	2.32	2.31	2.29	2.28	2.27
66	2.50	2.49	2.47	2.46	2.45	2.44	2.43	2.42	2.40	2.39	2.38	2.37	2.36	2.35	2.33	2.32	2.31	2.30	2.29	2.28
67	2.50	2.49	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33	2.32	2.31	2.29	2.28
68	2.51	2.50	2.49	2.48	2.46	2.45	2.44	2.43	2.42	2.40	2.39	2.38	2.37	2.36	2.35	2.33	2.32	2.31	2.30	2.29
69	2.52	2.50	2.49	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33	2.32	2.30	2.29
70	2.52	2.51	2.50	2.49	2.48	2.46	2.45	2.44	2.43	2.42	2.40	2.39	2.38	2.37	2.36	2.35	2.33	2.32	2.31	2.30
71	2.53	2.52	2.51	2.49	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33	2.32	2.30
72	2.54	2.52	2.51	2.50	2.49	2.48	2.46	2.45	2.44	2.43	2.42	2.41	2.39	2.38	2.37	2.36	2.35	2.33	2.32	2.31
73	2.54	2.53	2.52	2.51	2.49	2.48	2.47	2.46	2.45	2.44	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33	2.32
74	2.55	2.54	2.53	2.51	2.50	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.41	2.39	2.38	2.37	2.36	2.35	2.33	2.32
75	2.56	2.54	2.53	2.52	2.51	2.50	2.48	2.47	2.46	2.45	2.44	2.42	2.41	2.40	2.39	2.38	2.36	2.35	2.34	2.33
76	2.56	2.55	2.54	2.53	2.52	2.50	2.49	2.48	2.47	2.46	2.44	2.43	2.42	2.41	2.39	2.38	2.37	2.36	2.35	2.33
77	2.57	2.56	2.55	2.53	2.52	2.51	2.50	2.49	2.47	2.46	2.45	2.44	2.43	2.41	2.40	2.39	2.38	2.37	2.35	2.34
78	2.58	2.57	2.55	2.54	2.53	2.52	2.51	2.49	2.48	2.47	2.46	2.44	2.43	2.42	2.41	2.40	2.38	2.37	2.36	2.35
79	2.59	2.57	2.56	2.55	2.54	2.52	2.51	2.50	2.49	2.48	2.46	2.45	2.44	2.43	2.42	2.40	2.39	2.38	2.37	2.35
80	2.59	2.58	2.57	2.56	2.54	2.53	2.52	2.51	2.50	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40	2.39	2.37	2.36
81	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.51	2.50	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.40	2.39	2.38	2.37
82	2.61	2.60	2.58	2.57	2.56	2.55	2.53	2.52	2.51	2.50	2.49	2.47	2.46	2.45	2.44	2.42	2.41	2.40	2.39	2.37
83	2.62	2.60	2.59	2.58	2.57	2.55	2.54	2.53	2.52	2.50	2.49	2.48	2.47	2.46	2.44	2.43	2.42	2.41	2.39	2.38
84	2.62	2.61	2.60	2.59	2.57	2.56	2.55	2.54	2.52	2.51	2.50	2.49	2.48	2.46	2.45	2.44	2.43	2.41	2.40	2.39
85	2.63	2.62	2.61	2.59	2.58	2.57	2.56	2.54	2.53	2.52	2.51	2.50	2.48	2.47	2.46	2.45	2.43	2.42	2.41	2.40
86	2.64	2.63	2.61	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.52	2.50	2.49	2.48	2.47	2.45	2.44	2.43	2.42	2.40
87	2.65	2.64	2.62	2.61	2.60	2.59	2.57	2.56	2.55	2.54	2.52	2.51	2.50	2.49	2.47	2.46	2.45	2.44	2.42	2.41
88	2.66	2.64	2.63	2.62	2.61	2.59	2.58	2.57	2.56	2.54	2.53	2.52	2.51	2.49	2.48	2.47	2.46	2.44	2.43	2.42
89	2.66	2.65	2.64	2.63	2.61	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.51	2.50	2.49	2.48	2.46	2.45	2.44	2.43
90	2.67	2.66	2.65	2.64	2.62	2.61	2.60	2.58	2.57	2.56	2.55	2.53	2.52	2.51	2.50	2.48	2.47	2.46	2.45	2.43
91	2.68	2.67	2.66	2.64	2.63	2.62	2.61	2.59	2.58	2.57	2.56	2.54	2.53	2.52	2.50	2.49	2.48	2.47	2.45	2.44
92	2.69	2.68	2.67	2.65	2.64	2.63	2.61	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.51	2.50	2.49	2.47	2.46	2.45
93	2.70	2.69	2.67	2.66	2.65	2.64	2.62	2.61	2.60	2.58	2.57	2.56	2.55	2.53	2.52	2.51	2.50	2.48	2.47	2.46
94	2.71	2.70	2.68	2.67	2.66	2.64	2.63	2.62	2.61	2.59	2.58	2.57	2.56	2.54	2.53	2.52	2.50	2.49	2.48	2.47

Col - Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
95	2.72	2.70	2.69	2.68	2.67	2.65	2.64	2.63	2.61	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.51	2.50	2.49	2.47
96	2.73	2.71	2.70	2.69	2.68	2.66	2.65	2.64	2.62	2.61	2.60	2.59	2.57	2.56	2.55	2.53	2.52	2.51	2.50	2.48
97	2.74	2.72	2.71	2.70	2.68	2.67	2.66	2.65	2.63	2.62	2.61	2.59	2.58	2.57	2.56	2.54	2.53	2.52	2.50	2.49
98	2.75	2.73	2.72	2.71	2.69	2.68	2.67	2.65	2.64	2.63	2.62	2.60	2.59	2.58	2.56	2.55	2.54	2.53	2.51	2.50
99	2.76	2.74	2.73	2.72	2.70	2.69	2.68	2.66	2.65	2.64	2.63	2.61	2.60	2.59	2.57	2.56	2.55	2.53	2.52	2.51
100	2.77	2.75	2.74	2.73	2.71	2.70	2.69	2.67	2.66	2.65	2.63	2.62	2.61	2.60	2.58	2.57	2.56	2.54	2.53	2.52
101	2.78	2.76	2.75	2.74	2.72	2.71	2.70	2.68	2.67	2.66	2.64	2.63	2.62	2.60	2.59	2.58	2.56	2.55	2.54	2.53
102	2.78	2.77	2.76	2.75	2.73	2.72	2.71	2.69	2.68	2.67	2.65	2.64	2.63	2.61	2.60	2.59	2.57	2.56	2.55	2.53
103	2.80	2.78	2.77	2.76	2.74	2.73	2.72	2.70	2.69	2.68	2.66	2.65	2.64	2.62	2.61	2.60	2.58	2.57	2.56	2.54
104	2.81	2.79	2.78	2.77	2.75	2.74	2.73	2.71	2.70	2.69	2.67	2.66	2.65	2.63	2.62	2.61	2.59	2.58	2.57	2.55
105	2.82	2.80	2.79	2.78	2.76	2.75	2.74	2.72	2.71	2.70	2.68	2.67	2.66	2.64	2.63	2.62	2.60	2.59	2.58	2.56
106	2.83	2.81	2.80	2.79	2.77	2.76	2.75	2.73	2.72	2.71	2.69	2.68	2.67	2.65	2.64	2.62	2.61	2.60	2.58	2.57
107	2.84	2.82	2.81	2.80	2.78	2.77	2.76	2.74	2.73	2.72	2.70	2.69	2.67	2.66	2.65	2.63	2.62	2.61	2.59	2.58
108	2.85	2.83	2.82	2.81	2.79	2.78	2.77	2.75	2.74	2.73	2.71	2.70	2.68	2.67	2.66	2.64	2.63	2.62	2.60	2.59
109	2.86	2.84	2.83	2.82	2.80	2.79	2.78	2.76	2.75	2.74	2.72	2.71	2.69	2.68	2.67	2.65	2.64	2.63	2.61	2.60
110	2.87	2.86	2.84	2.83	2.81	2.80	2.79	2.77	2.76	2.75	2.73	2.72	2.71	2.69	2.68	2.66	2.65	2.64	2.62	2.61
111	2.88	2.87	2.85	2.84	2.82	2.81	2.80	2.78	2.77	2.76	2.74	2.73	2.72	2.70	2.69	2.67	2.66	2.65	2.63	2.62
112	2.89	2.88	2.86	2.85	2.84	2.82	2.81	2.79	2.78	2.77	2.75	2.74	2.73	2.71	2.70	2.68	2.67	2.66	2.64	2.63
113	2.90	2.89	2.87	2.86	2.85	2.83	2.82	2.81	2.79	2.78	2.76	2.75	2.74	2.72	2.71	2.70	2.68	2.67	2.65	2.64
114	2.91	2.90	2.89	2.87	2.86	2.84	2.83	2.82	2.80	2.79	2.77	2.76	2.75	2.73	2.72	2.71	2.69	2.68	2.66	2.65
115	2.92	2.91	2.90	2.88	2.87	2.86	2.84	2.83	2.81	2.80	2.79	2.77	2.76	2.74	2.73	2.72	2.70	2.69	2.67	2.66
116	2.94	2.92	2.91	2.89	2.88	2.87	2.85	2.84	2.82	2.81	2.80	2.78	2.77	2.75	2.74	2.73	2.71	2.70	2.69	2.67
117	2.95	2.93	2.92	2.91	2.89	2.88	2.86	2.85	2.84	2.82	2.81	2.79	2.78	2.77	2.75	2.74	2.72	2.71	2.70	2.68
118	2.96	2.95	2.93	2.92	2.90	2.89	2.88	2.86	2.85	2.83	2.82	2.80	2.79	2.78	2.76	2.75	2.73	2.72	2.71	2.69
119	2.97	2.96	2.94	2.93	2.92	2.90	2.89	2.87	2.86	2.84	2.83	2.82	2.80	2.79	2.77	2.76	2.75	2.73	2.72	2.70
120	2.98	2.97	2.96	2.94	2.93	2.91	2.90	2.88	2.87	2.86	2.84	2.83	2.81	2.80	2.78	2.77	2.76	2.74	2.73	2.71
121	3.00	2.98	2.97	2.95	2.94	2.92	2.91	2.90	2.88	2.87	2.85	2.84	2.82	2.81	2.80	2.78	2.77	2.75	2.74	2.73
122	3.01	2.99	2.98	2.97	2.95	2.94	2.92	2.91	2.89	2.88	2.86	2.85	2.84	2.82	2.81	2.79	2.78	2.76	2.75	2.74
123	3.02	3.01	2.99	2.98	2.96	2.95	2.93	2.92	2.91	2.89	2.88	2.86	2.85	2.83	2.82	2.80	2.79	2.78	2.76	2.75
124	3.03	3.02	3.00	2.99	2.98	2.96	2.95	2.93	2.92	2.90	2.89	2.87	2.86	2.85	2.83	2.82	2.80	2.79	2.77	2.76
125	3.05	3.03	3.02	3.00	2.99	2.97	2.96	2.94	2.93	2.92	2.90	2.89	2.87	2.86	2.84	2.83	2.81	2.80	2.78	2.77
126	3.06	3.04	3.03	3.01	3.00	2.99	2.97	2.96	2.94	2.93	2.91	2.90	2.88	2.87	2.85	2.84	2.83	2.81	2.80	2.78
127	3.07	3.06	3.04	3.03	3.01	3.00	2.98	2.97	2.95	2.94	2.92	2.91	2.90	2.88	2.87	2.85	2.84	2.82	2.81	2.79

Col - Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
128	3.08	3.07	3.06	3.04	3.03	3.01	3.00	2.98	2.97	2.95	2.94	2.92	2.91	2.89	2.88	2.86	2.85	2.83	2.82	2.81
129	3.10	3.08	3.07	3.05	3.04	3.02	3.01	2.99	2.98	2.96	2.95	2.94	2.92	2.91	2.89	2.88	2.86	2.85	2.83	2.82
130	3.11	3.10	3.08	3.07	3.05	3.04	3.02	3.01	2.99	2.98	2.96	2.95	2.93	2.92	2.90	2.89	2.87	2.86	2.84	2.83
131	3.12	3.11	3.09	3.08	3.06	3.05	3.03	3.02	3.01	2.99	2.98	2.96	2.95	2.93	2.92	2.90	2.89	2.87	2.86	2.84
132	3.14	3.12	3.11	3.09	3.08	3.06	3.05	3.03	3.02	3.00	2.99	2.97	2.96	2.94	2.93	2.91	2.90	2.88	2.87	2.85
133	3.15	3.14	3.12	3.11	3.09	3.08	3.06	3.05	3.03	3.02	3.00	2.99	2.97	2.96	2.94	2.93	2.91	2.90	2.88	2.87
134	3.17	3.15	3.14	3.12	3.10	3.09	3.07	3.06	3.04	3.03	3.01	3.00	2.98	2.97	2.95	2.94	2.92	2.91	2.89	2.88
135	3.18	3.16	3.15	3.13	3.12	3.10	3.09	3.07	3.06	3.04	3.03	3.01	3.00	2.98	2.97	2.95	2.94	2.92	2.91	2.89
136	3.19	3.18	3.16	3.15	3.13	3.12	3.10	3.09	3.07	3.06	3.04	3.03	3.01	2.99	2.98	2.96	2.95	2.93	2.92	2.90
137	3.21	3.19	3.18	3.16	3.15	3.13	3.12	3.10	3.08	3.07	3.05	3.04	3.02	3.01	2.99	2.98	2.96	2.95	2.93	2.92
138	3.22	3.21	3.19	3.18	3.16	3.14	3.13	3.11	3.10	3.08	3.07	3.05	3.04	3.02	3.01	2.99	2.98	2.96	2.94	2.93
139	3.24	3.22	3.21	3.19	3.17	3.16	3.14	3.13	3.11	3.10	3.08	3.07	3.05	3.03	3.02	3.00	2.99	2.97	2.96	2.94
140	3.25	3.24	3.22	3.20	3.19	3.17	3.16	3.14	3.13	3.11	3.09	3.08	3.06	3.05	3.03	3.02	3.00	2.99	2.97	2.96
141	3.27	3.25	3.23	3.22	3.20	3.19	3.17	3.16	3.14	3.12	3.11	3.09	3.08	3.06	3.05	3.03	3.02	3.00	2.98	2.97
142	3.28	3.26	3.25	3.23	3.22	3.20	3.19	3.17	3.15	3.14	3.12	3.11	3.09	3.08	3.06	3.04	3.03	3.01	3.00	2.98
143	3.30	3.28	3.26	3.25	3.23	3.22	3.20	3.18	3.17	3.15	3.14	3.12	3.11	3.09	3.07	3.06	3.04	3.03	3.01	3.00
144	3.31	3.29	3.28	3.26	3.25	3.23	3.21	3.20	3.18	3.17	3.15	3.14	3.12	3.10	3.09	3.07	3.06	3.04	3.02	3.01
145	3.33	3.31	3.29	3.28	3.26	3.25	3.23	3.21	3.20	3.18	3.17	3.15	3.13	3.12	3.10	3.09	3.07	3.05	3.04	3.02
146	3.34	3.32	3.31	3.29	3.28	3.26	3.24	3.23	3.21	3.20	3.18	3.16	3.15	3.13	3.12	3.10	3.08	3.07	3.05	3.04
147	3.36	3.34	3.32	3.31	3.29	3.28	3.26	3.24	3.23	3.21	3.19	3.18	3.16	3.15	3.13	3.11	3.10	3.08	3.07	3.05
148	3.37	3.36	3.34	3.32	3.31	3.29	3.27	3.26	3.24	3.23	3.21	3.19	3.18	3.16	3.14	3.13	3.11	3.10	3.08	3.06
149	3.39	3.37	3.35	3.34	3.32	3.31	3.29	3.27	3.26	3.24	3.22	3.21	3.19	3.18	3.16	3.14	3.13	3.11	3.09	3.08
150	3.40	3.39	3.37	3.35	3.34	3.32	3.30	3.29	3.27	3.26	3.24	3.22	3.21	3.19	3.17	3.16	3.14	3.13	3.11	3.09
151	3.42	3.40	3.39	3.37	3.35	3.34	3.32	3.30	3.29	3.27	3.25	3.24	3.22	3.21	3.19	3.17	3.16	3.14	3.12	3.11
152	3.44	3.42	3.40	3.39	3.37	3.35	3.34	3.32	3.30	3.29	3.27	3.25	3.24	3.22	3.20	3.19	3.17	3.15	3.14	3.12
153	3.45	3.43	3.42	3.40	3.38	3.37	3.35	3.33	3.32	3.30	3.29	3.27	3.25	3.24	3.22	3.20	3.19	3.17	3.15	3.14
154	3.47	3.45	3.43	3.42	3.40	3.38	3.37	3.35	3.33	3.32	3.30	3.28	3.27	3.25	3.23	3.22	3.20	3.18	3.17	3.15
155	3.48	3.47	3.45	3.43	3.42	3.40	3.38	3.37	3.35	3.33	3.32	3.30	3.28	3.27	3.25	3.23	3.22	3.20	3.18	3.17
156	3.50	3.48	3.47	3.45	3.43	3.42	3.40	3.38	3.37	3.35	3.33	3.32	3.30	3.28	3.26	3.25	3.23	3.21	3.20	3.18
157	3.52	3.50	3.48	3.47	3.45	3.43	3.42	3.40	3.38	3.36	3.35	3.33	3.31	3.30	3.28	3.26	3.25	3.23	3.21	3.20
158	3.53	3.52	3.50	3.48	3.47	3.45	3.43	3.41	3.40	3.38	3.36	3.35	3.33	3.31	3.30	3.28	3.26	3.25	3.23	3.21
159	3.55	3.53	3.52	3.50	3.48	3.47	3.45	3.43	3.41	3.40	3.38	3.36	3.35	3.33	3.31	3.29	3.28	3.26	3.24	3.23
160	3.57	3.55	3.53	3.52	3.50	3.48	3.46	3.45	3.43	3.41	3.40	3.38	3.36	3.34	3.33	3.31	3.29	3.28	3.26	3.24

Col - Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
161	3.59	3.57	3.55	3.53	3.52	3.50	3.48	3.46	3.45	3.43	3.41	3.40	3.38	3.36	3.34	3.33	3.31	3.29	3.27	3.26
162	3.60	3.59	3.57	3.55	3.53	3.52	3.50	3.48	3.46	3.45	3.43	3.41	3.39	3.38	3.36	3.34	3.33	3.31	3.29	3.27
163	3.62	3.60	3.59	3.57	3.55	3.53	3.52	3.50	3.48	3.46	3.45	3.43	3.41	3.39	3.38	3.36	3.34	3.32	3.31	3.29
164	3.64	3.62	3.60	3.59	3.57	3.55	3.53	3.51	3.50	3.48	3.46	3.44	3.43	3.41	3.39	3.37	3.36	3.34	3.32	3.30
165	3.66	3.64	3.62	3.60	3.58	3.57	3.55	3.53	3.51	3.50	3.48	3.46	3.44	3.43	3.41	3.39	3.37	3.36	3.34	3.32
166	3.67	3.66	3.64	3.62	3.60	3.58	3.57	3.55	3.53	3.51	3.50	3.48	3.46	3.44	3.43	3.41	3.39	3.37	3.35	3.34
167	3.69	3.67	3.66	3.64	3.62	3.60	3.58	3.57	3.55	3.53	3.51	3.50	3.48	3.46	3.44	3.42	3.41	3.39	3.37	3.35
168	3.71	3.69	3.67	3.66	3.64	3.62	3.60	3.58	3.57	3.55	3.53	3.51	3.49	3.48	3.46	3.44	3.42	3.41	3.39	3.37
169	3.73	3.71	3.69	3.67	3.66	3.64	3.62	3.60	3.58	3.57	3.55	3.53	3.51	3.49	3.48	3.46	3.44	3.42	3.40	3.39
170	3.75	3.73	3.71	3.69	3.67	3.66	3.64	3.62	3.60	3.58	3.57	3.55	3.53	3.51	3.49	3.48	3.46	3.44	3.42	3.40
171	3.76	3.75	3.73	3.71	3.69	3.67	3.66	3.64	3.62	3.60	3.58	3.56	3.55	3.53	3.51	3.49	3.47	3.46	3.44	3.42
172	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.66	3.64	3.62	3.60	3.58	3.56	3.55	3.53	3.51	3.49	3.47	3.45	3.44
173	3.80	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.66	3.64	3.62	3.60	3.58	3.56	3.55	3.53	3.51	3.49	3.47	3.45
174	3.82	3.80	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.64	3.62	3.60	3.58	3.56	3.54	3.53	3.51	3.49	3.47
175	3.84	3.82	3.80	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.64	3.62	3.60	3.58	3.56	3.54	3.53	3.51	3.49
176	3.86	3.84	3.82	3.80	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.64	3.62	3.60	3.58	3.56	3.54	3.52	3.51
177	3.88	3.86	3.84	3.82	3.80	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.64	3.62	3.60	3.58	3.56	3.54	3.52
178	3.90	3.88	3.86	3.84	3.82	3.80	3.79	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.63	3.62	3.60	3.58	3.56	3.54
179	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.79	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.63	3.61	3.60	3.58	3.56
180	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.79	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.63	3.61	3.60	3.58
181	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.79	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.63	3.61	3.59
182	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.79	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.63	3.61
183	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.65	3.63
184	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.77	3.75	3.73	3.71	3.69	3.67	3.65
185	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.76	3.75	3.73	3.71	3.69	3.67
186	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.76	3.74	3.73	3.71	3.69
187	4.08	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.76	3.74	3.72	3.70
188	4.10	4.08	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.76	3.74	3.72
189	4.12	4.10	4.08	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.76	3.74
190	4.14	4.12	4.10	4.08	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78	3.76
191	4.16	4.14	4.12	4.10	4.08	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80	3.78
192	4.19	4.17	4.15	4.12	4.10	4.08	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82	3.80
193	4.21	4.19	4.17	4.15	4.13	4.11	4.08	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84	3.82

Col - Row	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
194	4.23	4.21	4.19	4.17	4.15	4.13	4.11	4.09	4.06	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86	3.84
195	4.25	4.23	4.21	4.19	4.17	4.15	4.13	4.11	4.09	4.07	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88	3.86
196	4.27	4.25	4.23	4.21	4.19	4.17	4.15	4.13	4.11	4.09	4.07	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90	3.88
197	4.30	4.27	4.25	4.23	4.21	4.19	4.17	4.15	4.13	4.11	4.09	4.07	4.04	4.02	4.00	3.98	3.96	3.94	3.92	3.90
198	4.32	4.30	4.28	4.25	4.23	4.21	4.19	4.17	4.15	4.13	4.11	4.09	4.07	4.04	4.02	4.00	3.98	3.96	3.94	3.92
199	4.34	4.32	4.30	4.28	4.26	4.23	4.21	4.19	4.17	4.15	4.13	4.11	4.09	4.07	4.04	4.02	4.00	3.98	3.96	3.94

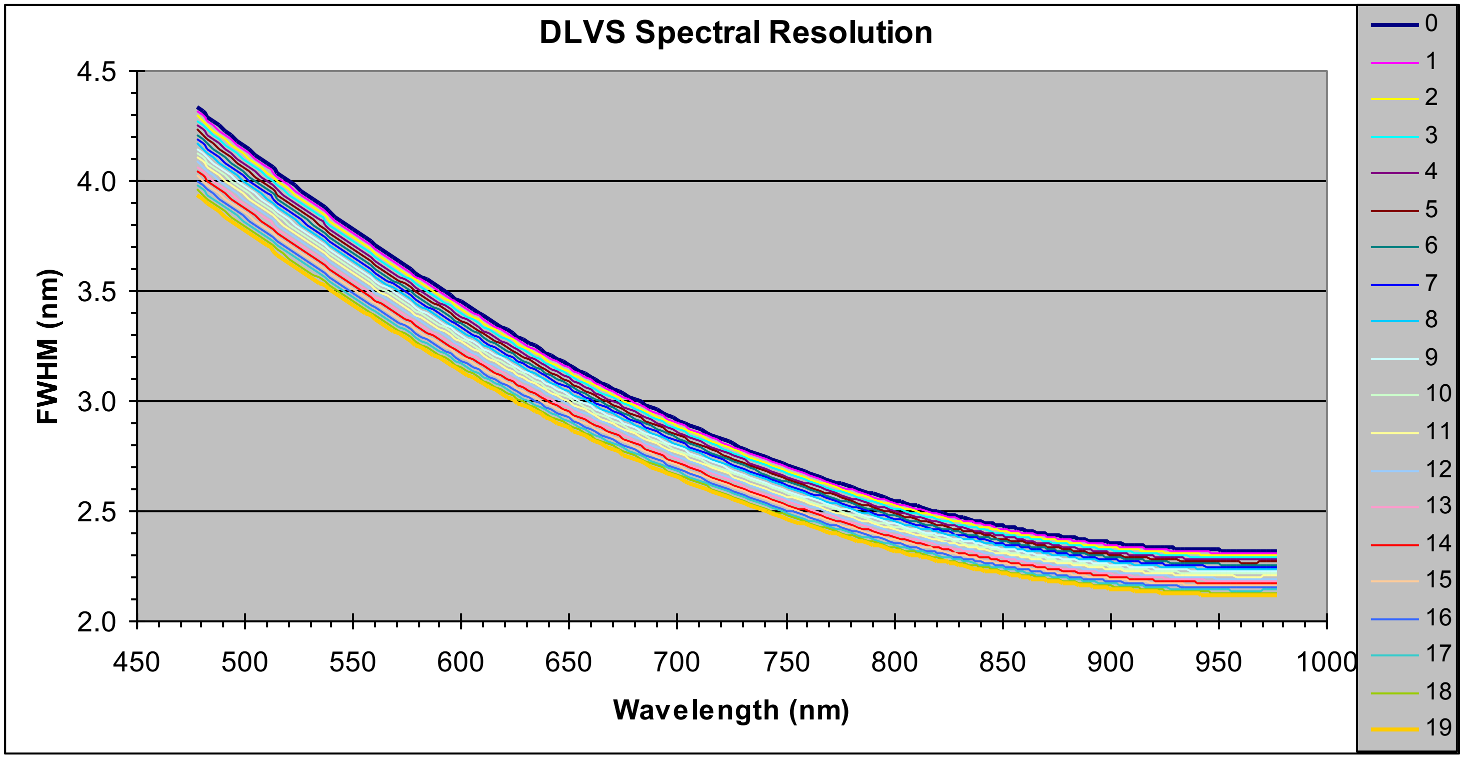


Figure - Plot of the data from the preceeding table (DLVS spectral resolution at 210ºK)

Table - This table presents the FWHM resolution of each ULVS pixel at 210ºK (in nm).

Col - Row	0	1	2	3	4	5	6	7
0	5.41	5.37	5.32	5.28	5.24	5.20	5.16	5.12
1	5.41	5.37	5.32	5.28	5.24	5.20	5.16	5.12
2	5.41	5.37	5.32	5.28	5.24	5.20	5.16	5.12
3	5.41	5.36	5.32	5.28	5.24	5.20	5.16	5.12
4	5.41	5.36	5.32	5.28	5.24	5.20	5.16	5.12
5	5.41	5.36	5.32	5.28	5.24	5.20	5.16	5.12
6	5.41	5.36	5.32	5.28	5.24	5.20	5.16	5.12
7	5.41	5.36	5.32	5.28	5.23	5.19	5.16	5.12
8	5.40	5.36	5.32	5.27	5.23	5.19	5.15	5.12
9	5.40	5.36	5.32	5.27	5.23	5.19	5.15	5.12
10	5.40	5.36	5.32	5.27	5.23	5.19	5.15	5.12
11	5.40	5.36	5.31	5.27	5.23	5.19	5.15	5.11
12	5.40	5.36	5.31	5.27	5.23	5.19	5.15	5.11
13	5.40	5.36	5.31	5.27	5.23	5.19	5.15	5.11
14	5.40	5.36	5.31	5.27	5.23	5.19	5.15	5.11
15	5.40	5.35	5.31	5.27	5.23	5.19	5.15	5.11
16	5.40	5.35	5.31	5.27	5.23	5.19	5.15	5.11
17	5.40	5.35	5.31	5.27	5.23	5.19	5.15	5.11
18	5.40	5.35	5.31	5.27	5.23	5.19	5.15	5.11
19	5.40	5.35	5.31	5.27	5.22	5.18	5.15	5.11
20	5.39	5.35	5.31	5.26	5.22	5.18	5.14	5.11
21	5.39	5.35	5.31	5.26	5.22	5.18	5.14	5.11
22	5.39	5.35	5.31	5.26	5.22	5.18	5.14	5.11
23	5.39	5.35	5.30	5.26	5.22	5.18	5.14	5.10
24	5.39	5.35	5.30	5.26	5.22	5.18	5.14	5.10
25	5.39	5.35	5.30	5.26	5.22	5.18	5.14	5.10
26	5.39	5.34	5.30	5.26	5.22	5.18	5.14	5.10
27	5.39	5.34	5.30	5.26	5.22	5.18	5.14	5.10
28	5.39	5.34	5.30	5.26	5.22	5.18	5.14	5.10
29	5.39	5.34	5.30	5.26	5.22	5.18	5.14	5.10

Col - Row	0	1	2	3	4	5	6	7
30	5.39	5.34	5.30	5.26	5.21	5.18	5.14	5.10
31	5.38	5.34	5.30	5.26	5.21	5.17	5.14	5.10
32	5.38	5.34	5.30	5.25	5.21	5.17	5.13	5.10
33	5.38	5.34	5.30	5.25	5.21	5.17	5.13	5.10
34	5.38	5.34	5.29	5.25	5.21	5.17	5.13	5.10
35	5.38	5.34	5.29	5.25	5.21	5.17	5.13	5.09
36	5.38	5.34	5.29	5.25	5.21	5.17	5.13	5.09
37	5.38	5.34	5.29	5.25	5.21	5.17	5.13	5.09
38	5.38	5.33	5.29	5.25	5.21	5.17	5.13	5.09
39	5.38	5.33	5.29	5.25	5.21	5.17	5.13	5.09
40	5.38	5.33	5.29	5.25	5.21	5.17	5.13	5.09
41	5.38	5.33	5.29	5.25	5.21	5.17	5.13	5.09
42	5.37	5.33	5.29	5.25	5.20	5.16	5.13	5.09
43	5.37	5.33	5.29	5.24	5.20	5.16	5.13	5.09
44	5.37	5.33	5.29	5.24	5.20	5.16	5.12	5.09
45	5.37	5.33	5.28	5.24	5.20	5.16	5.12	5.09
46	5.37	5.33	5.28	5.24	5.20	5.16	5.12	5.09
47	5.37	5.33	5.28	5.24	5.20	5.16	5.12	5.08
48	5.37	5.33	5.28	5.24	5.20	5.16	5.12	5.08
49	5.37	5.32	5.28	5.24	5.20	5.16	5.12	5.08
50	5.37	5.32	5.28	5.24	5.20	5.16	5.12	5.08
51	5.37	5.32	5.28	5.24	5.20	5.16	5.12	5.08
52	5.37	5.32	5.28	5.24	5.20	5.16	5.12	5.08
53	5.37	5.32	5.28	5.24	5.20	5.16	5.12	5.08
54	5.36	5.32	5.28	5.24	5.19	5.15	5.12	5.08
55	5.36	5.32	5.28	5.23	5.19	5.15	5.11	5.08
56	5.36	5.32	5.28	5.23	5.19	5.15	5.11	5.08
57	5.36	5.32	5.27	5.23	5.19	5.15	5.11	5.08
58	5.36	5.32	5.27	5.23	5.19	5.15	5.11	5.07
59	5.36	5.32	5.27	5.23	5.19	5.15	5.11	5.07
60	5.36	5.31	5.27	5.23	5.19	5.15	5.11	5.07
61	5.36	5.31	5.27	5.23	5.19	5.15	5.11	5.07

Col - Row	0	1	2	3	4	5	6	7
62	5.36	5.31	5.27	5.23	5.19	5.15	5.11	5.07
63	5.36	5.31	5.27	5.23	5.19	5.15	5.11	5.07
64	5.36	5.31	5.27	5.23	5.19	5.15	5.11	5.07
65	5.35	5.31	5.27	5.23	5.18	5.14	5.11	5.07
66	5.35	5.31	5.27	5.22	5.18	5.14	5.11	5.07
67	5.35	5.31	5.27	5.22	5.18	5.14	5.10	5.07
68	5.35	5.31	5.26	5.22	5.18	5.14	5.10	5.07
69	5.35	5.31	5.26	5.22	5.18	5.14	5.10	5.07
70	5.35	5.31	5.26	5.22	5.18	5.14	5.10	5.06
71	5.35	5.30	5.26	5.22	5.18	5.14	5.10	5.06
72	5.35	5.30	5.26	5.22	5.18	5.14	5.10	5.06
73	5.35	5.30	5.26	5.22	5.18	5.14	5.10	5.06
74	5.35	5.30	5.26	5.22	5.18	5.14	5.10	5.06
75	5.35	5.30	5.26	5.22	5.18	5.14	5.10	5.06
76	5.34	5.30	5.26	5.22	5.17	5.14	5.10	5.06
77	5.34	5.30	5.26	5.21	5.17	5.13	5.10	5.06
78	5.34	5.30	5.26	5.21	5.17	5.13	5.09	5.06
79	5.34	5.30	5.25	5.21	5.17	5.13	5.09	5.06
80	5.34	5.30	5.25	5.21	5.17	5.13	5.09	5.06
81	5.34	5.30	5.25	5.21	5.17	5.13	5.09	5.05
82	5.34	5.29	5.25	5.21	5.17	5.13	5.09	5.05
83	5.34	5.29	5.25	5.21	5.17	5.13	5.09	5.05
84	5.34	5.29	5.25	5.21	5.17	5.13	5.09	5.05
85	5.34	5.29	5.25	5.21	5.17	5.13	5.09	5.05
86	5.33	5.29	5.25	5.21	5.17	5.13	5.09	5.05
87	5.33	5.29	5.25	5.21	5.16	5.13	5.09	5.05
88	5.33	5.29	5.25	5.20	5.16	5.12	5.09	5.05
89	5.33	5.29	5.25	5.20	5.16	5.12	5.09	5.05
90	5.33	5.29	5.24	5.20	5.16	5.12	5.08	5.05
91	5.33	5.29	5.24	5.20	5.16	5.12	5.08	5.05
92	5.33	5.29	5.24	5.20	5.16	5.12	5.08	5.05
93	5.33	5.28	5.24	5.20	5.16	5.12	5.08	5.04

Col - Row	0	1	2	3	4	5	6	7
94	5.33	5.28	5.24	5.20	5.16	5.12	5.08	5.04
95	5.33	5.28	5.24	5.20	5.16	5.12	5.08	5.04
96	5.33	5.28	5.24	5.20	5.16	5.12	5.08	5.04
97	5.32	5.28	5.24	5.20	5.16	5.12	5.08	5.04
98	5.32	5.28	5.24	5.20	5.16	5.12	5.08	5.04
99	5.32	5.28	5.24	5.19	5.15	5.11	5.08	5.04
100	5.32	5.28	5.24	5.19	5.15	5.11	5.08	5.04
101	5.32	5.28	5.23	5.19	5.15	5.11	5.07	5.04
102	5.32	5.28	5.23	5.19	5.15	5.11	5.07	5.04
103	5.32	5.28	5.23	5.19	5.15	5.11	5.07	5.04
104	5.32	5.27	5.23	5.19	5.15	5.11	5.07	5.03
105	5.32	5.27	5.23	5.19	5.15	5.11	5.07	5.03
106	5.32	5.27	5.23	5.19	5.15	5.11	5.07	5.03
107	5.32	5.27	5.23	5.19	5.15	5.11	5.07	5.03
108	5.31	5.27	5.23	5.19	5.15	5.11	5.07	5.03
109	5.31	5.27	5.23	5.19	5.15	5.11	5.07	5.03
110	5.31	5.27	5.23	5.18	5.14	5.10	5.07	5.03
111	5.31	5.27	5.23	5.18	5.14	5.10	5.07	5.03
112	5.31	5.27	5.22	5.18	5.14	5.10	5.06	5.03
113	5.31	5.27	5.22	5.18	5.14	5.10	5.06	5.03
114	5.31	5.26	5.22	5.18	5.14	5.10	5.06	5.03
115	5.31	5.26	5.22	5.18	5.14	5.10	5.06	5.02
116	5.31	5.26	5.22	5.18	5.14	5.10	5.06	5.02
117	5.31	5.26	5.22	5.18	5.14	5.10	5.06	5.02
118	5.30	5.26	5.22	5.18	5.14	5.10	5.06	5.02
119	5.30	5.26	5.22	5.18	5.14	5.10	5.06	5.02
120	5.30	5.26	5.22	5.18	5.13	5.10	5.06	5.02
121	5.30	5.26	5.22	5.17	5.13	5.09	5.06	5.02
122	5.30	5.26	5.21	5.17	5.13	5.09	5.06	5.02
123	5.30	5.26	5.21	5.17	5.13	5.09	5.05	5.02
124	5.30	5.26	5.21	5.17	5.13	5.09	5.05	5.02
125	5.30	5.25	5.21	5.17	5.13	5.09	5.05	5.02

Col - Row	0	1	2	3	4	5	6	7
126	5.30	5.25	5.21	5.17	5.13	5.09	5.05	5.01
127	5.30	5.25	5.21	5.17	5.13	5.09	5.05	5.01
128	5.30	5.25	5.21	5.17	5.13	5.09	5.05	5.01
129	5.29	5.25	5.21	5.17	5.13	5.09	5.05	5.01
130	5.29	5.25	5.21	5.17	5.13	5.09	5.05	5.01
131	5.29	5.25	5.21	5.17	5.12	5.09	5.05	5.01
132	5.29	5.25	5.21	5.16	5.12	5.08	5.05	5.01
133	5.29	5.25	5.20	5.16	5.12	5.08	5.05	5.01
134	5.29	5.25	5.20	5.16	5.12	5.08	5.04	5.01
135	5.29	5.25	5.20	5.16	5.12	5.08	5.04	5.01
136	5.29	5.24	5.20	5.16	5.12	5.08	5.04	5.01
137	5.29	5.24	5.20	5.16	5.12	5.08	5.04	5.00
138	5.29	5.24	5.20	5.16	5.12	5.08	5.04	5.00
139	5.28	5.24	5.20	5.16	5.12	5.08	5.04	5.00
140	5.28	5.24	5.20	5.16	5.12	5.08	5.04	5.00
141	5.28	5.24	5.20	5.16	5.12	5.08	5.04	5.00
142	5.28	5.24	5.20	5.15	5.11	5.08	5.04	5.00
143	5.28	5.24	5.20	5.15	5.11	5.07	5.04	5.00
144	5.28	5.24	5.19	5.15	5.11	5.07	5.04	5.00
145	5.28	5.24	5.19	5.15	5.11	5.07	5.03	5.00
146	5.28	5.23	5.19	5.15	5.11	5.07	5.03	5.00
147	5.28	5.23	5.19	5.15	5.11	5.07	5.03	5.00
148	5.28	5.23	5.19	5.15	5.11	5.07	5.03	4.99
149	5.28	5.23	5.19	5.15	5.11	5.07	5.03	4.99
150	5.27	5.23	5.19	5.15	5.11	5.07	5.03	4.99
151	5.27	5.23	5.19	5.15	5.11	5.07	5.03	4.99
152	5.27	5.23	5.19	5.15	5.11	5.07	5.03	4.99
153	5.27	5.23	5.19	5.14	5.10	5.07	5.03	4.99
154	5.27	5.23	5.18	5.14	5.10	5.06	5.03	4.99
155	5.27	5.23	5.18	5.14	5.10	5.06	5.03	4.99
156	5.27	5.22	5.18	5.14	5.10	5.06	5.02	4.99
157	5.27	5.22	5.18	5.14	5.10	5.06	5.02	4.99

Col - Row	0	1	2	3	4	5	6	7
158	5.27	5.22	5.18	5.14	5.10	5.06	5.02	4.99
159	5.27	5.22	5.18	5.14	5.10	5.06	5.02	4.98
160	5.26	5.22	5.18	5.14	5.10	5.06	5.02	4.98
161	5.26	5.22	5.18	5.14	5.10	5.06	5.02	4.98
162	5.26	5.22	5.18	5.14	5.10	5.06	5.02	4.98
163	5.26	5.22	5.18	5.13	5.09	5.06	5.02	4.98
164	5.26	5.22	5.17	5.13	5.09	5.05	5.02	4.98
165	5.26	5.22	5.17	5.13	5.09	5.05	5.02	4.98
166	5.26	5.22	5.17	5.13	5.09	5.05	5.01	4.98
167	5.26	5.21	5.17	5.13	5.09	5.05	5.01	4.98
168	5.26	5.21	5.17	5.13	5.09	5.05	5.01	4.98
169	5.26	5.21	5.17	5.13	5.09	5.05	5.01	4.98
170	5.25	5.21	5.17	5.13	5.09	5.05	5.01	4.97
171	5.25	5.21	5.17	5.13	5.09	5.05	5.01	4.97
172	5.25	5.21	5.17	5.13	5.09	5.05	5.01	4.97
173	5.25	5.21	5.17	5.13	5.09	5.05	5.01	4.97
174	5.25	5.21	5.17	5.12	5.08	5.05	5.01	4.97
175	5.25	5.21	5.16	5.12	5.08	5.04	5.01	4.97
176	5.25	5.21	5.16	5.12	5.08	5.04	5.01	4.97
177	5.25	5.20	5.16	5.12	5.08	5.04	5.00	4.97
178	5.25	5.20	5.16	5.12	5.08	5.04	5.00	4.97
179	5.25	5.20	5.16	5.12	5.08	5.04	5.00	4.97
180	5.24	5.20	5.16	5.12	5.08	5.04	5.00	4.96
181	5.24	5.20	5.16	5.12	5.08	5.04	5.00	4.96
182	5.24	5.20	5.16	5.12	5.08	5.04	5.00	4.96
183	5.24	5.20	5.16	5.12	5.08	5.04	5.00	4.96
184	5.24	5.20	5.16	5.11	5.07	5.04	5.00	4.96
185	5.24	5.20	5.15	5.11	5.07	5.03	5.00	4.96
186	5.24	5.20	5.15	5.11	5.07	5.03	5.00	4.96
187	5.24	5.19	5.15	5.11	5.07	5.03	4.99	4.96
188	5.24	5.19	5.15	5.11	5.07	5.03	4.99	4.96
189	5.24	5.19	5.15	5.11	5.07	5.03	4.99	4.96

Col - Row	0	1	2	3	4	5	6	7
190	5.23	5.19	5.15	5.11	5.07	5.03	4.99	4.96
191	5.23	5.19	5.15	5.11	5.07	5.03	4.99	4.95
192	5.23	5.19	5.15	5.11	5.07	5.03	4.99	4.95
193	5.23	5.19	5.15	5.11	5.07	5.03	4.99	4.95
194	5.23	5.19	5.15	5.10	5.06	5.03	4.99	4.95
195	5.23	5.19	5.14	5.10	5.06	5.02	4.99	4.95
196	5.23	5.19	5.14	5.10	5.06	5.02	4.99	4.95
197	5.23	5.18	5.14	5.10	5.06	5.02	4.99	4.95
198	5.23	5.18	5.14	5.10	5.06	5.02	4.98	4.95
199	5.23	5.18	5.14	5.10	5.06	5.02	4.98	4.95

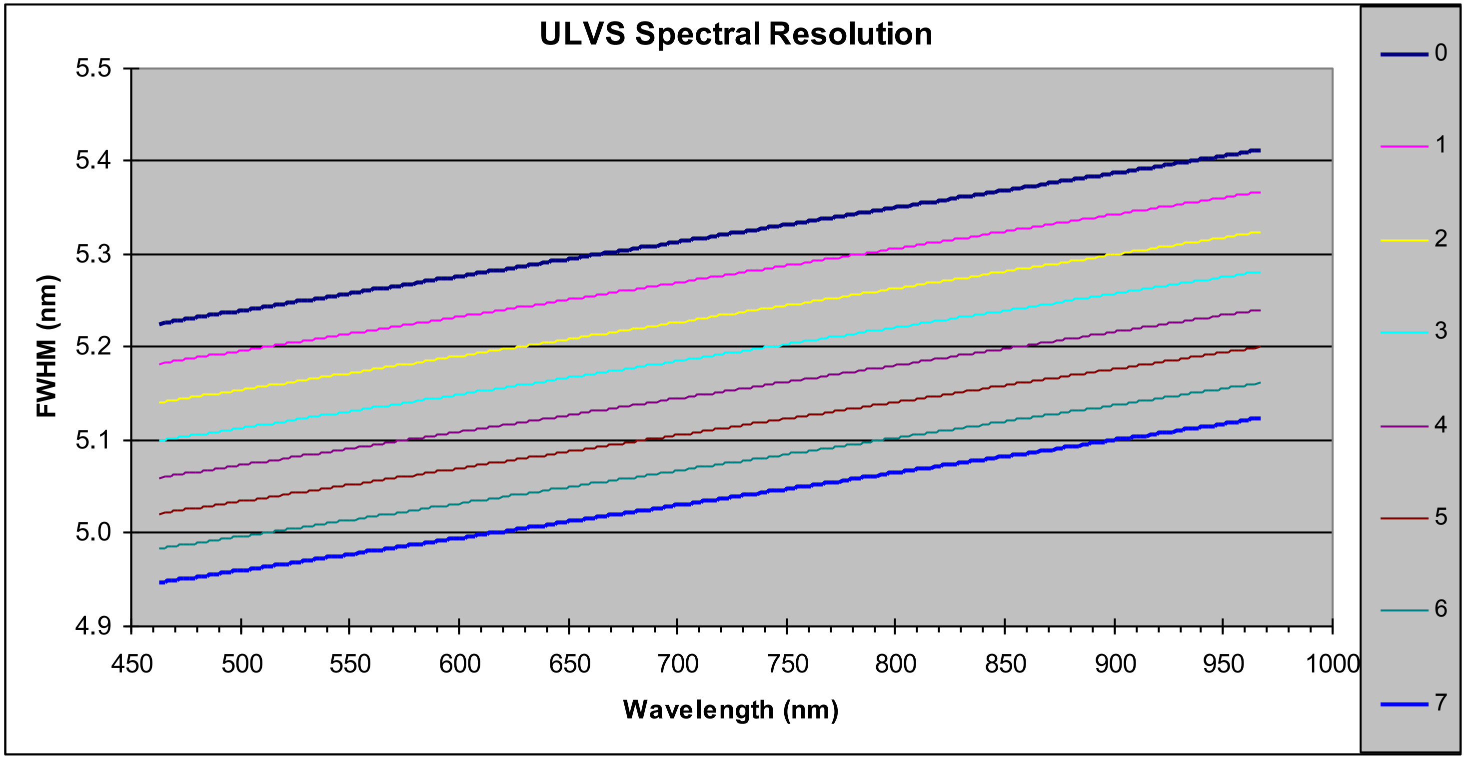
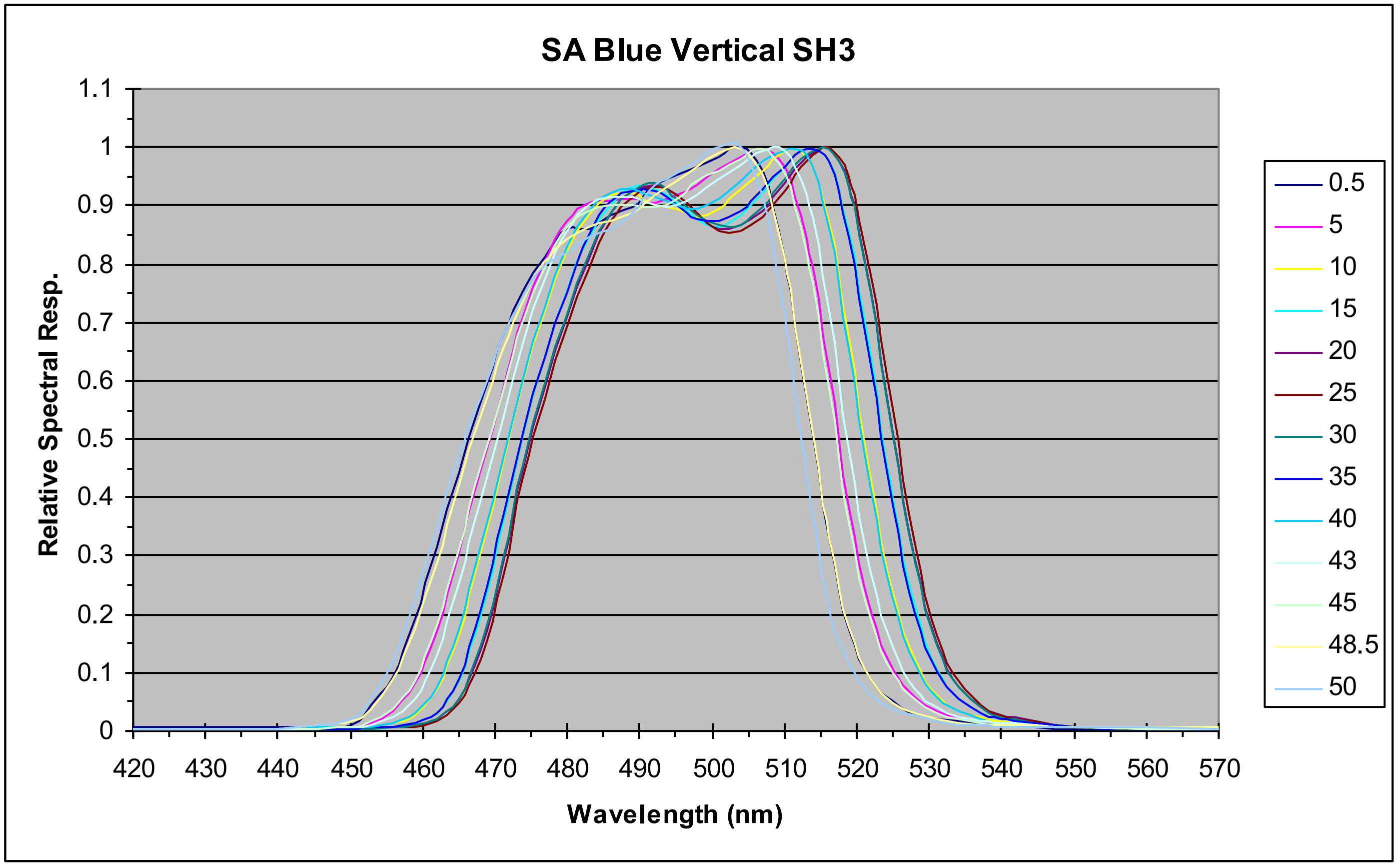


Figure - Plot of the data from the preceding table (ULVS spectral resolution at 210ºK)

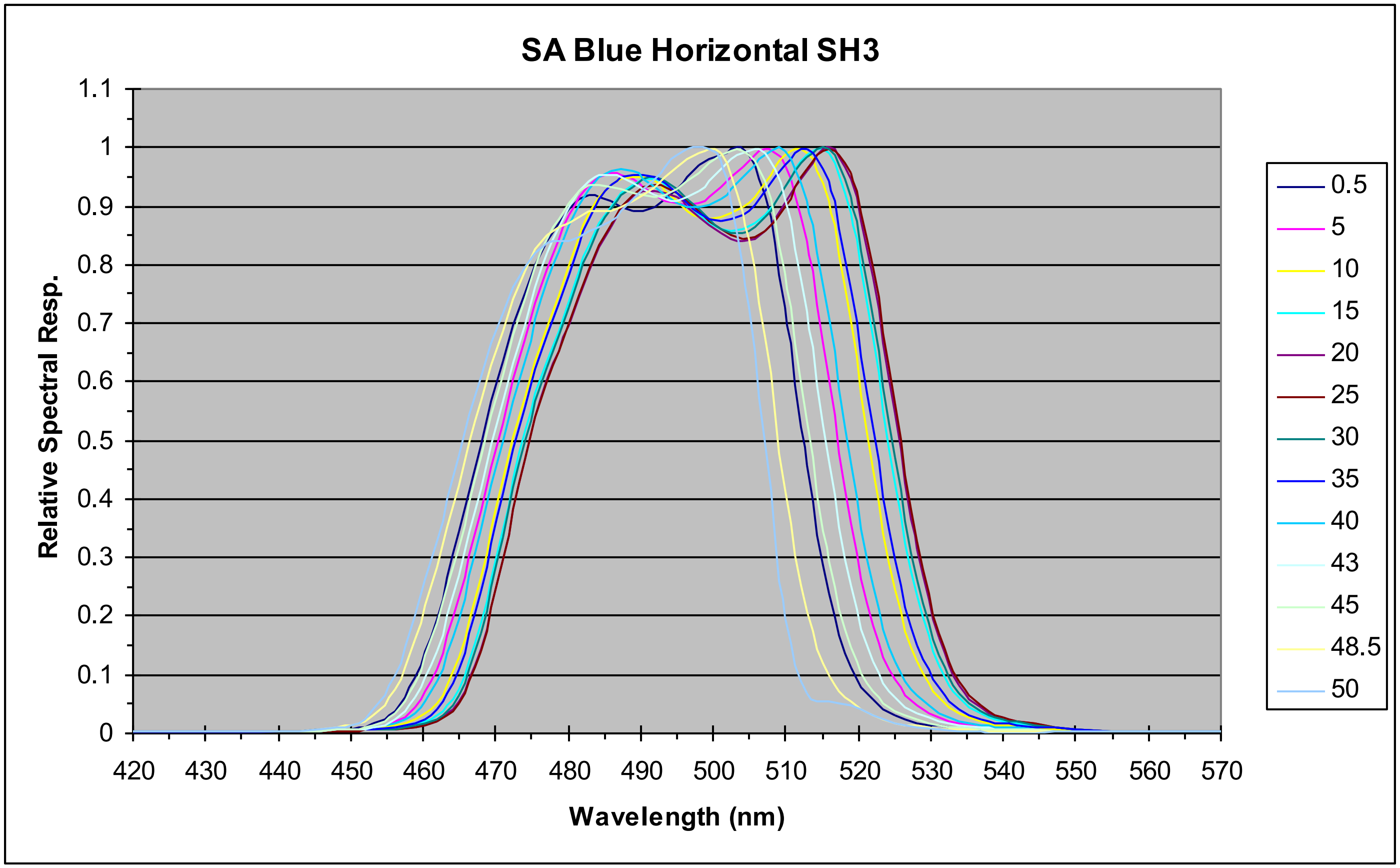
Appendix 31 - Solar Aureole Relative Spectral Response Tables

This appendix presents the filter curve portion of the Relative Spectral Response for the 4 Solar Aureole Cameras (Blue, vertical & horizontal polarization; and Red, vertical and horizontal polarization. Three columns (Red Vertical column 0 and Red Horizontal columns 0 & 1) require different RSR tables (below). The RSR are presented by wavelength (table row) and SA Row (table column!), but must be interpolated to attain each pixel's value.



Blue Vertical

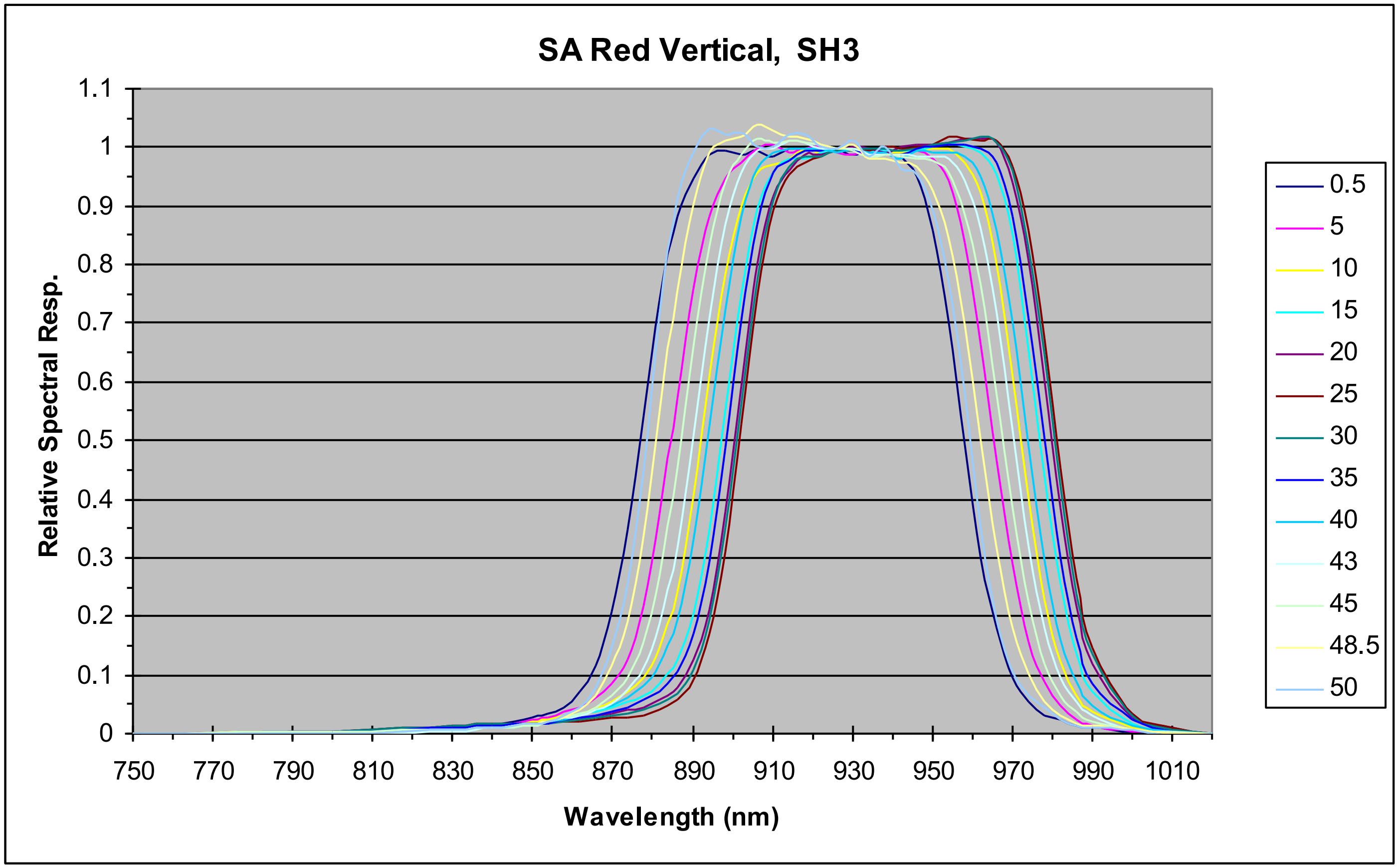
nm	0.5	5	10	15	20	25	30	35	40	43	45	48.5	50
420	0.00639	0.00467	0.00397	0.00427	0.00249	0.00370	0.00334	0.00257	0.00346	0.00312	0.00405	0.00360	0.00259
430	0.00546	0.00438	0.00376	0.00292	0.00283	0.00245	0.00319	0.00298	0.00330	0.00268	0.00308	0.00307	0.00278
440	0.00540	0.00281	0.00297	0.00354	0.00218	0.00308	0.00251	0.00360	0.00326	0.00302	0.00338	0.00326	0.00292
450	0.01021	0.00789	0.00534	0.00491	0.00363	0.00444	0.00339	0.00439	0.00557	0.00695	0.00822	0.01567	0.02090
453	0.04461	0.01413	0.00697	0.00563	0.00517	0.00459	0.00466	0.00543	0.00741	0.01089	0.01545	0.03863	0.05449
456	0.09363	0.03297	0.01301	0.00740	0.00690	0.00580	0.00615	0.00807	0.01279	0.02265	0.03710	0.08742	0.11874
459	0.19046	0.08053	0.02709	0.01312	0.00934	0.00824	0.00941	0.01387	0.02987	0.05603	0.08690	0.17340	0.22313
462	0.31466	0.17214	0.07047	0.03152	0.01959	0.01615	0.01998	0.03236	0.07670	0.12967	0.18000	0.28952	0.34482
465	0.44129	0.30563	0.16554	0.08663	0.05508	0.04718	0.05369	0.08989	0.17331	0.25499	0.31227	0.42176	0.47229
468	0.56547	0.44951	0.30983	0.20018	0.14096	0.12436	0.14646	0.20799	0.31968	0.39614	0.45411	0.54166	0.57377
471	0.67785	0.58664	0.45862	0.35736	0.28907	0.26459	0.29308	0.36594	0.46447	0.53426	0.58375	0.65441	0.67848
474	0.75338	0.70944	0.59911	0.50788	0.44951	0.43405	0.45645	0.50896	0.60187	0.66544	0.70208	0.73799	0.74239
477	0.81075	0.80430	0.71941	0.63948	0.59005	0.57053	0.59793	0.64129	0.72592	0.77368	0.79423	0.80484	0.79950
480	0.85843	0.87521	0.82183	0.75558	0.71076	0.69050	0.71382	0.75209	0.82818	0.85685	0.86447	0.84175	0.81797
483	0.86099	0.90345	0.88495	0.84622	0.80907	0.79220	0.81430	0.84994	0.89071	0.89989	0.89188	0.86307	0.84496
486	0.88381	0.90767	0.91752	0.90275	0.88643	0.87228	0.88738	0.90909	0.92185	0.91509	0.90121	0.87425	0.86165
489	0.89629	0.91028	0.92318	0.93348	0.92433	0.91554	0.92658	0.92399	0.92846	0.91598	0.90081	0.88839	0.88857
492	0.93652	0.90357	0.90230	0.92995	0.93419	0.93060	0.93729	0.92506	0.91436	0.90248	0.89876	0.91793	0.93615
495	0.95367	0.91703	0.89318	0.90578	0.91944	0.91958	0.91320	0.89968	0.90083	0.90265	0.91319	0.94144	0.95737
498	0.96608	0.93503	0.87927	0.87831	0.88746	0.88625	0.88285	0.87607	0.89395	0.91872	0.94071	0.96781	0.97499
501	0.98414	0.96304	0.89473	0.86522	0.86134	0.85829	0.86691	0.87271	0.91085	0.94612	0.96114	0.98922	1.00000
504	0.99955	0.98329	0.92910	0.88508	0.86737	0.85516	0.86824	0.89206	0.94337	0.96949	0.97986	0.99870	1.00000
507	0.96080	0.99699	0.96071	0.92179	0.89101	0.88078	0.89654	0.92812	0.97605	0.99383	0.99679	0.95332	0.91573
510	0.80987	0.96594	0.99472	0.96474	0.94018	0.92369	0.94732	0.96791	0.99520	0.99284	0.95762	0.80902	0.71146
513	0.56857	0.84396	0.98483	0.99760	0.98304	0.97615	0.98675	0.99740	0.98650	0.91795	0.81807	0.57082	0.43663
516	0.33182	0.62095	0.87433	0.97794	0.99812	0.99973	0.99764	0.97687	0.86526	0.72475	0.58945	0.33179	0.21323
519	0.17310	0.38256	0.67536	0.85675	0.93400	0.94964	0.93218	0.84721	0.65300	0.48189	0.35717	0.17746	0.11547
522	0.08822	0.20528	0.43098	0.64318	0.75483	0.78266	0.75109	0.62652	0.41555	0.27090	0.19058	0.08942	0.06142
525	0.05114	0.10727	0.23595	0.39622	0.51033	0.55065	0.50799	0.38615	0.22480	0.14283	0.09898	0.04913	0.03825
528	0.02795	0.05714	0.12172	0.21573	0.29385	0.32258	0.29178	0.20307	0.11725	0.07299	0.05378	0.03147	0.02631
531	0.01977	0.03318	0.06324	0.10756	0.14970	0.16492	0.14672	0.10440	0.05989	0.04074	0.03104	0.01918	0.01608
534	0.01590	0.02153	0.03566	0.05625	0.07707	0.08516	0.07616	0.05456	0.03516	0.02532	0.02099	0.01404	0.01130
537	0.00981	0.01423	0.02265	0.03210	0.04076	0.04435	0.04144	0.03054	0.02123	0.01794	0.01498	0.01083	0.00946
540	0.00878	0.01069	0.01554	0.02074	0.02583	0.02748	0.02487	0.01961	0.01405	0.01211	0.01053	0.00861	0.00810
550	0.00491	0.00553	0.00605	0.00627	0.00726	0.00739	0.00711	0.00717	0.00635	0.00593	0.00620	0.00581	0.00532
560	0.00749	0.00484	0.00457	0.00380	0.00409	0.00426	0.00412	0.00450	0.00427	0.00420	0.00467	0.00535	0.00557
570	0.00500	0.00437	0.00413	0.00356	0.00366	0.00341	0.00281	0.00360	0.00405	0.00419	0.00494	0.00528	0.00505



Blue Horizontal

nm	0.5	5	10	15	20	25	30	35	40	43	45	48.5	50
420	0.00131	0.00237	0.00335	0.00216	0.00276	0.00310	0.00286	0.00340	0.00353	0.00293	0.00328	0.00270	0.00198
430	0.00112	0.00272	0.00286	0.00215	0.00294	0.00353	0.00274	0.00290	0.00268	0.00361	0.00281	0.00291	0.00355
440	0.00219	0.00298	0.00391	0.00325	0.00311	0.00311	0.00403	0.00313	0.00294	0.00277	0.00308	0.00257	0.00194
450	0.00743	0.00697	0.00654	0.00584	0.00512	0.00512	0.00554	0.00537	0.00609	0.00617	0.00804	0.01261	0.01507
453	0.01620	0.01046	0.00882	0.00687	0.00635	0.00544	0.00634	0.00646	0.00982	0.01156	0.01485	0.02956	0.03936
456	0.03781	0.01964	0.01385	0.00995	0.00752	0.00729	0.00779	0.00994	0.01638	0.02307	0.03397	0.07351	0.09844
459	0.09607	0.04289	0.02312	0.01604	0.01123	0.01036	0.01275	0.01849	0.03374	0.05986	0.08669	0.16037	0.20236
462	0.19495	0.10998	0.05105	0.02969	0.02033	0.01904	0.02522	0.04231	0.08909	0.13910	0.18661	0.28241	0.32839
465	0.34334	0.23082	0.13115	0.07567	0.05355	0.05269	0.06628	0.10964	0.19520	0.27088	0.31910	0.42361	0.47625
468	0.49096	0.37908	0.26700	0.18649	0.14223	0.13948	0.17166	0.24379	0.34871	0.41704	0.47086	0.56594	0.60704

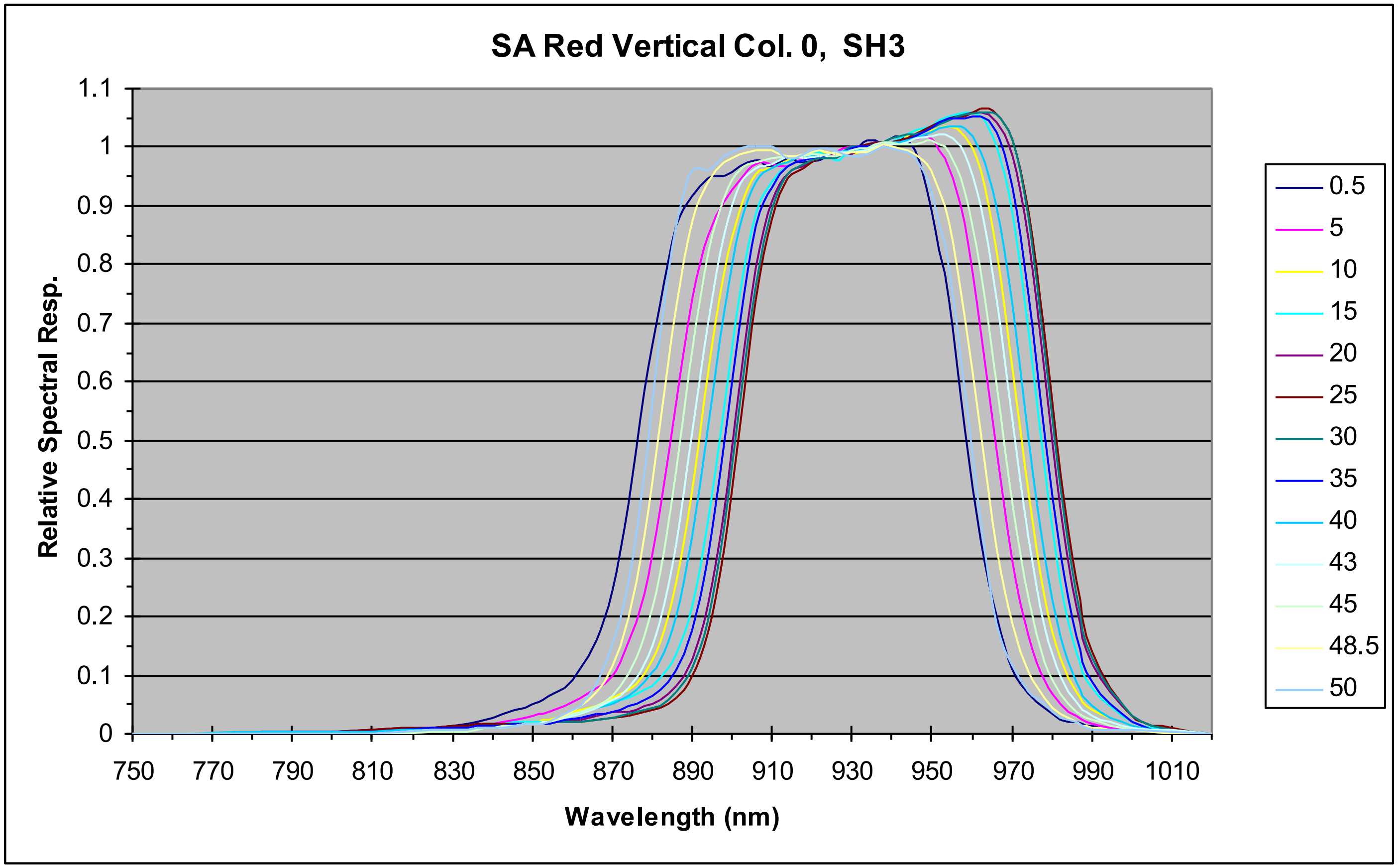
471	0.63669	0.53080	0.43407	0.35013	0.29734	0.29596	0.33528	0.40964	0.49853	0.56565	0.61054	0.68553	0.71627
474	0.75271	0.67278	0.57263	0.51467	0.46791	0.46887	0.49941	0.55771	0.63585	0.69778	0.74174	0.78775	0.79542
477	0.84077	0.79189	0.69363	0.63584	0.60618	0.60290	0.62651	0.68060	0.77053	0.81966	0.84416	0.84970	0.83754
480	0.89614	0.88625	0.79867	0.73680	0.69791	0.70162	0.72718	0.78308	0.86693	0.89689	0.90615	0.87277	0.83914
483	0.91794	0.93711	0.88755	0.83204	0.79029	0.79102	0.82244	0.87640	0.92837	0.94376	0.93576	0.89004	0.85810
486	0.90849	0.95513	0.93650	0.89879	0.86261	0.86606	0.89468	0.93434	0.96106	0.95250	0.93133	0.89254	0.87523
489	0.89287	0.94547	0.94840	0.93608	0.91387	0.91737	0.93327	0.95313	0.95884	0.93937	0.92138	0.90904	0.91120
492	0.89835	0.91893	0.94357	0.94573	0.92433	0.93597	0.94973	0.95088	0.93421	0.91938	0.91683	0.93234	0.94677
495	0.92803	0.90457	0.90928	0.92255	0.91437	0.92297	0.92879	0.92395	0.90444	0.90917	0.92834	0.96779	0.98701
498	0.96897	0.90472	0.88000	0.88314	0.88190	0.89066	0.89574	0.88683	0.89900	0.92481	0.95505	0.99201	1.00000
501	0.98605	0.93260	0.88038	0.85942	0.85296	0.86040	0.86235	0.87495	0.91324	0.96191	0.98767	0.99185	0.97769
504	0.99783	0.96770	0.89719	0.86136	0.83893	0.84350	0.85364	0.88610	0.94842	0.98983	0.99540	0.88868	0.79756
507	0.92010	0.99629	0.93799	0.88541	0.85815	0.85836	0.88157	0.92631	0.98687	0.99206	0.94277	0.67775	0.49452
510	0.72661	0.96894	0.98806	0.93174	0.90406	0.89889	0.93200	0.97177	0.99320	0.91206	0.78493	0.41515	0.19928
513	0.45717	0.83938	0.99029	0.98787	0.95949	0.96317	0.98436	0.99884	0.90792	0.71934	0.53456	0.20879	0.06825
516	0.24055	0.60483	0.90831	0.99076	1.00000	0.99898	0.99640	0.94398	0.71109	0.46406	0.29538	0.10060	0.05623
519	0.11172	0.35974	0.70273	0.88814	0.94630	0.95588	0.91718	0.75886	0.46022	0.25244	0.14765	0.05326	0.04748
522	0.05750	0.18470	0.45254	0.67800	0.78020	0.79606	0.71129	0.52202	0.25181	0.12317	0.07113	0.03022	0.03224
525	0.03113	0.09128	0.24568	0.42844	0.54819	0.56246	0.47271	0.29730	0.12382	0.06238	0.03806	0.01783	0.01785
528	0.01808	0.04666	0.12146	0.23455	0.31380	0.32728	0.26207	0.15131	0.06426	0.03396	0.02249	0.01233	0.01183
531	0.01271	0.02573	0.06218	0.11682	0.16235	0.17114	0.13210	0.07786	0.03444	0.02032	0.01386	0.00740	0.00651
534	0.00808	0.01562	0.03469	0.06096	0.08365	0.08721	0.06877	0.04033	0.02076	0.01326	0.01003	0.00559	0.00415
537	0.00518	0.01139	0.02068	0.03411	0.04523	0.04804	0.03843	0.02423	0.01340	0.00917	0.00729	0.00469	0.00385
540	0.00344	0.00856	0.01313	0.02113	0.02718	0.02749	0.02327	0.01610	0.00918	0.00635	0.00564	0.00316	0.00161
550	0.00231	0.00394	0.00529	0.00682	0.00718	0.00783	0.00761	0.00609	0.00446	0.00398	0.00389	0.00295	0.00224
560	0.00352	0.00392	0.00367	0.00427	0.00425	0.00442	0.00441	0.00391	0.00349	0.00333	0.00344	0.00307	0.00269
570	0.00338	0.00331	0.00368	0.00375	0.00358	0.00376	0.00372	0.00334	0.00347	0.00394	0.00343	0.00284	0.00271



Red Vertical

nm	0.5	5	10	15	20	25	30	35	40	43	45	48.5	50
750	0.00009	0.00009	0.00001	0.00012	0.00006	0.00008	0.00010	0.00004	0.00000	0.00011	0.00008	0.00013	0.00018
800	0.00228	0.00187	0.00213	0.00297	0.00309	0.00309	0.00272	0.00211	0.00154	0.00161	0.00174	0.00161	0.00141
830	0.00683	0.00530	0.00730	0.00986	0.01275	0.01334	0.01196	0.00940	0.00602	0.00477	0.00518	0.00608	0.00653
840	0.01448	0.01143	0.01045	0.01434	0.01651	0.01783	0.01618	0.01390	0.01044	0.00887	0.00958	0.01008	0.01000
850	0.02844	0.02218	0.01897	0.01640	0.01724	0.01707	0.01664	0.01624	0.01495	0.01470	0.01531	0.01661	0.01726
854	0.03474	0.02835	0.02337	0.01962	0.01772	0.01723	0.01685	0.01781	0.01909	0.01914	0.01975	0.02075	0.02115
858	0.04574	0.03598	0.03131	0.02585	0.02222	0.02028	0.02135	0.02247	0.02530	0.02635	0.02706	0.02894	0.02999
862	0.07238	0.04517	0.03479	0.03253	0.02489	0.01955	0.02274	0.02717	0.02936	0.03087	0.03257	0.04056	0.04594
866	0.11732	0.06026	0.04469	0.03762	0.02973	0.02330	0.02598	0.03043	0.03957	0.04088	0.04477	0.06450	0.07798
870	0.20718	0.08560	0.05362	0.04390	0.03349	0.02555	0.02960	0.03754	0.04742	0.05231	0.06517	0.11552	0.14796

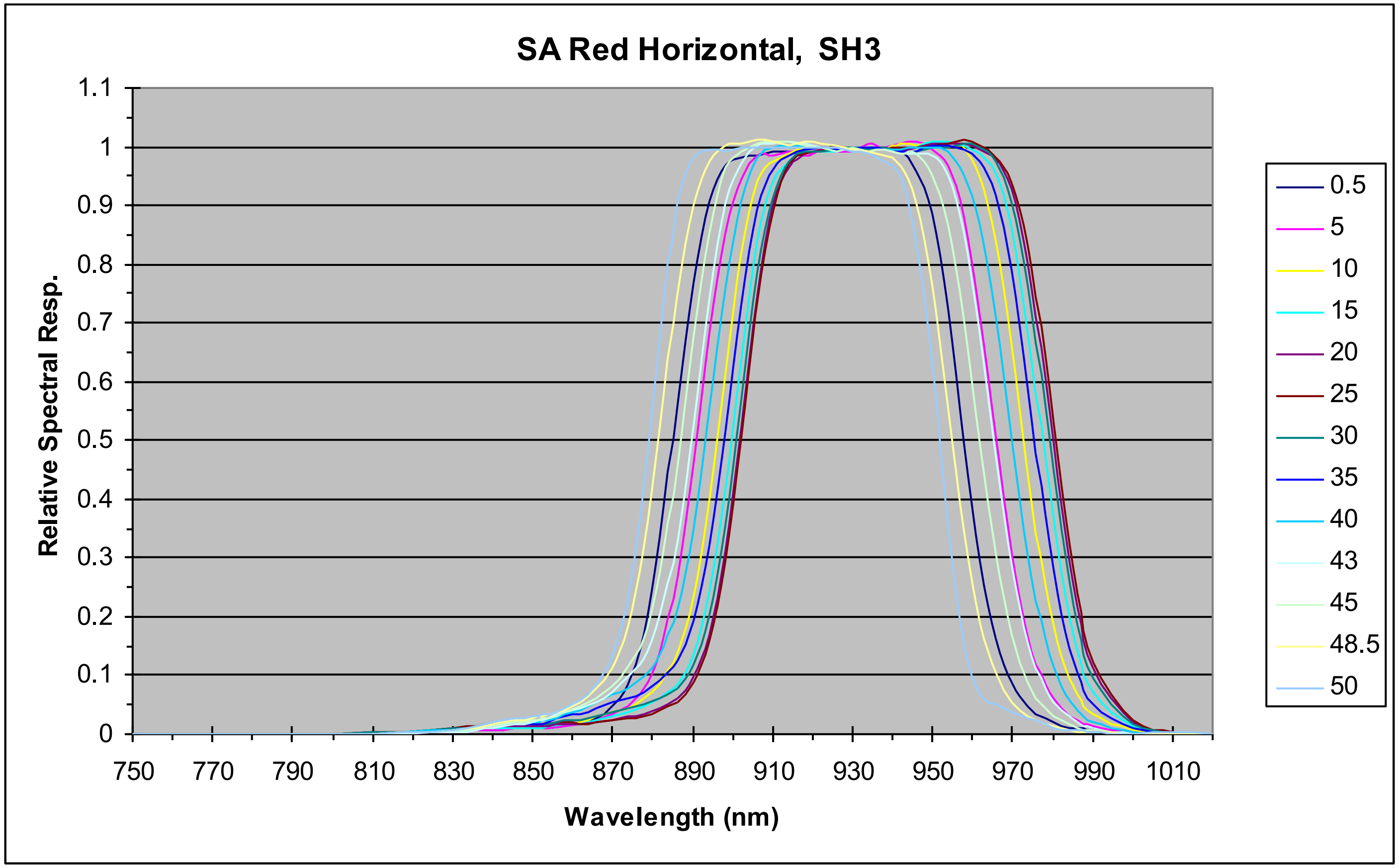
874	0.34620	0.12673	0.07185	0.05354	0.03941	0.02789	0.03259	0.04474	0.05995	0.07383	0.09493	0.19066	0.25460
878	0.54247	0.21858	0.09502	0.06561	0.04428	0.03139	0.03966	0.05706	0.08129	0.11133	0.15763	0.33545	0.44938
882	0.73786	0.37316	0.14648	0.08595	0.05727	0.03968	0.04971	0.07289	0.11931	0.18586	0.27056	0.54665	0.71480
886	0.88202	0.57121	0.24264	0.12496	0.07832	0.05747	0.06901	0.10574	0.19528	0.31695	0.45175	0.75593	0.91290
890	0.94843	0.75941	0.40573	0.20448	0.12518	0.09232	0.10866	0.16868	0.32926	0.50610	0.66208	0.90196	0.99187
894	0.98843	0.88145	0.60985	0.34716	0.21235	0.16883	0.19425	0.29455	0.52395	0.70708	0.83266	0.98965	1.03247
898	0.99364	0.94576	0.78233	0.55243	0.37684	0.30889	0.34921	0.48571	0.72159	0.86724	0.93904	1.01212	1.02295
902	0.98919	0.97417	0.89764	0.74934	0.59171	0.52757	0.56301	0.70611	0.88041	0.95761	0.98843	1.01958	1.02404
906	0.99556	0.99824	0.95752	0.89578	0.80019	0.74583	0.77472	0.87011	0.96232	0.99559	1.01455	1.03813	1.00000
910	0.98489	1.00437	0.97036	0.95841	0.91683	0.89209	0.91027	0.95844	0.99217	0.99853	1.00820	1.02912	1.00000
914	0.99661	0.98980	0.98116	0.97988	0.96134	0.95448	0.96603	0.97602	0.99940	1.01029	1.01137	1.01803	1.02274
918	0.99929	0.99850	0.99634	0.98110	0.98805	0.97473	0.98471	0.99356	0.99842	1.00859	1.00868	1.01621	1.02231
922	0.99399	1.00070	0.98894	0.99205	0.98807	0.98268	0.98526	0.99611	0.99865	0.99731	1.00402	1.00410	0.99960
926	0.99690	0.99074	0.99705	0.99664	0.99449	0.99513	0.99334	0.99756	0.99198	0.99745	0.99707	0.99762	0.99834
930	0.98911	0.98873	0.99918	0.99334	1.00027	0.99818	0.99558	0.99553	0.99883	0.99907	0.99515	1.00325	1.01254
934	0.99660	0.99499	0.99233	0.99317	0.99614	0.99607	0.99862	0.99120	0.98963	0.98790	0.98411	0.98218	0.98318
938	0.99332	0.99442	0.99264	0.99491	0.99146	0.99964	0.99878	0.98856	0.98996	0.98678	0.98740	0.97974	1.00000
942	0.98525	0.99241	0.99129	0.99550	1.00056	0.99887	0.99285	0.98813	0.97984	0.98701	0.98471	0.97263	0.96432
946	0.95091	0.99382	0.99394	0.99405	1.00305	1.00247	0.99671	0.99810	0.99559	0.98552	0.98176	0.96555	0.95485
950	0.85945	0.98157	0.99899	0.99956	1.00509	1.00324	1.00496	1.00152	0.99046	0.98516	0.97761	0.92775	0.89209
954	0.70305	0.94236	0.99881	1.00678	1.00896	1.01661	1.00850	1.00353	0.99158	0.97992	0.95660	0.84445	0.76859
958	0.49475	0.83685	0.97542	1.00212	1.01517	1.01419	1.01243	1.00567	0.98588	0.94241	0.88417	0.69665	0.58294
962	0.30010	0.66441	0.92443	0.98984	1.01577	1.01096	1.01709	0.99715	0.94862	0.86206	0.76479	0.50025	0.35013
966	0.17933	0.46692	0.79879	0.95461	1.00763	1.01097	1.00885	0.97423	0.85776	0.71841	0.58064	0.31592	0.19326
970	0.09460	0.28990	0.61103	0.85278	0.94015	0.96732	0.95962	0.88283	0.70046	0.51701	0.38418	0.18100	0.10533
974	0.05476	0.15705	0.40116	0.65474	0.80569	0.85956	0.82915	0.70996	0.49187	0.31970	0.22416	0.10119	0.06573
978	0.03191	0.08727	0.22957	0.43817	0.60211	0.67397	0.64645	0.50258	0.29682	0.18005	0.11970	0.05590	0.04485
982	0.02221	0.04781	0.12355	0.25627	0.38317	0.45218	0.42098	0.29977	0.16041	0.09677	0.06626	0.03204	0.02485
986	0.01247	0.02535	0.06423	0.13772	0.21922	0.26462	0.23887	0.16507	0.08911	0.05409	0.03737	0.01770	0.01301
990	0.00855	0.01492	0.03770	0.07192	0.11846	0.14806	0.13459	0.08651	0.04703	0.03004	0.02177	0.01295	0.01136
1000	0.00262	0.00506	0.01038	0.01871	0.02812	0.03497	0.03167	0.02342	0.01224	0.00786	0.00666	0.00555	0.00546
1010	0.00142	0.00178	0.00453	0.00467	0.00883	0.01137	0.00800	0.00326	0.00451	0.00148	0.00356	0.00116	-0.00222
1020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



Red Vertical, Column 0

nm	0.5	5	10	15	20	25	30	35	40	43	45	48.5	50
750	0.00041	0.00030	0.00013	0.00004	0.00006	0.00019	0.00014	0.00024	0.00011	0.00019	0.00010	0.00012	0.00021
800	0.00468	0.00239	0.00269	0.00371	0.00309	0.00328	0.00243	0.00192	0.00207	0.00135	0.00149	0.00130	0.00106
830	0.01465	0.00700	0.00781	0.01178	0.01259	0.01366	0.01121	0.00956	0.00677	0.00522	0.00462	0.00604	0.00761
840	0.02880	0.01551	0.01144	0.01553	0.01540	0.01694	0.01486	0.01399	0.01117	0.00937	0.00997	0.01002	0.00964
850	0.05252	0.02992	0.01998	0.01878	0.01731	0.01825	0.01608	0.01643	0.01716	0.01737	0.01789	0.01777	0.01731
854	0.06283	0.03658	0.02438	0.02148	0.01742	0.01931	0.01709	0.01820	0.02052	0.02181	0.02196	0.02169	0.02137
858	0.07870	0.04814	0.03320	0.02884	0.02256	0.02154	0.02085	0.02367	0.02791	0.02783	0.02950	0.03218	0.03323
862	0.11096	0.06080	0.04113	0.03525	0.02404	0.02187	0.01889	0.02879	0.03386	0.03473	0.03876	0.04590	0.04899
866	0.15888	0.07807	0.04765	0.04520	0.03087	0.02492	0.02369	0.03519	0.04262	0.04382	0.04846	0.07036	0.08512
870	0.24320	0.09997	0.06227	0.05331	0.03647	0.02879	0.02824	0.03768	0.05157	0.05654	0.06542	0.11591	0.15115

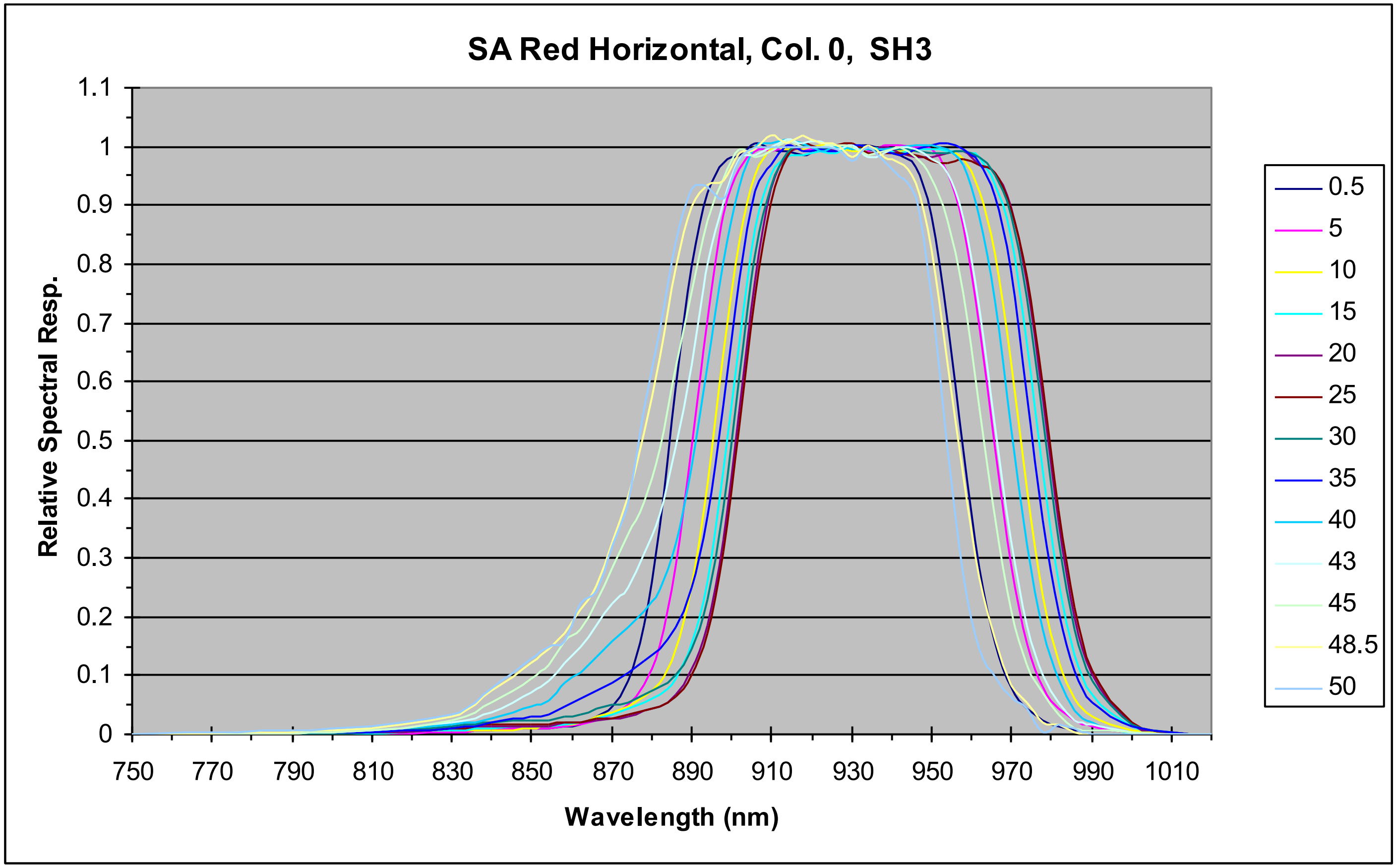
874	0.39092	0.15460	0.07567	0.06070	0.03891	0.03224	0.03460	0.04801	0.06380	0.07803	0.10171	0.19702	0.25885
878	0.58368	0.23771	0.10234	0.07551	0.04749	0.03793	0.03937	0.05744	0.08703	0.11893	0.16753	0.33546	0.43973
882	0.73457	0.38283	0.15649	0.09433	0.05610	0.04566	0.04913	0.07637	0.12559	0.19436	0.27664	0.53073	0.68252
886	0.86739	0.56409	0.25886	0.13534	0.08154	0.06099	0.07230	0.10716	0.19988	0.32120	0.44960	0.72735	0.86705
890	0.91723	0.73917	0.41510	0.21681	0.12501	0.09722	0.11232	0.17714	0.33691	0.51157	0.65169	0.87404	0.96042
894	0.94839	0.85043	0.61497	0.36265	0.22110	0.17213	0.19215	0.30090	0.52209	0.70025	0.81817	0.94149	0.96199
898	0.95146	0.90546	0.78318	0.55246	0.37853	0.31387	0.35042	0.49082	0.71797	0.85039	0.91258	0.97479	0.98329
902	0.96756	0.94418	0.89246	0.74920	0.59730	0.52423	0.56392	0.69874	0.86725	0.93866	0.95927	0.98870	0.99873
906	0.97901	0.97014	0.95390	0.88632	0.79382	0.73898	0.76545	0.86539	0.93945	0.96510	0.97484	0.99349	1.00000
910	0.96894	0.96986	0.96521	0.94200	0.90600	0.87757	0.89306	0.93112	0.96500	0.97195	0.98044	0.99464	1.00000
914	0.98082	0.96793	0.97671	0.96640	0.95542	0.94600	0.95268	0.96620	0.97289	0.98344	0.98578	0.98458	0.98199
918	0.97550	0.98001	0.98313	0.97628	0.96894	0.96574	0.97009	0.97904	0.98370	0.98274	0.98434	0.98768	0.98933
922	0.97695	0.98160	0.98980	0.98976	0.98446	0.98022	0.98127	0.98434	0.98519	0.98624	0.98873	0.99550	0.99934
926	0.99037	0.99196	0.98688	0.97903	0.98720	0.98499	0.98246	0.98404	0.99214	0.99302	0.98386	0.98694	0.99570
930	0.98856	1.00104	0.98947	0.99296	0.98864	0.99665	1.00084	0.99804	0.99475	0.99061	0.99606	0.99234	0.98559
934	1.01134	0.99650	0.99936	1.00557	1.00473	1.00499	1.00073	1.00144	0.99496	0.99568	0.99691	0.99298	0.98894
938	1.00670	1.00102	1.00674	1.00550	1.00812	1.00668	1.00822	1.00499	1.00503	1.00654	1.00683	1.00327	1.00000
942	1.01978	1.01022	1.00776	1.01574	1.01101	1.01100	1.01843	1.00989	1.00993	1.00580	1.00391	0.99844	0.99526
946	0.99497	1.01494	1.02760	1.02937	1.02029	1.02144	1.02280	1.01930	1.01665	1.01668	1.00625	0.98845	0.98099
950	0.89782	1.01412	1.02818	1.03548	1.03464	1.03705	1.03110	1.03195	1.02502	1.01878	1.01109	0.96231	0.92765
954	0.74182	0.96495	1.03574	1.05347	1.04907	1.04847	1.04485	1.04747	1.03654	1.01741	0.99119	0.87320	0.79454
958	0.51848	0.86928	1.01803	1.05772	1.05443	1.05259	1.05503	1.04830	1.03050	0.98910	0.92324	0.71115	0.58253
962	0.32956	0.68604	0.96076	1.05230	1.06039	1.06436	1.06011	1.05137	0.99227	0.89987	0.78802	0.51216	0.36272
966	0.19962	0.48068	0.82261	1.00098	1.04255	1.05614	1.05585	1.02436	0.89746	0.74013	0.59577	0.31738	0.18804
970	0.10815	0.29086	0.62125	0.88640	0.98465	1.01162	1.01070	0.93102	0.73102	0.53409	0.39028	0.18516	0.11538
974	0.06717	0.16519	0.40952	0.68537	0.84049	0.88978	0.87844	0.74595	0.50282	0.33177	0.22919	0.10423	0.07192
978	0.04255	0.09325	0.23377	0.45628	0.61705	0.68325	0.65614	0.51207	0.30429	0.18338	0.12359	0.06058	0.04981
982	0.02523	0.05260	0.12990	0.25950	0.38310	0.44586	0.41937	0.30957	0.16615	0.09866	0.06914	0.03444	0.02618
986	0.01905	0.02981	0.07073	0.14010	0.21708	0.26174	0.23914	0.16724	0.08851	0.05578	0.03761	0.02122	0.02019
990	0.01257	0.01719	0.04140	0.07702	0.11862	0.13845	0.12813	0.08806	0.04836	0.03120	0.02268	0.01145	0.00807
1000	0.00702	0.00737	0.01324	0.02033	0.02940	0.03136	0.03073	0.02182	0.01431	0.00939	0.00720	0.00636	0.00716
1010	0.00715	0.00260	0.00471	0.00508	0.00631	0.00960	0.00818	0.00460	0.00522	0.00541	0.00232	0.00119	0.00236
1020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



Red Horizontal

nm	0.5	5	10	15	20	25	30	35	40	43	45	48.5	50
750	0.00013	0.00000	0.00008	0.00003	0.00000	0.00004	0.00003	0.00006	0.00005	0.00011	0.00013	0.00002	0.00000
800	0.00133	0.00166	0.00154	0.00155	0.00121	0.00103	0.00100	0.00109	0.00114	0.00110	0.00107	0.00110	0.00114
830	0.00525	0.00476	0.00612	0.00810	0.00945	0.01038	0.00884	0.00704	0.00566	0.00504	0.00516	0.00653	0.00756
840	0.00808	0.00745	0.00854	0.01072	0.01389	0.01569	0.01494	0.01283	0.01013	0.01020	0.01193	0.01783	0.02148
850	0.01000	0.00973	0.01083	0.01151	0.01417	0.01612	0.01694	0.01810	0.01932	0.02064	0.02282	0.02778	0.03035
854	0.01132	0.01121	0.01221	0.01272	0.01507	0.01663	0.01808	0.02164	0.02477	0.02709	0.02838	0.03247	0.03494
858	0.01438	0.01471	0.01733	0.01696	0.01724	0.01882	0.02274	0.02877	0.03412	0.03611	0.03753	0.04124	0.04332
862	0.01909	0.01657	0.02131	0.01820	0.01766	0.01786	0.02467	0.03409	0.04012	0.04499	0.04591	0.05334	0.05878
866	0.02743	0.02367	0.02993	0.02309	0.02118	0.02178	0.02993	0.04385	0.05428	0.05543	0.06158	0.07737	0.08610
870	0.04666	0.03450	0.03571	0.03061	0.02532	0.02331	0.03680	0.05298	0.06604	0.07142	0.08108	0.11212	0.13093
874	0.08321	0.04860	0.04487	0.03770	0.02968	0.02686	0.04312	0.05954	0.07832	0.09670	0.11348	0.18367	0.22966

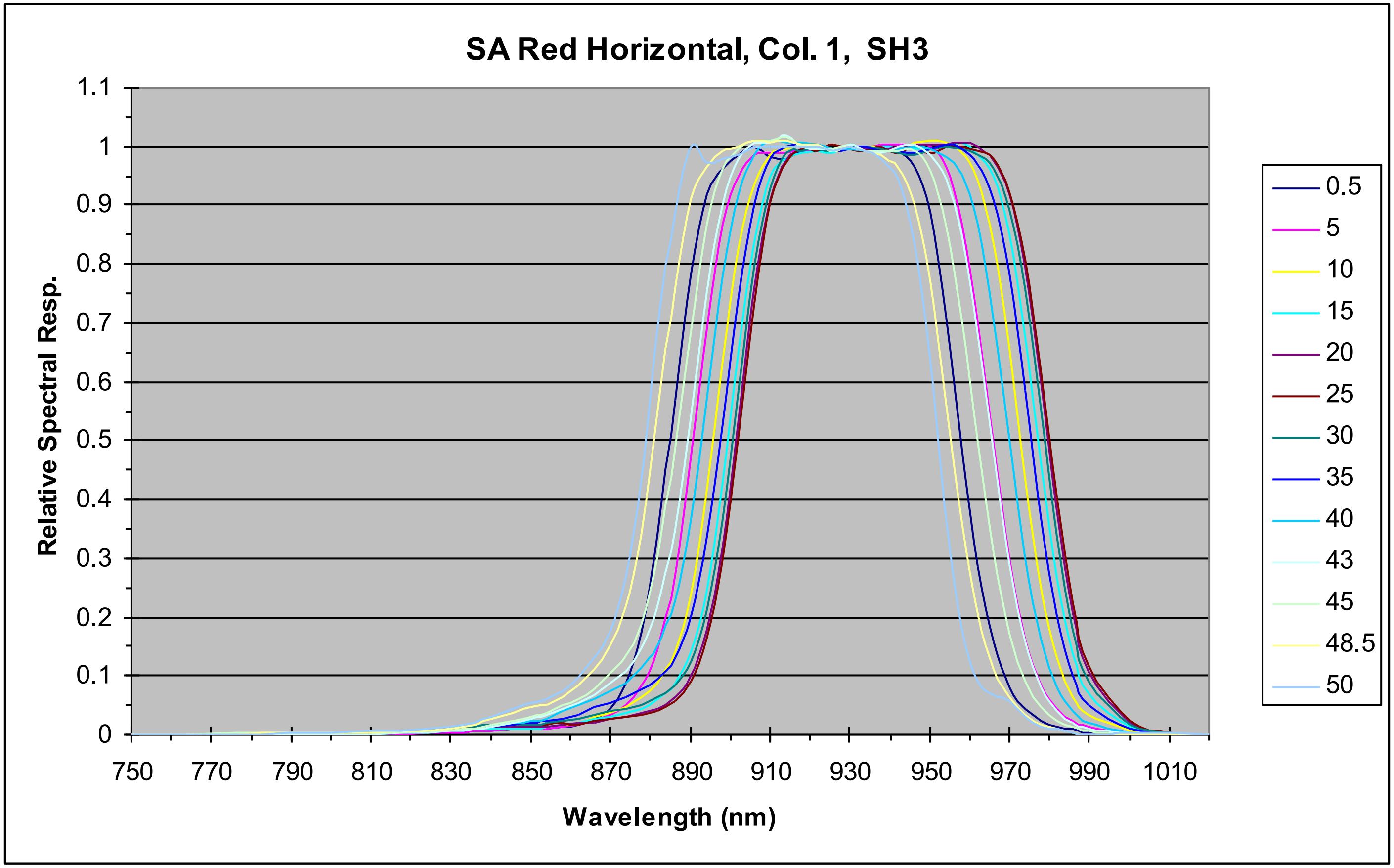
878	0.16854	0.07798	0.06142	0.04586	0.03501	0.03184	0.04942	0.07220	0.09868	0.12699	0.16415	0.31835	0.41918
882	0.33491	0.14011	0.08470	0.05950	0.04419	0.03922	0.05976	0.08984	0.13542	0.20163	0.27573	0.52169	0.67241
886	0.56229	0.26575	0.13715	0.08501	0.06174	0.05532	0.07866	0.12459	0.21269	0.32877	0.45574	0.75196	0.90776
890	0.76896	0.45890	0.23460	0.13688	0.09792	0.08863	0.11978	0.19201	0.34785	0.52545	0.67574	0.90032	0.98160
894	0.90708	0.68252	0.40101	0.24236	0.17073	0.15892	0.20444	0.32282	0.55536	0.74084	0.85317	0.97358	0.99550
898	0.96699	0.85168	0.61250	0.41711	0.31245	0.29559	0.35601	0.51488	0.75894	0.90325	0.96334	1.00156	0.99187
902	0.98017	0.94596	0.81984	0.63799	0.52196	0.50572	0.57018	0.72969	0.90737	0.97144	0.99116	1.00672	1.00000
906	0.98551	0.98421	0.94023	0.83883	0.74310	0.73442	0.78607	0.89202	0.98100	1.00315	1.00481	1.01253	1.00000
910	0.99020	0.98412	0.97572	0.93960	0.90252	0.88921	0.91305	0.96231	0.99909	1.00546	1.00865	1.00787	1.00000
914	0.99100	0.99303	0.98909	0.97412	0.96370	0.97304	0.97352	0.98593	1.00055	1.00868	1.00823	1.00332	0.99961
918	0.98605	0.98429	0.99754	0.98728	0.98833	0.98753	0.99224	0.99465	0.99905	1.00375	1.00188	1.00898	1.00000
922	0.99497	0.99413	0.99504	0.99125	0.99469	0.99223	0.99242	0.99709	0.99935	0.99840	1.00014	1.00541	1.00000
926	0.99183	0.99204	0.99618	0.99281	0.99751	1.00049	0.99547	0.99426	0.99951	0.99914	0.99275	1.00027	1.00000
930	0.99584	0.99238	0.99469	0.99967	0.99526	0.99641	0.99945	0.99579	0.99227	0.99428	0.99802	0.99560	0.99107
934	0.99788	1.00373	0.99816	0.99852	0.99473	0.99446	0.99581	0.99857	0.99122	0.99213	0.99188	0.99033	0.98924
938	0.99983	0.99833	0.99555	0.99835	0.99742	0.99596	0.99686	0.99360	0.99626	0.99467	0.99616	0.98497	0.97480
942	0.99441	1.00676	1.00505	0.99640	0.99218	0.99720	0.99230	0.99017	0.99503	0.98863	0.98682	0.96697	0.95196
946	0.95827	1.00932	1.00203	0.99822	0.99924	0.99997	0.99270	0.99332	0.99802	0.98956	0.98801	0.90383	0.83601
950	0.88617	0.99410	1.00730	1.00761	1.00426	1.00039	0.99863	1.00223	0.99834	0.98469	0.95170	0.76374	0.63245
954	0.72473	0.96633	1.00717	1.00844	1.00364	1.00456	0.99795	1.00094	0.99170	0.95005	0.86770	0.55573	0.35663
958	0.49536	0.87863	0.99710	1.00077	1.00619	1.01224	1.00483	0.99585	0.95006	0.85385	0.70252	0.34406	0.15396
962	0.29467	0.71212	0.94604	0.98920	0.99660	1.00259	0.99699	0.97569	0.86682	0.68048	0.49266	0.18912	0.06883
966	0.16148	0.50904	0.83809	0.95598	0.97884	0.98246	0.97470	0.91648	0.71096	0.47413	0.30673	0.10353	0.05141
970	0.08774	0.30805	0.65886	0.86031	0.92590	0.93800	0.90347	0.78900	0.50098	0.28772	0.17013	0.05362	0.03847
974	0.04626	0.16594	0.44275	0.68308	0.80213	0.83239	0.76334	0.58972	0.30447	0.15449	0.08795	0.02970	0.02740
978	0.02704	0.08579	0.25443	0.47021	0.60692	0.64227	0.55964	0.37276	0.16107	0.07757	0.04439	0.01665	0.01657
982	0.01421	0.04313	0.13097	0.27262	0.38946	0.42195	0.34877	0.20408	0.08122	0.03984	0.02326	0.00886	0.00839
986	0.00916	0.02282	0.06634	0.14212	0.21528	0.24183	0.18564	0.10574	0.04019	0.01975	0.01135	0.00487	0.00528
990	0.00583	0.01292	0.03442	0.07106	0.11048	0.12243	0.09330	0.05217	0.02137	0.00950	0.00555	0.00224	0.00223
1000	0.00233	0.00367	0.00649	0.01324	0.02002	0.02370	0.01704	0.01060	0.00326	0.00117	0.00116	0.00044	0.00000
1010	0.00054	0.00110	0.00131	0.00231	0.00384	0.00380	0.00332	0.00232	0.00052	0.00027	0.00000	0.00133	0.00260
1020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



Red Horizontal, Column 0

nm	0.5	5	10	15	20	25	30	35	40	43	45	48.5	50
750	0.00007	0.00006	0.00010	0.00000	0.00013	0.00016	0.00002	0.00019	0.00026	0.00000	0.00013	0.00029	0.00033
800	0.00138	0.00138	0.00151	0.00152	0.00128	0.00188	0.00143	0.00193	0.00330	0.00286	0.00435	0.00785	0.00969
830	0.00489	0.00464	0.00592	0.00811	0.00924	0.01062	0.01205	0.01155	0.01671	0.02061	0.02311	0.03014	0.03420
840	0.00761	0.00760	0.00771	0.01132	0.01370	0.01707	0.01958	0.02081	0.02835	0.03577	0.05325	0.07315	0.07752
850	0.00973	0.00993	0.01113	0.01265	0.01430	0.01753	0.02272	0.02982	0.04687	0.07070	0.09347	0.12112	0.12823
854	0.01113	0.01080	0.01243	0.01402	0.01468	0.01836	0.02409	0.03457	0.05869	0.09261	0.11823	0.14393	0.14748
858	0.01352	0.01491	0.01708	0.01777	0.01882	0.02142	0.03048	0.04726	0.08644	0.12306	0.15757	0.17073	0.15797
862	0.01758	0.01556	0.01952	0.01946	0.01901	0.01904	0.03435	0.06017	0.10545	0.14962	0.17863	0.21417	0.22347
866	0.02886	0.02444	0.02887	0.02782	0.02313	0.02715	0.04391	0.07349	0.13171	0.18564	0.22733	0.25223	0.24417
870	0.04734	0.03347	0.03860	0.03389	0.02844	0.02795	0.04894	0.08793	0.15801	0.22124	0.28365	0.32681	0.31956
874	0.09093	0.05094	0.04654	0.04243	0.03135	0.03304	0.05398	0.10440	0.18066	0.24859	0.33997	0.40477	0.39548

878	0.18557	0.08336	0.06361	0.05315	0.04169	0.03937	0.06581	0.12505	0.20757	0.30718	0.39529	0.51444	0.55185
882	0.35428	0.15311	0.08813	0.06856	0.04877	0.04649	0.08006	0.14487	0.24641	0.37523	0.48630	0.63949	0.68910
886	0.59073	0.28749	0.14437	0.09522	0.06651	0.06349	0.10126	0.18228	0.32274	0.48842	0.62575	0.79333	0.83681
890	0.79769	0.49051	0.25388	0.15483	0.10986	0.10027	0.14434	0.24958	0.45542	0.62735	0.75363	0.89659	0.92745
894	0.92237	0.70531	0.42498	0.25929	0.18563	0.17092	0.22950	0.37105	0.62856	0.79883	0.87458	0.93370	0.93043
898	0.97263	0.88324	0.64690	0.44761	0.33234	0.31062	0.38304	0.56165	0.80193	0.90358	0.94512	0.94285	0.91268
902	0.98621	0.96032	0.83726	0.66465	0.54837	0.52434	0.60901	0.77386	0.93174	0.97835	0.99482	0.98986	0.97457
906	1.00442	0.99219	0.95198	0.85970	0.77244	0.74675	0.81496	0.92562	1.00026	0.98367	0.98033	0.99679	1.00000
910	0.99537	0.99195	0.99372	0.95179	0.92820	0.90402	0.93165	0.96890	1.00697	0.99955	0.99252	1.01985	1.00000
914	0.99191	0.99417	0.99412	0.98295	0.98373	0.98188	0.98917	1.00333	1.01071	1.01070	1.00957	1.00711	1.00000
918	0.98457	0.99562	0.99669	0.98503	0.99827	1.00681	1.00197	0.99173	1.00589	1.00553	0.99979	1.02055	1.00000
922	0.99418	0.99634	1.00053	0.99357	0.99585	0.99471	0.99446	0.99445	0.99140	1.00773	0.99851	1.00699	1.00000
926	0.99618	0.99277	0.99806	0.98975	0.99523	1.00136	1.00076	0.99103	1.00028	0.99497	1.00375	1.00221	0.99497
930	0.99726	0.99617	0.99038	1.00225	1.00049	1.00432	0.99583	1.00219	0.99567	1.00132	0.99738	0.98326	0.97440
934	1.00137	0.99358	0.99645	0.99877	0.99023	0.98969	0.99532	0.99893	0.99700	0.98334	0.98559	1.00094	1.00000
938	0.99036	1.00117	0.99308	0.99592	0.99758	0.98800	0.99260	0.99320	0.99540	0.98934	0.99251	0.98326	0.97352
942	0.98432	1.00100	0.99201	0.98746	0.98933	0.98805	0.99431	0.98563	0.99973	0.99759	0.99920	0.97115	0.94709
946	0.96656	1.00025	0.99055	0.99403	0.98323	0.98656	0.99187	0.99666	1.00238	0.99667	0.98194	0.93900	0.91391
950	0.88002	0.99530	1.00197	0.99444	0.98277	0.97587	0.98822	1.00245	1.00072	0.97900	0.94508	0.82170	0.74387
954	0.70329	0.95411	0.99270	0.99296	0.98749	0.97063	0.98870	1.00449	0.99572	0.95352	0.87438	0.63190	0.48746
958	0.48279	0.86524	0.97831	0.99214	0.99075	0.97975	0.99247	0.99381	0.96906	0.87758	0.74868	0.43702	0.26990
962	0.28316	0.69517	0.92610	0.98216	0.96968	0.96887	0.98114	0.97163	0.87952	0.72479	0.55564	0.26676	0.14573
966	0.15479	0.48625	0.81757	0.93616	0.95580	0.95386	0.95305	0.91353	0.73691	0.52340	0.36800	0.16170	0.09886
970	0.07995	0.29091	0.63270	0.84578	0.89630	0.89475	0.88242	0.78893	0.52245	0.32975	0.21113	0.08496	0.06261
974	0.04257	0.15529	0.41800	0.66638	0.76773	0.77866	0.74149	0.57802	0.32459	0.18695	0.11960	0.05335	0.04508
978	0.02321	0.07943	0.23533	0.44899	0.57505	0.59489	0.54129	0.36426	0.17944	0.10267	0.06969	0.02172	0.00495
982	0.01492	0.04332	0.12348	0.25971	0.36249	0.38287	0.33201	0.20938	0.09315	0.05276	0.03278	0.01571	0.01536
986	0.00769	0.02333	0.06230	0.13423	0.20016	0.21587	0.17924	0.10698	0.04160	0.02244	0.00884	0.00474	0.01067
990	0.00589	0.01292	0.03100	0.06688	0.10054	0.10952	0.08984	0.05291	0.01966	0.01696	0.00678	0.00000	0.00140
1000	0.00189	0.00362	0.00652	0.01236	0.01747	0.02052	0.01778	0.01197	0.00000	0.00400	0.00233	0.00000	0.00000
1010	0.00105	0.00037	0.00125	0.00342	0.00302	0.00355	0.00322	0.00190	0.00000	0.00000	0.00000	0.00000	0.00000
1020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



Red Horizontal, Column 1

nm	0.5	5	10	15	20	25	30	35	40	43	45	48.5	50
750	0.00003	0.00007	0.00002	0.00005	0.00002	0.00001	0.00007	0.00005	0.00006	0.00008	0.00003	0.00014	0.00025
800	0.00162	0.00147	0.00156	0.00157	0.00115	0.00127	0.00117	0.00116	0.00150	0.00149	0.00172	0.00179	0.00170
830	0.00418	0.00496	0.00612	0.00743	0.00929	0.00939	0.00968	0.00775	0.00621	0.00655	0.00746	0.01034	0.01207
840	0.00708	0.00730	0.00897	0.01071	0.01369	0.01431	0.01531	0.01409	0.01210	0.01346	0.01658	0.02593	0.03146
850	0.00941	0.00939	0.01045	0.01141	0.01348	0.01584	0.01810	0.01873	0.02228	0.02579	0.03181	0.04599	0.05349
854	0.01069	0.01128	0.01279	0.01243	0.01448	0.01629	0.01851	0.02201	0.02828	0.03342	0.03804	0.05155	0.05944
858	0.01293	0.01456	0.01730	0.01609	0.01766	0.01861	0.02313	0.02851	0.03991	0.04439	0.04927	0.06559	0.07561
862	0.01598	0.01684	0.02080	0.01856	0.01920	0.01820	0.02728	0.03521	0.04965	0.05395	0.05992	0.08340	0.09854
866	0.02595	0.02358	0.02960	0.02539	0.02156	0.02190	0.03297	0.04561	0.06057	0.06721	0.07687	0.11062	0.13165
870	0.04443	0.03320	0.03641	0.03081	0.02549	0.02538	0.03888	0.05392	0.07264	0.08722	0.10509	0.15025	0.17502
874	0.08832	0.04981	0.04662	0.03724	0.03105	0.02957	0.04438	0.06388	0.08861	0.10717	0.13488	0.21869	0.26837

878	0.17512	0.08264	0.06344	0.04479	0.03590	0.03281	0.05075	0.07686	0.11371	0.14927	0.18947	0.34167	0.43878
882	0.33910	0.14513	0.08633	0.05959	0.04294	0.04155	0.06272	0.09507	0.15049	0.21960	0.30360	0.54766	0.69007
886	0.56854	0.27330	0.14056	0.08605	0.06288	0.05771	0.08376	0.13097	0.22720	0.35122	0.48915	0.76021	0.88793
890	0.78491	0.47265	0.23916	0.13966	0.10030	0.09242	0.12476	0.20300	0.36823	0.54066	0.68544	0.91206	0.99877
894	0.91916	0.68830	0.41701	0.24700	0.17705	0.16344	0.21285	0.33558	0.57247	0.75321	0.86693	0.96680	0.97098
898	0.96224	0.86635	0.63530	0.42892	0.31800	0.29959	0.36584	0.52932	0.78141	0.90272	0.96182	0.99315	0.97850
902	0.98558	0.94910	0.82817	0.65408	0.53574	0.50868	0.58427	0.74376	0.91941	0.98004	0.99721	0.99776	0.98649
906	0.99969	0.98423	0.93668	0.83734	0.76044	0.73469	0.79712	0.90273	0.98622	1.00557	1.00758	1.00993	1.00000
910	0.98224	0.99024	0.98491	0.94724	0.90904	0.90423	0.92974	0.97945	1.01025	1.00642	1.01073	1.00517	0.99768
914	0.97827	0.98863	0.99427	0.97758	0.97499	0.97296	0.98822	0.99933	1.00621	1.01896	1.01471	1.00789	1.00000
918	0.99172	0.99078	0.99774	0.99020	0.99508	0.99537	0.99389	1.00522	1.00614	0.99824	1.00062	1.00085	0.99942
922	0.99414	0.99286	0.99387	0.99320	0.99624	0.99179	0.99593	1.00001	1.00137	0.99671	1.00064	1.00410	1.00000
926	0.99386	0.99206	0.99591	0.98975	0.99333	1.00188	0.99312	0.99377	0.99723	0.99565	0.99467	0.99363	0.99345
930	0.99754	0.99554	0.99497	1.00088	0.99771	0.99593	0.99758	0.99521	0.99738	1.00276	0.99801	1.00031	1.00000
934	0.99888	0.99737	0.99701	0.99695	0.99548	0.99207	0.99794	0.99827	0.99223	0.99329	0.99370	0.99352	0.99309
938	0.99548	1.00307	0.99826	0.99986	0.99690	0.99794	0.99508	0.99148	0.98964	0.99020	0.99132	0.98583	0.98057
942	0.99271	1.00334	0.99443	0.99522	0.99948	0.98909	0.98957	0.99366	0.99412	0.99853	0.99355	0.96346	0.94224
946	0.96604	0.99903	1.00634	0.99477	1.00172	0.99809	0.98699	0.99047	0.99768	1.00180	0.99093	0.90097	0.83478
950	0.88755	0.99816	1.00960	0.99602	1.00217	0.98984	0.99696	0.99589	0.99500	0.98636	0.95774	0.76907	0.63422
954	0.70896	0.96443	1.00689	1.00074	1.00103	0.99964	1.00074	1.00121	0.98194	0.94428	0.86519	0.56164	0.36722
958	0.48565	0.86842	0.98956	1.00510	1.00427	0.99978	0.99572	0.99454	0.95152	0.84867	0.70322	0.36067	0.17958
962	0.28582	0.69921	0.94164	0.98650	0.99876	0.99099	0.98549	0.97034	0.86697	0.68034	0.49760	0.20490	0.09001
966	0.15832	0.49425	0.83352	0.94778	0.97612	0.97830	0.96355	0.90703	0.70350	0.47982	0.30843	0.11098	0.06629
970	0.08096	0.30073	0.65465	0.85102	0.91874	0.92225	0.89120	0.78321	0.50002	0.28842	0.17141	0.06381	0.05555
974	0.04411	0.16238	0.43478	0.67548	0.79342	0.80787	0.75670	0.58599	0.29940	0.15821	0.08991	0.03214	0.03143
978	0.02460	0.08427	0.24882	0.45921	0.59888	0.61683	0.55139	0.36824	0.16072	0.08127	0.04677	0.01587	0.01410
982	0.01341	0.04222	0.12976	0.26639	0.38034	0.40506	0.33657	0.20050	0.08172	0.04075	0.02379	0.01006	0.01039
986	0.00861	0.02209	0.06438	0.13762	0.20795	0.22408	0.17726	0.10228	0.04123	0.02062	0.01205	0.00466	0.00445
990	0.00390	0.01229	0.03455	0.06946	0.10620	0.11629	0.09078	0.04926	0.01904	0.01009	0.00616	0.00148	0.00032
1000	0.00202	0.00345	0.00718	0.01272	0.02041	0.02230	0.01653	0.00950	0.00390	0.00218	0.00000	0.00074	0.00284
1010	0.00043	0.00112	0.00161	0.00316	0.00408	0.00406	0.00353	0.00144	0.00031	0.00039	0.00000	0.00086	0.00182
1020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Appendix 32 - Solar Aureole Absolute Responsivity Map 'M' Coefficients

These are the Absolute Responsivity Pixel Map coefficients

Blue Horizontal...

Blue Horizontal M0 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	1.1166E-01	1.7616E+00	7.9401E-01	1.1149E+00	1.3307E+00	1.3400E+00
1	-7.5696E-01	9.2418E-01	1.0640E+00	-1.7179E-01	7.5688E-01	8.5097E-01
2	-2.4384E-01	1.6625E+00	8.0596E-01	8.5711E-01	-2.5769E-01	6.7213E-01
3	-4.9241E-01	1.1152E+00	1.6209E+00	7.6384E-01	6.7513E-01	-2.3701E-01
4	-2.5292E-01	8.8523E-01	5.2151E-01	-1.1844E-02	1.9744E-01	-5.2066E-01
5	-7.8787E-01	2.0848E+00	2.0217E+00	1.2669E+00	8.6140E-01	1.7763E+00
6	-9.1825E-01	1.1402E+00	5.3121E-01	1.0620E+00	4.3546E-01	1.2913E+00
7	-4.2870E-01	6.1545E-01	9.3151E-01	5.7191E-01	3.8705E-01	4.0442E+00
8	-3.0931E-01	8.1131E-01	1.3284E-01	4.8408E-01	-7.8313E-02	1.2489E+00
9	-1.2811E-01	2.2464E+00	1.7642E-01	9.1922E-01	2.2497E+00	1.3527E+00
10	3.8187E-01	2.6040E-01	9.5700E-01	7.6975E-01	1.7055E+00	1.4946E+00
11	3.8671E-01	1.1621E+00	2.0299E+00	2.6966E-01	1.1010E+00	1.0558E+00
12	-6.6516E-01	1.3018E+00	1.3426E+00	4.4531E-01	1.1134E+00	9.3739E-01
13	-1.5880E+00	1.1934E+00	-2.3538E-01	7.8043E-01	1.5155E+00	1.7286E+00
14	2.2255E-01	1.0313E+00	7.8329E-01	8.8881E-01	1.3679E+00	1.2901E+00
15	-2.0752E+00	1.7221E+00	1.6011E+00	1.5083E+00	8.2922E-02	6.7178E-01
16	1.5466E-03	8.0109E-01	3.7826E-01	1.0045E+00	1.8424E-02	7.9481E-01
17	-4.0204E-01	2.2466E+00	7.7891E-01	1.7688E+00	2.1508E+00	1.4477E+00
18	-6.3321E-01	2.0161E+00	2.0353E+00	-4.4739E-01	1.0919E+00	2.0834E+00
19	-1.7273E-01	4.4216E-01	1.7553E+00	1.3221E+00	6.1320E-01	3.0729E+00
20	-5.9201E-01	6.7709E-01	4.2782E-02	8.1270E-01	1.2984E+00	2.4481E+00
21	-1.2843E+00	4.3407E-01	1.6173E+00	1.0955E+00	5.0758E-01	2.3928E+00
22	-2.5004E-01	1.9132E+00	1.1400E+00	1.0722E+00	1.2041E+00	2.2428E+00
23	-6.8900E-01	1.8571E+00	9.2271E-01	5.7453E-01	1.2784E+00	1.9764E+00
24	5.8083E-02	9.0416E-01	2.4141E-01	4.2847E-01	7.5785E-01	-1.7735E-01
25	-2.5903E-01	1.5395E+00	9.1146E-01	-1.2329E-02	6.0144E-01	4.6544E-01
26	-1.1976E+00	1.3672E+00	1.2115E+00	8.0978E-01	2.0603E+00	6.4939E-01
27	-1.3407E+00	1.1122E+00	2.1010E+00	1.2488E-01	5.1136E-01	1.2736E+00
28	-7.0200E-01	2.1341E+00	1.3297E+00	1.0584E+00	1.2167E+00	1.1554E+00
29	-9.3273E-01	1.1097E+00	3.7373E-01	1.1269E+00	8.1235E-01	5.0595E-01
30	-3.3603E-01	1.1955E+00	5.5354E-01	1.6822E+00	3.5890E-01	1.2763E+00
31	-5.7847E-01	8.2567E-01	9.4048E-01	2.7228E+00	7.6499E-01	2.2712E+00
32	-2.2496E-01	1.5030E+00	6.7883E-01	1.5310E+00	1.9143E+00	9.8104E-01
33	-8.6737E-01	1.0228E+00	9.6827E-01	2.1472E-01	1.6789E+00	8.8908E-01
34	-1.1899E+00	1.4994E+00	8.8021E-01	1.4869E+00	1.4761E+00	1.2916E+00
35	3.8611E-02	1.1080E+00	1.3348E-01	1.5578E+00	4.1910E-01	1.7963E+00
36	-1.6060E+00	1.0537E+00	1.8787E+00	7.7370E-01	1.2306E+00	5.0730E-01
37	-1.3219E+00	1.3873E+00	5.5234E-01	5.8094E-01	8.0474E-01	3.6581E-01
38	-1.3429E+00	1.3063E+00	1.7789E-01	1.8920E+00	1.1419E+00	7.2597E-01
39	-1.1644E+00	1.2608E+00	1.7653E-01	2.4158E-01	1.2606E+00	1.0316E+00

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
40	-1.4542E+00	3.4700E-02	1.7146E+00	7.0580E-01	-2.7048E-01	5.0655E-01
41	-9.9240E-01	1.4130E+00	7.0278E-01	1.2750E+00	9.1214E-01	2.0931E-02
42	-1.6187E+00	3.9687E-01	1.0292E+00	-2.2273E-01	1.8472E+00	6.4474E-01
43	-4.4228E-01	1.0542E-01	8.0585E-01	1.3174E+00	5.6709E-01	1.5892E+00
44	-1.4223E+00	1.4074E+00	7.9453E-01	6.6590E-02	1.0756E+00	6.7484E-01
45	-9.6768E-01	2.7033E-01	1.5829E+00	-1.4718E-01	1.2837E+00	2.8820E-01
46	-1.3353E+00	8.9364E-01	4.3270E-01	9.0728E-02	1.8479E+00	1.9303E+00
47	-5.6086E-01	1.5129E+00	3.1698E-01	-5.9463E-01	2.1763E-02	7.6647E-01
48	-6.0706E-01	2.1768E+00	5.3820E-01	3.2366E-01	2.3189E+00	5.1398E-02
49	-8.2334E-01	9.8517E-02	8.4011E-01	5.8328E-01	8.9229E-01	-1.5822E-01

Blue Horizontal M1 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	3.0210E-03	-1.5680E-02	-3.5010E-03	-6.9014E-03	-1.0956E-02	-1.2549E-02
1	1.6804E-02	-3.5038E-04	-2.0556E-03	1.4978E-02	2.3256E-03	8.1365E-04
2	9.8456E-03	-9.9336E-03	1.1356E-03	6.2618E-04	1.6266E-02	3.1625E-03
3	1.4979E-02	-3.9565E-03	-9.2219E-03	2.5110E-03	3.8170E-03	1.7141E-02
4	1.1633E-02	2.8167E-04	5.3809E-03	1.3099E-02	1.0697E-02	2.3288E-02
5	1.8500E-02	-1.6188E-02	-1.4334E-02	-4.4263E-03	1.2568E-03	-7.5017E-03
6	2.0518E-02	-4.6208E-03	6.0655E-03	-1.3905E-03	7.2632E-03	-1.5665E-03
7	1.3363E-02	4.6167E-03	-5.0180E-04	5.4671E-03	9.0832E-03	-4.0118E-02
8	1.3745E-02	2.3419E-03	1.1554E-02	7.0283E-03	1.4398E-02	-3.0877E-03
9	1.1277E-02	-1.8196E-02	1.1637E-02	1.6949E-03	-1.6000E-02	-4.6404E-03
10	4.5917E-03	9.0194E-03	5.5804E-04	3.5761E-03	-8.7946E-03	-5.7229E-03
11	5.0057E-03	-2.4659E-03	-1.3829E-02	1.1295E-02	3.5670E-04	-2.1642E-04
12	1.8551E-02	-4.5147E-03	-3.7595E-03	8.5486E-03	-7.5639E-04	1.3327E-03
13	3.1679E-02	-2.6337E-03	1.7567E-02	4.1944E-03	-4.9597E-03	-9.6124E-03
14	4.1551E-03	1.9675E-04	2.4066E-03	1.6181E-03	-3.6497E-03	-2.2994E-03
15	3.7014E-02	-9.6961E-03	-7.2094E-03	-6.9012E-03	1.2060E-02	9.2923E-03
16	8.3247E-03	3.3822E-03	1.0499E-02	1.3867E-03	1.5054E-02	8.6272E-03
17	1.4920E-02	-1.7146E-02	3.8158E-03	-9.0572E-03	-1.4566E-02	-9.6435E-04
18	1.7448E-02	-1.2142E-02	-1.3411E-02	2.0556E-02	7.0911E-05	-1.1827E-02
19	1.1586E-02	8.5939E-03	-8.8076E-03	-2.7656E-03	6.8642E-03	-2.4975E-02
20	1.5306E-02	4.8671E-03	1.3565E-02	4.1982E-03	-1.7706E-03	-1.6872E-02
21	2.1849E-02	7.0172E-03	-7.8561E-03	-1.0685E-04	7.8730E-03	-1.5268E-02
22	1.1110E-02	-1.1897E-02	-1.1918E-03	5.7261E-04	-1.4405E-03	-1.0230E-02
23	1.8366E-02	-1.1780E-02	1.9571E-03	7.3298E-03	-1.4105E-03	-6.6403E-03
24	8.1799E-03	2.5622E-03	1.1185E-02	9.5101E-03	4.6827E-03	2.0323E-02
25	1.1294E-02	-6.8803E-03	2.1455E-03	1.4580E-02	7.3811E-03	9.1470E-03
26	2.5058E-02	-4.3265E-03	-1.3802E-03	3.1234E-03	-1.2306E-02	7.2302E-03
27	2.5824E-02	-1.6073E-03	-1.3508E-02	1.3150E-02	8.3379E-03	-2.3835E-03
28	1.5903E-02	-1.5551E-02	-3.9602E-03	-3.2638E-04	-7.5964E-04	-2.7364E-04
29	1.8138E-02	-1.4858E-03	9.5642E-03	-2.9600E-05	4.0204E-03	8.2936E-03
30	1.1527E-02	-2.5765E-03	6.1470E-03	-8.0680E-03	9.8095E-03	-2.3060E-03
31	1.5153E-02	1.8337E-03	9.2789E-04	-2.2361E-02	4.3242E-03	-1.6838E-02
32	1.1055E-02	-6.3542E-03	4.9123E-03	-6.7670E-03	-1.1672E-02	6.8811E-04
33	1.9166E-02	-5.7738E-04	1.3364E-04	1.1181E-02	-8.4027E-03	2.3504E-03

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
34	2.1904E-02	-7.0538E-03	1.3404E-03	-6.7745E-03	-5.4721E-03	-2.6622E-03
35	5.5519E-03	-2.5348E-03	1.1415E-02	-8.2122E-03	7.5341E-03	-9.8641E-03
36	2.5708E-02	-2.1882E-03	-1.2129E-02	2.9956E-03	-3.3797E-03	6.6322E-03
37	2.2555E-02	-5.9053E-03	5.8413E-03	4.1767E-03	2.9160E-03	9.1904E-03
38	2.2471E-02	-5.2982E-03	1.0881E-02	-1.1424E-02	-2.1412E-03	3.3554E-03
39	1.8798E-02	-4.7236E-03	9.9017E-03	1.0199E-02	-3.4191E-03	-5.9656E-04
40	2.2579E-02	1.2918E-02	-1.0434E-02	2.7433E-03	1.7146E-02	6.4087E-03
41	1.5471E-02	-6.6394E-03	2.4757E-03	-5.2057E-03	5.5120E-04	1.2973E-02
42	2.2801E-02	6.5149E-03	-1.1219E-03	1.5254E-02	-1.1767E-02	4.3556E-03
43	5.1332E-03	9.3421E-03	1.0956E-03	-6.4626E-03	4.9396E-03	-8.7238E-03
44	1.9649E-02	-6.7237E-03	1.2515E-03	1.2292E-02	-2.3450E-03	3.1300E-03
45	1.3285E-02	7.1279E-03	-9.4099E-03	1.4414E-02	-4.4528E-03	8.3747E-03
46	1.7819E-02	-1.5634E-05	5.7954E-03	1.0725E-02	-1.2521E-02	-1.3883E-02
47	6.8862E-03	-9.5706E-03	6.9675E-03	1.9829E-02	1.1170E-02	1.6460E-03
48	6.8950E-03	-1.9021E-02	4.3805E-03	7.3348E-03	-2.0684E-02	9.7858E-03
49	9.7180E-03	9.0092E-03	-3.3279E-04	3.7203E-03	-2.4084E-03	1.0492E-02

Blue Horizontal M2 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	-1.0324E-05	6.2945E-05	1.1101E-05	2.2924E-05	4.1982E-05	5.4872E-05
1	-6.0516E-05	8.9238E-07	1.0736E-05	-6.5983E-05	-7.6803E-06	1.9667E-06
2	-2.8771E-05	4.3631E-05	-2.7193E-06	2.1634E-07	-7.0490E-05	-7.8045E-06
3	-5.8084E-05	2.3001E-05	4.0236E-05	-1.0388E-05	-1.6238E-05	-7.5855E-05
4	-4.1237E-05	6.8419E-07	-2.2859E-05	-5.6320E-05	-4.6699E-05	-1.1857E-04
5	-6.9153E-05	7.4957E-05	6.4047E-05	2.3102E-05	-2.8099E-06	6.4662E-06
6	-8.0064E-05	2.5467E-05	-2.5985E-05	9.3981E-06	-2.8677E-05	-2.7035E-05
7	-4.9088E-05	-2.2273E-05	6.3515E-06	-2.1699E-05	-4.2779E-05	1.6228E-04
8	-5.2897E-05	-9.4595E-06	-4.8619E-05	-2.9647E-05	-5.9897E-05	1.6723E-05
9	-3.9465E-05	8.4210E-05	-5.0732E-05	-7.1852E-06	7.0958E-05	2.6336E-05
10	-1.0491E-05	-3.7747E-05	1.3679E-07	-1.3678E-05	3.9803E-05	2.7335E-05
11	-1.4105E-05	1.4157E-05	6.3324E-05	-5.1854E-05	-3.9121E-06	5.6722E-06
12	-7.2211E-05	2.3586E-05	1.6842E-05	-3.7042E-05	5.9959E-06	-6.1182E-07
13	-1.3247E-04	1.3294E-05	-7.7784E-05	-1.8467E-05	1.8470E-05	4.7693E-05
14	-2.4219E-06	-3.5349E-06	-9.1146E-06	-3.9954E-06	1.5811E-05	9.7441E-06
15	-1.5295E-04	4.4624E-05	3.1476E-05	3.6310E-05	-4.7519E-05	-5.9800E-05
16	-2.1559E-05	-1.5279E-05	-5.0462E-05	-5.2590E-06	-6.6641E-05	-6.7747E-05
17	-5.5190E-05	7.9769E-05	-1.4353E-05	4.1450E-05	6.8342E-05	-2.9829E-05
18	-6.3658E-05	5.1821E-05	6.2535E-05	-8.7669E-05	1.9080E-06	2.1258E-05
19	-3.9124E-05	-3.8525E-05	3.8535E-05	1.1982E-05	-2.7562E-05	7.5421E-05
20	-5.2174E-05	-1.8596E-05	-5.5225E-05	-1.7495E-05	8.1132E-06	4.2230E-05
21	-7.5800E-05	-2.6042E-05	3.8380E-05	1.7299E-06	-3.2204E-05	3.6665E-05
22	-3.7425E-05	5.4408E-05	7.5830E-06	-1.2958E-06	9.9819E-06	1.0502E-05
23	-6.6863E-05	5.5754E-05	-6.6014E-06	-3.1056E-05	4.7892E-06	6.3868E-06
24	-2.2574E-05	-1.3780E-05	-4.7356E-05	-4.2804E-05	-1.7873E-05	-9.7999E-05
25	-3.3563E-05	3.1617E-05	-8.3032E-06	-6.1381E-05	-3.3249E-05	-3.7041E-05
26	-9.8862E-05	2.0438E-05	3.1875E-06	-9.0178E-06	5.2248E-05	-3.2774E-05
27	-9.9368E-05	9.3012E-06	5.7842E-05	-5.7668E-05	-3.6633E-05	9.5950E-06

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
28	-5.3663E-05	6.9988E-05	1.9225E-05	4.3380E-06	1.9250E-06	1.9239E-06
29	-6.2848E-05	8.0866E-06	-4.3190E-05	-2.4014E-06	-1.7491E-05	-3.4964E-05
30	-3.4306E-05	1.2806E-05	-2.4906E-05	3.6842E-05	-4.2836E-05	1.1390E-05
31	-5.2217E-05	-4.6648E-06	-2.0281E-06	1.0026E-04	-1.7954E-05	7.9821E-05
32	-3.6269E-05	2.7198E-05	-2.1551E-05	3.1665E-05	5.4394E-05	1.8388E-06
33	-7.0710E-05	4.4162E-06	2.3579E-06	-4.8126E-05	3.9936E-05	-7.2269E-06
34	-7.9162E-05	3.2352E-05	-4.7582E-06	3.3265E-05	2.6153E-05	1.2140E-05
35	-9.4690E-06	1.4891E-05	-5.0234E-05	3.9936E-05	-2.8151E-05	4.2476E-05
36	-9.6469E-05	1.2811E-05	5.4309E-05	-1.2515E-05	1.6263E-05	-2.5341E-05
37	-8.2416E-05	2.6466E-05	-2.5500E-05	-1.3510E-05	-1.1348E-05	-3.9956E-05
38	-8.1722E-05	2.6089E-05	-4.7221E-05	4.8933E-05	1.2739E-05	-1.2941E-05
39	-6.2291E-05	2.3010E-05	-4.1060E-05	-4.4534E-05	1.6530E-05	4.8516E-06
40	-8.1343E-05	-6.0661E-05	4.5747E-05	-9.1281E-06	-7.6380E-05	-2.7302E-05
41	-4.8674E-05	2.9680E-05	-7.7235E-06	2.7703E-05	-1.5096E-06	-5.6532E-05
42	-8.0648E-05	-2.7690E-05	5.0163E-06	-6.4145E-05	5.1719E-05	-1.7214E-05
43	-4.5431E-06	-3.8184E-05	-3.5692E-06	2.9491E-05	-2.1846E-05	3.9601E-05
44	-6.8369E-05	2.9915E-05	-3.1410E-06	-5.5944E-05	1.3618E-05	-9.7550E-06
45	-3.9911E-05	-2.6081E-05	4.3430E-05	-6.2712E-05	1.9764E-05	-3.4486E-05
46	-6.0466E-05	-8.6278E-07	-2.4020E-05	-4.5501E-05	5.6474E-05	6.4064E-05
47	-1.2646E-05	4.5357E-05	-2.8186E-05	-8.6682E-05	-4.6372E-05	-7.8245E-06
48	-1.3419E-05	8.8228E-05	-1.8506E-05	-3.2441E-05	9.4857E-05	-4.1822E-05
49	-2.8983E-05	-3.7197E-05	3.3078E-06	-1.9383E-05	1.2196E-05	-4.5878E-05

Blue Horizontal M3 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	8.6412E-09	-8.9110E-08	-1.4944E-08	-2.8110E-08	-5.6952E-08	-8.3198E-08
1	7.3154E-08	-7.6031E-10	-1.9872E-08	9.3992E-08	5.0781E-09	-1.6852E-08
2	2.7254E-08	-6.2538E-08	2.0678E-09	-3.4526E-09	1.0182E-07	1.1669E-10
3	7.8578E-08	-3.9984E-08	-5.5921E-08	1.5078E-08	2.4149E-08	1.0588E-07
4	5.1051E-08	-2.6754E-09	3.3292E-08	8.0237E-08	6.8199E-08	1.8456E-07
5	8.7912E-08	-1.1200E-07	-9.3291E-08	-3.6742E-08	1.2757E-09	1.6933E-08
6	1.0488E-07	-4.0021E-08	3.6821E-08	-1.6925E-08	3.7337E-08	7.8722E-08
7	6.4175E-08	3.6680E-08	-1.3382E-08	2.8816E-08	6.6826E-08	-2.1844E-07
8	7.0670E-08	1.3094E-08	6.7666E-08	4.1961E-08	8.3393E-08	-3.0567E-08
9	4.7251E-08	-1.2522E-07	7.2535E-08	1.1250E-08	-1.0155E-07	-4.8429E-08
10	5.4517E-09	5.1838E-08	-2.6046E-09	1.7287E-08	-5.7458E-08	-4.3703E-08
11	1.3929E-08	-2.4545E-08	-9.3503E-08	7.9513E-08	1.0683E-08	-1.5501E-08
12	9.6497E-08	-3.7776E-08	-2.4431E-08	5.4070E-08	-1.1003E-08	-7.7869E-09
13	1.8748E-07	-1.9750E-08	1.1441E-07	2.7539E-08	-2.0566E-08	-7.7496E-08
14	-1.0524E-08	9.8848E-09	1.3712E-08	3.4763E-09	-2.1555E-08	-1.8219E-08
15	2.1256E-07	-6.6477E-08	-4.4486E-08	-6.0753E-08	6.3045E-08	1.0352E-07
16	1.6174E-08	2.3977E-08	7.8677E-08	7.4892E-09	9.8288E-08	1.2715E-07
17	7.1006E-08	-1.1979E-07	1.8174E-08	-6.0882E-08	-1.0372E-07	7.5704E-08
18	8.0310E-08	-7.1739E-08	-9.3301E-08	1.2345E-07	-5.4727E-09	-2.1923E-09
19	4.6569E-08	5.8243E-08	-5.3680E-08	-1.5004E-08	3.5969E-08	-7.4484E-08
20	6.4060E-08	2.4153E-08	7.3865E-08	2.4479E-08	-1.2171E-08	-3.0897E-08
21	9.3903E-08	3.2927E-08	-5.9069E-08	-2.4039E-09	4.4119E-08	-2.7304E-08

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
22	4.5228E-08	-8.0844E-08	-1.3022E-08	8.7584E-11	-1.9147E-08	1.3423E-08
23	8.2027E-08	-8.3768E-08	8.0660E-09	4.3811E-08	-3.1735E-09	3.7487E-09
24	2.0982E-08	2.4812E-08	6.7023E-08	6.4787E-08	2.3431E-08	1.3884E-07
25	3.4268E-08	-4.6060E-08	1.2047E-08	8.6058E-08	5.0961E-08	4.2570E-08
26	1.3444E-07	-3.0917E-08	1.3899E-09	7.9857E-09	-7.1354E-08	4.6979E-08
27	1.3198E-07	-1.5066E-08	-8.0398E-08	8.4945E-08	5.4165E-08	-9.7128E-09
28	6.4675E-08	-1.0113E-07	-2.8809E-08	-9.2379E-09	-1.1663E-10	-2.6582E-09
29	7.6949E-08	-1.2710E-08	6.4892E-08	7.5462E-09	2.6600E-08	4.9581E-08
30	3.4446E-08	-1.9650E-08	3.4629E-08	-5.4352E-08	6.4014E-08	-1.5717E-08
31	6.2931E-08	3.1137E-09	1.8303E-09	-1.4607E-07	2.6074E-08	-1.2161E-07
32	4.1381E-08	-3.7917E-08	3.2523E-08	-4.6026E-08	-8.1687E-08	-8.3694E-09
33	9.0487E-08	-7.8470E-09	-6.4327E-09	6.9583E-08	-6.0286E-08	7.4690E-09
34	9.9277E-08	-4.7455E-08	6.7844E-09	-5.1010E-08	-3.9518E-08	-1.6081E-08
35	9.9104E-10	-2.5698E-08	7.2865E-08	-6.0895E-08	3.5538E-08	-5.8482E-08
36	1.2697E-07	-2.1823E-08	-7.9118E-08	1.8004E-08	-2.2632E-08	2.9949E-08
37	1.0519E-07	-3.7104E-08	3.7385E-08	1.5696E-08	1.5853E-08	5.9363E-08
38	1.0417E-07	-4.0145E-08	6.7723E-08	-6.8053E-08	-2.1829E-08	1.9163E-08
39	7.2328E-08	-3.5296E-08	5.7586E-08	6.4993E-08	-2.4736E-08	-8.7398E-09
40	1.0306E-07	9.4343E-08	-6.4305E-08	1.1096E-08	1.1306E-07	4.0623E-08
41	5.4682E-08	-4.2487E-08	8.3526E-09	-4.5275E-08	2.5663E-09	8.2348E-08
42	1.0223E-07	4.0933E-08	-5.7022E-09	8.9831E-08	-7.2431E-08	2.3564E-08
43	-3.7692E-09	5.4096E-08	4.3618E-09	-4.2790E-08	3.4782E-08	-5.7316E-08
44	8.5769E-08	-4.2883E-08	2.1004E-09	8.3648E-08	-2.2510E-08	1.0010E-08
45	4.4472E-08	3.1804E-08	-6.3804E-08	9.0968E-08	-2.6910E-08	4.8419E-08
46	7.5134E-08	4.2101E-09	3.4518E-08	6.5070E-08	-8.2344E-08	-9.5465E-08
47	6.1380E-09	-6.8406E-08	3.8944E-08	1.2644E-07	6.5516E-08	1.4711E-08
48	8.6066E-09	-1.3143E-07	2.7043E-08	4.8574E-08	-1.4052E-07	6.0933E-08
49	3.5168E-08	5.2506E-08	-5.6069E-09	3.3327E-08	-1.9076E-08	6.7826E-08

Blue Vertical...

Blue Vertical M0 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	3.4265E-01	8.1702E-01	5.1103E-01	7.1696E-01	6.8309E-01	7.1961E-01
1	-6.9944E-05	1.9027E-01	1.3127E+00	1.4864E+00	6.8964E-01	1.2130E+00
2	-7.6297E-01	1.1357E+00	7.3321E-01	6.1583E-01	1.3146E+00	8.4157E-01
3	-1.8893E+00	5.9644E-01	1.5927E+00	1.6617E+00	6.7200E-01	6.2445E-01
4	-9.5761E-01	-8.6244E-02	1.0868E+00	1.4341E+00	1.8799E-01	3.5085E-01
5	-1.2565E+00	1.7808E+00	7.8126E-01	3.9293E-01	1.1798E+00	1.0149E+00
6	-2.2710E+00	3.1469E-01	4.6699E-01	5.4673E-01	6.1278E-01	1.9033E+00
7	-1.1184E+00	-9.1791E-02	1.1510E+00	7.5504E-01	9.9360E-01	1.1463E-01
8	-9.3046E-01	1.7170E+00	1.4080E+00	9.0712E-01	1.1186E+00	1.4161E+00
9	-1.2159E+00	2.0349E+00	1.0790E+00	1.1525E+00	1.6118E+00	4.2950E-01
10	-1.3485E+00	1.3182E+00	2.2440E+00	-9.6466E-02	2.8164E+00	1.9334E+00
11	-1.6116E+00	2.6125E-01	2.6709E-01	1.6695E+00	1.6899E+00	6.7946E-01
12	-3.5140E+00	2.4353E+00	8.8660E-01	8.6123E-01	1.1507E+00	1.3590E+00
13	-2.3694E+00	1.1981E+00	9.9047E-01	2.9540E-01	6.5939E-01	1.3408E+00
14	-1.1982E+00	-2.2060E-02	2.1958E+00	9.2633E-01	-1.0121E+00	9.9898E-01
15	-1.8482E+00	1.3449E+00	8.8776E-01	9.1687E-01	2.7715E-01	7.5436E-01
16	-2.1475E+00	1.0559E+00	1.5209E+00	2.4782E-01	7.4547E-01	1.2363E+00
17	-1.1531E+00	6.3334E-01	5.7554E-01	1.4945E+00	-1.3211E-01	1.8347E+00
18	-1.6525E+00	1.3360E+00	-3.3356E-01	7.3143E-01	1.2205E+00	2.1820E+00
19	-1.5074E+00	1.0949E+00	3.5027E-01	2.2215E+00	6.1283E-01	1.9809E+00
20	-2.2129E+00	1.5978E+00	1.4724E-01	1.8753E+00	1.9099E-02	1.2886E+00
21	-9.3383E-01	1.4600E+00	1.7751E+00	2.5621E-01	1.1642E+00	1.6528E+00
22	-2.6836E+00	1.4364E+00	7.0443E-01	1.6934E+00	3.4293E-01	6.4235E-01
23	-2.4864E+00	1.0347E+00	9.9022E-01	-3.2472E-01	1.3547E+00	1.2011E+00
24	-1.7833E+00	1.0582E+00	8.0737E-03	5.5341E-01	1.6349E+00	2.1415E+00
25	-2.0045E+00	7.4342E-01	1.2753E+00	2.6082E-01	1.5913E+00	2.2713E+00
26	-1.9858E+00	1.7580E+00	2.3316E+00	-8.9514E-02	2.1298E+00	9.2821E-01
27	-2.2628E+00	2.2897E+00	1.4737E+00	7.9899E-01	6.2373E-01	5.6613E-01
28	-2.2126E+00	1.2794E+00	-2.9592E-02	9.0541E-01	3.7674E-02	1.5650E+00
29	-1.0355E+00	1.2070E+00	7.0073E-01	2.6268E-01	-3.4980E-01	-4.1955E-01
30	-2.6880E+00	6.2475E-01	1.7202E+00	-4.8636E-01	9.8348E-01	2.0661E+00
31	-2.2595E+00	1.7891E+00	1.7420E+00	2.0968E+00	1.5704E-01	1.1764E+00
32	-3.3473E+00	9.3182E-01	5.8453E-01	1.9078E+00	2.0172E+00	1.3381E+00
33	-1.9743E+00	5.6096E-01	1.5492E+00	-1.1604E-01	1.9820E+00	1.2788E+00
34	-2.8312E+00	4.9281E-01	3.2565E-01	1.5901E+00	7.6121E-01	1.5403E+00
35	-2.2985E+00	3.8865E-01	4.7221E-01	1.0034E+00	1.7781E+00	2.9876E-01
36	-2.7255E-01	2.4554E+00	2.0206E+00	4.7079E-01	2.1748E+00	4.0420E-01
37	-1.0757E+00	-9.8177E-01	2.0920E+00	6.0405E-02	8.1371E-01	1.9706E+00
38	-8.2739E-01	8.5971E-01	1.0500E+00	2.0043E+00	1.6543E+00	5.9556E-01
39	-4.8301E-01	3.6756E-01	7.1407E-01	-1.3911E-01	1.1986E+00	1.0382E+00
40	-2.0026E+00	1.2209E+00	1.5816E+00	1.3685E+00	9.6205E-01	1.4368E+00
41	-8.7799E-01	2.6045E+00	-3.9946E-01	1.6154E+00	1.1497E+00	4.7897E-01
42	-9.2342E-01	8.6782E-01	4.2635E-01	1.0771E+00	1.4626E+00	1.0565E+00
43	-8.8570E-01	2.0827E+00	1.9412E+00	1.4877E+00	-9.5790E-01	1.3838E+00

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
44	-5.3332E-02	6.9148E-01	3.9178E-01	9.0819E-01	8.6628E-01	1.1056E+00
45	-1.6408E+00	2.2979E+00	1.0521E+00	8.2297E-02	1.2231E+00	1.4577E+00
46	-2.0337E-01	-8.9947E-02	9.5658E-01	1.2051E+00	2.8959E-01	1.5893E+00
47	-6.3727E-01	1.1415E+00	-5.6002E-01	1.6034E+00	8.3301E-01	1.3424E+00
48	-1.4442E+00	-3.1431E-01	2.3406E+00	-5.1817E-02	5.8150E-01	2.0142E+00
49	-9.5054E-01	-5.0154E-02	1.7320E-01	1.1080E+00	7.6622E-01	4.6457E-02

Blue Vertical M1 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	-4.4503E-03	-8.0328E-03	-3.3095E-03	-5.5459E-03	-6.3449E-03	-7.3684E-03
1	-1.3489E-03	9.7238E-03	-4.6847E-03	-7.4310E-03	2.5221E-03	-5.5166E-03
2	9.6847E-03	-2.6978E-03	2.5953E-03	4.9206E-03	-5.3388E-03	6.3933E-04
3	2.5072E-02	4.8330E-03	-7.7885E-03	-9.7898E-03	3.6481E-03	2.9347E-03
4	1.2367E-02	1.5185E-02	-5.5142E-04	-5.4469E-03	8.9910E-03	7.0757E-03
5	1.5148E-02	-1.0295E-02	3.3526E-03	7.9073E-03	-3.5080E-03	-7.6032E-04
6	3.0355E-02	1.0077E-02	7.2282E-03	5.1230E-03	4.3853E-03	-1.3966E-02
7	1.3455E-02	1.3274E-02	-1.4181E-03	2.5809E-03	-5.0919E-04	1.0351E-02
8	1.3551E-02	-9.8307E-03	-4.2185E-03	2.1372E-03	-1.8029E-03	-7.1485E-03
9	1.7353E-02	-1.2880E-02	-6.6998E-04	-2.3601E-03	-8.1570E-03	6.6893E-03
10	1.9787E-02	-2.8409E-03	-1.5432E-02	1.4961E-02	-2.4001E-02	-1.3644E-02
11	2.3328E-02	1.2534E-02	1.1841E-02	-8.0995E-03	-9.1364E-03	3.9878E-03
12	4.8473E-02	-1.8611E-02	3.0595E-03	3.8820E-03	-2.1939E-03	-5.0633E-03
13	3.1349E-02	-6.3747E-04	9.3526E-04	1.1100E-02	5.0433E-03	-5.3836E-03
14	1.5522E-02	1.5478E-02	-1.5395E-02	1.9082E-03	2.7693E-02	-8.5863E-04
15	2.7337E-02	-2.7171E-03	1.9761E-03	2.2481E-03	9.8740E-03	2.3680E-03
16	2.9311E-02	1.0961E-03	-4.4845E-03	1.1212E-02	4.0303E-03	-3.5266E-03
17	1.8707E-02	6.6342E-03	7.3893E-03	-5.0280E-03	1.5628E-02	-1.1991E-02
18	2.6708E-02	-2.9643E-03	1.9587E-02	5.0907E-03	-2.5611E-03	-1.5924E-02
19	2.4078E-02	8.6274E-04	1.0633E-02	-1.6127E-02	6.4241E-03	-1.5023E-02
20	3.1072E-02	-6.0573E-03	1.3100E-02	-1.0754E-02	1.4164E-02	-4.0600E-03
21	9.9448E-03	-5.0004E-03	-9.1113E-03	1.0894E-02	-1.2241E-03	-9.5188E-03
22	3.6196E-02	-3.0289E-03	5.5052E-03	-7.5355E-03	9.9617E-03	3.8808E-03
23	3.3811E-02	2.0120E-03	1.7978E-03	1.9147E-02	-4.1683E-03	-3.5686E-03
24	2.3199E-02	1.2854E-03	1.4695E-02	6.9620E-03	-8.0105E-03	-1.5555E-02
25	2.7277E-02	4.6328E-03	-2.0548E-03	1.2039E-02	-6.7433E-03	-1.7961E-02
26	2.8070E-02	-7.4211E-03	-1.6301E-02	1.6047E-02	-1.5063E-02	9.5313E-04
27	3.5726E-02	-1.5464E-02	-4.6560E-03	3.9497E-03	6.2257E-03	5.4480E-03
28	3.5037E-02	-1.8713E-03	1.5244E-02	2.8179E-03	1.3467E-02	-8.3671E-03
29	1.5341E-02	-1.6173E-03	6.3350E-03	1.0997E-02	1.9659E-02	1.9041E-02
30	3.8180E-02	7.2304E-03	-7.7092E-03	2.1074E-02	1.3471E-03	-1.5208E-02
31	3.7940E-02	-8.7677E-03	-8.2916E-03	-1.3981E-02	1.2084E-02	-3.6343E-03
32	4.9546E-02	2.4442E-03	7.5246E-03	-1.1004E-02	-1.3688E-02	-5.0843E-03
33	3.1536E-02	7.5524E-03	-6.1518E-03	1.6501E-02	-1.2692E-02	-4.5094E-03
34	3.6749E-02	8.1834E-03	1.0086E-02	-7.3377E-03	3.5875E-03	-8.5133E-03
35	3.5943E-02	9.9405E-03	8.3243E-03	-8.7117E-06	-1.0307E-02	8.4484E-03
36	7.4296E-03	-1.8074E-02	-1.1570E-02	6.3693E-03	-1.5657E-02	5.8115E-03
37	2.0718E-02	2.7761E-02	-1.4048E-02	1.3553E-02	3.2544E-03	-1.4265E-02

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
38	2.0450E-02	3.6650E-03	-6.7289E-05	-1.3018E-02	-9.0174E-03	4.7115E-03
39	1.5188E-02	9.9124E-03	5.9471E-03	1.5684E-02	-2.3063E-03	-1.5375E-03
40	3.7179E-02	-1.8873E-03	-7.2047E-03	-4.6048E-03	7.8618E-04	-7.0629E-03
41	2.0146E-02	-2.1264E-02	1.9535E-02	-7.9041E-03	-1.6406E-03	4.9285E-03
42	1.7615E-02	2.0723E-03	8.0018E-03	-7.9004E-04	-6.2056E-03	-2.1889E-03
43	1.6365E-02	-1.4744E-02	-1.3526E-02	-6.7139E-03	2.5602E-02	-7.6798E-03
44	8.8974E-03	5.2238E-03	8.7037E-03	6.2466E-04	6.7383E-05	-3.3389E-03
45	2.9121E-02	-1.7727E-02	-9.2664E-04	1.1774E-02	-4.2720E-03	-8.6642E-03
46	8.2078E-03	1.4078E-02	3.8291E-04	-4.3002E-03	8.0950E-03	-9.9187E-03
47	1.6039E-02	-1.8634E-03	2.1093E-02	-8.5067E-03	9.4992E-04	-7.1051E-03
48	2.5552E-02	1.7996E-02	-1.9063E-02	1.2881E-02	3.4629E-03	-1.6887E-02
49	1.6280E-02	1.1496E-02	9.8918E-03	-3.6768E-03	4.9724E-04	8.1563E-03

Blue Vertical M2 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	2.0822E-05	3.3435E-05	1.1025E-05	1.8377E-05	2.5526E-05	2.9048E-05
1	3.1071E-05	-4.0533E-05	2.0127E-05	3.2601E-05	-1.3217E-05	2.0662E-05
2	-1.7306E-05	1.3961E-05	-8.9478E-06	-2.3819E-05	2.3067E-05	-5.2999E-06
3	-8.5491E-05	-1.6810E-05	3.3012E-05	4.4193E-05	-1.7417E-05	-1.2660E-05
4	-2.9715E-05	-6.6749E-05	9.7919E-07	2.0066E-05	-3.7393E-05	-3.3170E-05
5	-3.5927E-05	4.7425E-05	-1.4350E-05	-3.4626E-05	1.7031E-05	-1.3602E-06
6	-1.0845E-04	-4.4059E-05	-2.9263E-05	-1.8226E-05	-1.8288E-05	6.2205E-05
7	-3.5964E-05	-5.3149E-05	4.7656E-06	-9.2271E-06	2.7415E-06	-4.6586E-05
8	-3.9232E-05	4.5955E-05	1.7052E-05	-1.0971E-05	9.2103E-06	3.3731E-05
9	-4.7711E-05	5.6739E-05	5.9778E-06	9.4903E-06	3.6186E-05	-2.9650E-05
10	-5.9464E-05	1.3641E-05	6.6926E-05	-6.4342E-05	1.0486E-04	6.0003E-05
11	-7.4915E-05	-5.9402E-05	-5.5330E-05	3.5602E-05	4.1575E-05	-1.9647E-05
12	-1.8555E-04	8.1999E-05	-1.4193E-05	-2.1834E-05	1.2344E-05	1.6830E-05
13	-1.0905E-04	-5.6270E-07	-1.2488E-06	-5.1083E-05	-2.2961E-05	2.2460E-05
14	-3.8540E-05	-6.9478E-05	6.9955E-05	-8.7662E-06	-1.2503E-04	1.1127E-06
15	-9.8015E-05	1.0940E-05	-4.7839E-06	-9.7848E-06	-4.2979E-05	-1.1448E-05
16	-9.6654E-05	-4.3713E-06	1.6303E-05	-4.9341E-05	-1.9393E-05	1.2167E-05
17	-5.5115E-05	-2.6894E-05	-3.2139E-05	2.1086E-05	-6.8237E-05	5.1762E-05
18	-9.3581E-05	1.4964E-05	-8.5925E-05	-2.3753E-05	1.2879E-05	6.6045E-05
19	-7.9837E-05	-4.1681E-06	-4.8121E-05	7.5790E-05	-3.0362E-05	6.8945E-05
20	-1.0559E-04	2.7234E-05	-5.7385E-05	4.8449E-05	-6.3726E-05	1.5352E-05
21	-9.8356E-06	2.5555E-05	4.1360E-05	-4.6125E-05	4.0085E-06	4.0695E-05
22	-1.3666E-04	9.8970E-06	-2.2962E-05	3.2282E-05	-4.6559E-05	-1.7855E-05
23	-1.1931E-04	-9.4970E-06	-7.1823E-06	-8.3559E-05	1.9863E-05	1.4693E-05
24	-6.7356E-05	-5.2790E-06	-6.1974E-05	-2.9246E-05	3.5633E-05	6.4964E-05
25	-8.8812E-05	-1.7599E-05	1.0154E-05	-5.5109E-05	2.7839E-05	7.8862E-05
26	-9.2273E-05	3.0582E-05	7.1866E-05	-7.1633E-05	6.7573E-05	-7.7286E-06
27	-1.3497E-04	6.9036E-05	2.0275E-05	-1.6777E-05	-2.8843E-05	-2.7053E-05
28	-1.2761E-04	8.3563E-06	-6.6162E-05	-1.3943E-05	-5.9105E-05	3.3886E-05
29	-3.9146E-05	9.3574E-06	-3.2102E-05	-4.8365E-05	-9.1707E-05	-9.0890E-05
30	-1.3949E-04	-3.1323E-05	3.3215E-05	-9.3259E-05	-8.7005E-06	6.4201E-05
31	-1.4806E-04	3.8344E-05	3.5858E-05	6.3146E-05	-5.3834E-05	1.5764E-05

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
32	-1.9337E-04	-9.3945E-06	-3.4496E-05	4.8199E-05	6.2629E-05	1.8996E-05
33	-1.1390E-04	-3.2211E-05	2.8798E-05	-7.5622E-05	5.6913E-05	1.7436E-05
34	-1.2418E-04	-3.3456E-05	-4.2604E-05	3.3788E-05	-1.5034E-05	3.6792E-05
35	-1.3848E-04	-4.3720E-05	-3.6946E-05	2.3396E-06	4.6940E-05	-3.9786E-05
36	-8.2728E-06	7.9954E-05	4.5227E-05	-2.4520E-05	6.8925E-05	-2.4294E-05
37	-6.9346E-05	-1.1955E-04	6.5468E-05	-5.9201E-05	-1.6283E-05	6.0899E-05
38	-7.4537E-05	-1.6309E-05	3.4886E-06	5.8739E-05	4.0436E-05	-2.5273E-05
39	-4.9596E-05	-4.3481E-05	-2.8981E-05	-6.7454E-05	8.1135E-06	3.4706E-06
40	-1.5303E-04	9.2643E-06	3.3410E-05	2.1671E-05	-4.8215E-06	2.8207E-05
41	-7.1713E-05	9.7871E-05	-8.6426E-05	3.4742E-05	4.7007E-06	-2.3111E-05
42	-5.7673E-05	-6.7727E-06	-3.3125E-05	3.8011E-06	2.5633E-05	6.6019E-06
43	-5.9908E-05	6.6823E-05	6.4033E-05	3.0146E-05	-1.1290E-04	3.2806E-05
44	-2.3126E-05	-2.4305E-05	-3.8292E-05	-3.5318E-07	1.6436E-06	1.1119E-05
45	-1.1300E-04	8.1530E-05	5.7727E-06	-5.0295E-05	2.0441E-05	3.7527E-05
46	-2.2217E-05	-5.9174E-05	-4.1860E-07	2.3351E-05	-3.4181E-05	3.9583E-05
47	-5.5355E-05	8.2477E-06	-9.4320E-05	3.6411E-05	-2.7878E-06	2.8783E-05
48	-9.4190E-05	-8.1604E-05	8.6328E-05	-5.4884E-05	-1.1260E-05	7.4628E-05
49	-5.7453E-05	-4.4351E-05	-4.2650E-05	1.8852E-05	-2.8835E-06	-3.5270E-05

Blue Vertical M3 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	-2.9341E-08	-4.7784E-08	-1.3620E-08	-2.0999E-08	-3.6058E-08	-3.8746E-08
1	-6.8596E-08	5.0577E-08	-3.2291E-08	-5.3910E-08	1.4952E-08	-3.4447E-08
2	8.2991E-09	-2.1840E-08	1.0639E-08	3.8300E-08	-3.3339E-08	8.2208E-09
3	1.0907E-07	1.9367E-08	-4.4977E-08	-6.4888E-08	2.7540E-08	1.5741E-08
4	2.9121E-08	9.7275E-08	8.8063E-10	-2.4046E-08	5.1854E-08	4.8786E-08
5	3.0697E-08	-7.0462E-08	2.0373E-08	5.0186E-08	-2.6675E-08	5.6665E-09
6	1.4215E-07	6.4825E-08	3.9406E-08	2.1349E-08	2.5387E-08	-9.3631E-08
7	4.2431E-08	7.3343E-08	-3.3108E-09	1.1793E-08	-4.4925E-09	6.5289E-08
8	4.5518E-08	-6.7974E-08	-2.1947E-08	1.7612E-08	-1.6343E-08	-5.6561E-08
9	4.7758E-08	-8.0753E-08	-1.2082E-08	-1.1206E-08	-5.2577E-08	3.9122E-08
10	6.6617E-08	-1.9296E-08	-9.3905E-08	9.1698E-08	-1.4983E-07	-8.9715E-08
11	8.9091E-08	9.3422E-08	8.5329E-08	-5.0848E-08	-6.1849E-08	2.7738E-08
12	2.4921E-07	-1.1674E-07	2.2332E-08	3.8533E-08	-2.1512E-08	-1.9751E-08
13	1.4027E-07	7.5895E-09	-1.2748E-09	7.7399E-08	3.4243E-08	-3.4262E-08
14	3.5546E-08	1.0398E-07	-1.0212E-07	1.4195E-08	1.8565E-07	5.5806E-10
15	1.2705E-07	-1.3214E-08	2.2200E-09	1.4076E-08	6.0993E-08	1.4929E-08
16	1.1495E-07	7.5883E-09	-1.7570E-08	7.1523E-08	3.0076E-08	-1.4315E-08
17	5.8231E-08	3.7308E-08	4.6032E-08	-2.8434E-08	9.7541E-08	-7.5356E-08
18	1.1899E-07	-2.2031E-08	1.2525E-07	3.7234E-08	-2.0723E-08	-9.1802E-08
19	9.5644E-08	8.5288E-09	7.2775E-08	-1.1586E-07	4.6875E-08	-1.0486E-07
20	1.2912E-07	-3.9000E-08	8.3849E-08	-7.0703E-08	9.4409E-08	-2.1555E-08
21	-7.5086E-09	-3.9488E-08	-5.9448E-08	6.5162E-08	-2.9057E-09	-5.8477E-08
22	1.8628E-07	-8.2175E-09	3.1817E-08	-4.5655E-08	7.1536E-08	2.4783E-08
23	1.5252E-07	1.5843E-08	1.1065E-08	1.2059E-07	-3.1443E-08	-2.1878E-08
24	7.0301E-08	8.9943E-09	8.6387E-08	4.0636E-08	-5.1294E-08	-9.1119E-08
25	1.0490E-07	2.4195E-08	-1.4727E-08	8.2842E-08	-3.7200E-08	-1.1526E-07

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
26	1.0811E-07	-3.9723E-08	-1.0342E-07	1.0619E-07	-9.8285E-08	1.3728E-08
27	1.7916E-07	-9.9057E-08	-2.8218E-08	2.4262E-08	4.3273E-08	4.1521E-08
28	1.6207E-07	-1.0577E-08	9.5336E-08	2.3686E-08	8.5549E-08	-4.6399E-08
29	3.7516E-08	-1.4898E-08	5.3198E-08	7.0412E-08	1.3970E-07	1.3876E-07
30	1.8115E-07	4.5601E-08	-4.6308E-08	1.3751E-07	1.7204E-08	-9.0145E-08
31	1.9949E-07	-5.3263E-08	-4.9655E-08	-9.3724E-08	7.8562E-08	-2.4672E-08
32	2.6036E-07	1.1919E-08	5.3111E-08	-6.8610E-08	-9.3528E-08	-2.4952E-08
33	1.4324E-07	4.6461E-08	-4.3295E-08	1.1444E-07	-8.4225E-08	-2.4379E-08
34	1.4999E-07	4.5338E-08	6.0646E-08	-4.8858E-08	2.0915E-08	-5.4380E-08
35	1.8762E-07	6.5231E-08	5.4162E-08	-4.0026E-09	-7.0369E-08	5.9141E-08
36	-5.9287E-09	-1.1472E-07	-5.9485E-08	3.2455E-08	-9.9676E-08	3.0662E-08
37	8.1890E-08	1.7003E-07	-9.8681E-08	8.5859E-08	2.5838E-08	-8.7684E-08
38	9.4561E-08	2.5169E-08	-8.6656E-09	-8.6244E-08	-5.9008E-08	4.1380E-08
39	5.6299E-08	6.4396E-08	4.5448E-08	9.5485E-08	-8.8158E-09	-1.4065E-09
40	2.1410E-07	-1.2868E-08	-4.9322E-08	-3.2603E-08	8.8305E-09	-3.8733E-08
41	8.8919E-08	-1.4620E-07	1.2703E-07	-4.9111E-08	-4.1041E-09	3.4531E-08
42	6.7602E-08	8.7634E-09	4.5077E-08	-5.0901E-09	-3.4572E-08	-7.5741E-09
43	8.1338E-08	-9.7293E-08	-9.7428E-08	-4.3550E-08	1.6360E-07	-4.7732E-08
44	1.8147E-08	3.9569E-08	5.6221E-08	-1.8947E-09	-3.6441E-09	-1.2358E-08
45	1.5361E-07	-1.2103E-07	-9.1662E-09	7.1245E-08	-3.2289E-08	-5.5945E-08
46	2.3807E-08	8.4767E-08	-3.9765E-10	-3.9311E-08	4.7370E-08	-5.4442E-08
47	6.6513E-08	-1.0467E-08	1.3961E-07	-5.0131E-08	1.5854E-09	-4.1357E-08
48	1.2077E-07	1.2178E-07	-1.2604E-07	7.8166E-08	1.0794E-08	-1.1216E-07
49	7.6809E-08	5.8680E-08	6.2387E-08	-2.9134E-08	6.6198E-09	4.5903E-08

Red Horizontal...

Red Horizontal M0 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	-1.2186E-02	1.0514E+00	1.1795E+00	1.4398E+00	1.8887E+00	7.8769E-01
1	3.7988E-02	1.6679E+00	9.4454E-01	1.7830E+00	2.0641E+00	1.4723E+00
2	1.5073E-01	1.5150E+00	1.6648E+00	2.3270E+00	2.1448E+00	1.7307E+00
3	-4.7894E-01	1.8810E+00	1.5554E+00	1.9099E+00	1.0566E+00	1.8170E+00
4	-4.5783E-01	1.1420E+00	1.9123E+00	1.3700E+00	1.7131E+00	1.7034E+00
5	-5.8242E-01	1.4359E+00	2.4067E+00	1.6209E+00	1.4501E+00	1.9723E+00
6	-2.9769E-01	7.2897E-01	6.6215E-01	6.3739E-01	1.0519E+00	1.1843E+00
7	-7.6280E-01	6.9655E-01	1.3855E+00	1.0016E+00	7.6587E-01	1.2220E+00
8	-6.3142E-01	8.9035E-01	6.3115E-01	6.8990E-01	9.0899E-01	8.0672E-01
9	-4.0866E-01	2.4427E-01	5.2786E-01	1.1902E+00	1.3474E+00	7.8520E-01
10	-6.1000E-01	9.1409E-01	3.1601E-01	1.2322E+00	6.9962E-01	1.5682E+00
11	-4.7619E-01	9.4388E-01	4.7204E-01	8.1015E-01	1.0222E+00	9.9061E-01
12	-2.0408E-01	9.0547E-01	8.7558E-01	9.4500E-01	8.3395E-01	1.3787E+00
13	-2.4264E-01	8.0162E-01	8.6631E-01	1.1605E+00	1.0975E+00	1.0384E+00
14	-1.3662E-01	6.2510E-01	7.5205E-01	1.0702E+00	5.8781E-01	1.3688E+00
15	-4.8337E-01	1.1238E+00	1.0300E+00	1.0372E+00	8.1214E-01	9.4820E-01
16	-5.2380E-01	4.2849E-01	4.0264E-01	9.1824E-01	7.7056E-01	1.2574E+00
17	-3.1297E-01	4.8994E-01	7.2266E-01	8.8597E-01	7.5655E-01	1.6804E+00
18	-3.4568E-01	7.2278E-01	7.3378E-01	1.3618E+00	2.4808E-01	1.1810E+00
19	1.9659E-01	3.3291E-01	2.3240E-01	1.1347E+00	5.4185E-01	1.2429E+00
20	-1.4951E-01	-3.4512E-01	1.0533E+00	7.7094E-01	6.8799E-01	8.2639E-01
21	6.2325E-02	2.6649E-01	4.7592E-01	1.2166E+00	5.1668E-01	1.4413E+00
22	2.0733E-01	5.6194E-01	1.1025E+00	6.1822E-01	6.5306E-01	1.1464E+00
23	2.1304E-01	2.1495E-01	9.5467E-01	1.0595E+00	1.3929E+00	1.1503E+00
24	3.3897E-01	4.5152E-01	7.3609E-01	8.3256E-01	8.7148E-01	1.1280E+00
25	4.1620E-01	6.7201E-01	9.8657E-01	1.0746E+00	1.1922E+00	1.7295E+00
26	-4.4182E-02	1.7998E-01	1.1444E+00	1.1371E+00	7.4327E-01	1.3087E+00
27	-2.8481E-02	4.2893E-01	8.8189E-01	9.5558E-01	1.3193E+00	1.0785E+00
28	-4.3249E-02	4.8547E-01	1.0620E+00	1.4858E+00	8.9351E-01	1.2173E+00
29	2.7780E-01	6.4213E-01	1.1009E+00	8.8368E-01	1.3510E+00	9.1407E-01
30	1.6523E-01	1.0106E+00	1.1153E+00	1.0382E+00	8.4187E-01	1.0553E+00
31	4.8614E-01	8.2679E-01	1.2305E+00	8.2853E-01	9.6430E-01	1.0741E+00
32	2.3569E-01	7.6781E-01	1.3714E+00	1.1938E+00	7.7228E-01	1.3081E+00
33	3.1881E-01	8.8774E-01	1.0464E+00	1.1734E+00	7.5397E-01	8.9808E-01
34	1.8662E-01	7.7740E-01	1.0017E+00	1.2371E+00	1.3653E+00	1.3022E+00
35	4.9430E-01	8.2983E-01	8.3844E-01	7.0032E-01	8.7412E-01	1.2773E+00
36	2.9987E-01	1.9050E-01	7.3729E-01	1.0882E+00	1.0927E+00	1.3113E+00
37	1.5621E-01	3.4021E-01	4.8561E-01	5.6403E-01	1.0791E+00	9.0136E-01
38	3.8566E-01	3.7909E-01	1.3374E+00	5.3739E-01	1.2108E+00	9.6908E-01
39	1.9633E-01	3.2311E-01	1.2567E+00	1.2768E+00	8.1355E-01	1.9404E-01
40	3.3072E-01	3.1104E-01	4.8743E-01	4.7936E-01	1.5192E+00	9.5873E-01
41	8.6797E-02	-9.6046E-02	1.1839E+00	1.0650E+00	8.3150E-01	7.4900E-01
42	4.0531E-01	5.1257E-01	1.3686E+00	9.5751E-01	9.9943E-01	1.0683E+00
43	2.0323E-01	2.1585E-01	8.0658E-01	1.5502E+00	9.7530E-01	9.9149E-01

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
44	-2.5460E-03	2.0548E-01	3.8133E-01	9.4177E-01	1.2480E+00	1.0097E+00
45	2.3293E-01	5.4330E-01	1.5635E+00	8.4116E-01	1.4642E+00	6.3129E-01
46	-5.6520E-02	7.2453E-01	1.2616E+00	1.2907E+00	7.3871E-01	5.9514E-01
47	-6.2274E-02	5.3904E-01	2.2054E+00	1.5707E+00	7.1473E-01	1.1869E+00
48	4.8170E-03	7.0321E-01	2.3502E+00	1.8475E+00	1.2585E+00	8.4761E-01
49	-4.5586E-02	5.4068E-01	1.5510E+00	1.5477E+00	1.3692E+00	1.0934E+00

Red Horizontal M1 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	6.6727E-03	3.1087E-04	-1.4291E-04	-4.0643E-03	-1.7310E-02	-7.7176E-03
1	7.8336E-03	-6.9410E-03	3.7674E-03	-8.3648E-03	-1.2106E-02	-1.0240E-02
2	5.8506E-03	-5.2407E-03	-6.3602E-03	-1.5544E-02	-1.3465E-02	-8.7981E-03
3	1.2055E-02	-1.0824E-02	-5.4386E-03	-9.8664E-03	9.6928E-04	-1.0463E-02
4	1.1026E-02	-9.0220E-04	-1.0706E-02	-3.2613E-03	-7.7555E-03	-8.6478E-03
5	1.1759E-02	-5.7236E-03	-1.7669E-02	-7.1046E-03	-4.3636E-03	-1.2482E-02
6	7.1529E-03	3.7773E-03	5.7422E-03	6.4980E-03	1.0926E-03	-1.8095E-03
7	1.3868E-02	4.5452E-03	-3.3668E-03	1.9085E-03	4.8421E-03	-2.5267E-03
8	1.2054E-02	2.1550E-03	6.3350E-03	5.7360E-03	3.0691E-03	2.9356E-03
9	7.8673E-03	1.0043E-02	7.5062E-03	-1.2320E-03	-3.5331E-03	3.3379E-03
10	9.9769E-03	6.5244E-04	1.0107E-02	-2.1756E-03	4.8898E-03	-7.8874E-03
11	7.9492E-03	-4.3808E-05	8.2197E-03	3.2624E-03	6.9249E-06	-1.2112E-03
12	6.1646E-03	2.6176E-04	2.2876E-03	1.7048E-03	3.2013E-03	-8.6807E-03
13	9.4916E-03	2.5306E-03	2.5117E-03	-1.3184E-03	-4.9500E-04	-1.0830E-03
14	8.4517E-03	5.3923E-03	4.0622E-03	1.6512E-05	6.2745E-03	-5.6698E-03
15	1.1830E-02	-2.1111E-03	4.4437E-04	2.6398E-04	3.2861E-03	5.6234E-04
16	1.1250E-02	6.7146E-03	8.6275E-03	1.8609E-03	3.4091E-03	-3.8396E-03
17	8.3955E-03	5.6586E-03	3.6600E-03	1.6264E-03	3.3008E-03	-9.8759E-03
18	6.1660E-03	1.7103E-03	3.2174E-03	-6.2425E-03	9.3534E-03	-3.4546E-03
19	-2.2395E-03	6.8942E-03	1.0121E-02	-1.5541E-03	7.0490E-03	-3.6060E-03
20	2.2054E-03	1.5534E-02	-4.2802E-04	3.7466E-03	4.9660E-03	2.0960E-03
21	-4.6209E-04	6.9388E-03	7.1685E-03	-2.0026E-03	7.1264E-03	-6.1541E-03
22	-2.6418E-03	2.8492E-03	-1.2845E-03	5.9742E-03	5.1347E-03	-1.7755E-03
23	-2.5695E-03	6.8433E-03	5.8947E-04	-3.8923E-04	-4.8601E-03	-1.4689E-03
24	-4.0201E-03	3.3179E-03	3.3213E-03	2.2455E-03	1.9276E-03	-2.7777E-03
25	-4.3550E-03	1.9261E-03	3.4485E-04	-6.8205E-04	-2.0296E-03	-1.0526E-02
26	2.3283E-03	8.8838E-03	-1.8291E-03	-1.3937E-03	4.0586E-03	-4.0337E-03
27	1.8497E-03	5.7680E-03	1.6566E-03	9.5823E-04	-3.6759E-03	-1.2282E-03
28	2.1802E-03	5.1468E-03	-3.8646E-04	-5.7638E-03	2.0293E-03	-3.5378E-03
29	-2.1680E-03	2.8251E-03	-1.0563E-03	1.9857E-03	-4.2626E-03	4.0925E-04
30	-1.0857E-03	-2.6421E-03	-1.6891E-03	2.4203E-04	1.8371E-03	-1.5863E-03
31	-5.3388E-03	-1.1901E-03	-3.1259E-03	2.3496E-03	2.9058E-04	-3.0818E-03
32	-1.5014E-03	1.5818E-04	-4.8321E-03	-2.8101E-03	3.0187E-03	-4.5728E-03
33	-2.6639E-03	-1.4471E-03	-4.8541E-04	-2.4438E-03	3.7269E-03	8.8339E-04
34	-1.1282E-03	4.8261E-06	2.0462E-04	-2.3831E-03	-4.0643E-03	-4.0310E-03
35	-5.4207E-03	-9.0278E-04	2.9174E-03	4.8284E-03	2.5404E-03	-3.4270E-03
36	-3.1544E-03	7.1717E-03	4.6027E-03	3.7093E-04	-1.2517E-04	-4.2128E-03
37	-1.3486E-03	4.3601E-03	7.6161E-03	7.4068E-03	6.7153E-05	1.7786E-03

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
38	-4.3503E-03	3.6838E-03	-3.6042E-03	8.3943E-03	-1.0381E-03	1.1949E-03
39	-1.4712E-03	4.1520E-03	-2.4820E-03	-1.4077E-03	4.7193E-03	1.1934E-02
40	-3.3118E-03	4.2242E-03	8.1629E-03	9.3232E-03	-4.6831E-03	2.6060E-03
41	6.9204E-05	9.0113E-03	-1.1304E-03	8.7345E-04	4.7362E-03	5.3377E-03
42	-4.3539E-03	1.6351E-04	-3.5493E-03	2.2508E-03	2.3136E-03	8.9441E-04
43	-1.6899E-03	2.0193E-03	2.2001E-03	-5.3079E-03	3.2045E-03	1.5108E-03
44	9.0303E-04	1.7161E-03	6.4803E-03	3.1144E-03	-5.3334E-04	2.0851E-03
45	-2.0956E-03	-2.8606E-03	-7.0255E-03	4.5203E-03	-2.7262E-03	7.7950E-03
46	1.9560E-03	-6.3890E-03	-2.6364E-03	-1.1896E-03	7.2608E-03	8.4668E-03
47	1.9100E-03	-3.9619E-03	-1.5037E-02	-5.4216E-03	6.8994E-03	9.4631E-04
48	8.1239E-04	-6.8629E-03	-1.7532E-02	-8.1847E-03	-2.9012E-04	4.9284E-03
49	1.2355E-03	-5.9868E-03	-8.0329E-03	-6.1509E-03	-3.1114E-03	-2.2172E-04

Red Horizontal M2 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	-2.2535E-05	-6.5829E-06	-7.7242E-06	1.0392E-05	6.4455E-05	2.9336E-05
1	-2.1911E-05	2.9222E-05	-2.0693E-05	3.4924E-05	3.8416E-05	3.4282E-05
2	-1.0626E-05	2.3340E-05	2.5927E-05	6.5546E-05	5.7932E-05	3.4656E-05
3	-3.3544E-05	5.0661E-05	2.3297E-05	4.0985E-05	-4.5808E-06	4.4161E-05
4	-3.0165E-05	5.5936E-06	4.7720E-05	1.4154E-05	3.2323E-05	3.5929E-05
5	-3.3563E-05	2.7968E-05	7.8361E-05	3.0957E-05	1.6353E-05	5.2223E-05
6	-1.5207E-05	-1.4137E-05	-2.5165E-05	-3.0403E-05	-7.6183E-06	7.3347E-06
7	-4.3757E-05	-1.8609E-05	1.3095E-05	-1.1389E-05	-2.4261E-05	1.0585E-05
8	-3.3855E-05	-9.6649E-06	-2.9700E-05	-2.7462E-05	-1.7198E-05	-1.4818E-05
9	-1.5168E-05	-4.1683E-05	-3.3174E-05	4.4218E-06	1.2273E-05	-1.6660E-05
10	-2.4083E-05	1.0604E-06	-4.3355E-05	8.0082E-06	-2.3818E-05	3.3711E-05
11	-1.7128E-05	4.3469E-06	-3.7309E-05	-1.5737E-05	-9.3030E-07	4.1551E-06
12	-1.3398E-05	2.1377E-06	-1.1403E-05	-1.0619E-05	-1.9418E-05	3.1376E-05
13	-3.0136E-05	-9.7742E-06	-1.1763E-05	5.6927E-06	-1.7788E-08	-3.5680E-07
14	-2.5037E-05	-2.4484E-05	-1.9223E-05	-1.6981E-06	-2.9201E-05	2.4595E-05
15	-3.8558E-05	1.1651E-05	-3.1894E-06	-2.1403E-06	-1.5438E-05	-5.1555E-06
16	-3.5114E-05	-2.7956E-05	-3.9291E-05	-1.0796E-05	-1.5883E-05	1.5690E-05
17	-2.3322E-05	-2.3257E-05	-1.5645E-05	-8.6882E-06	-1.5363E-05	4.3221E-05
18	-9.1597E-06	-3.2806E-06	-1.4109E-05	2.5493E-05	-4.1897E-05	1.5185E-05
19	2.3039E-05	-2.6769E-05	-4.4093E-05	5.2335E-06	-3.5396E-05	1.4841E-05
20	8.5491E-07	-6.3946E-05	2.9525E-07	-1.8370E-05	-2.5130E-05	-9.3486E-06
21	1.1171E-05	-2.4044E-05	-3.1921E-05	5.8660E-06	-3.3212E-05	2.6810E-05
22	2.0486E-05	-5.9905E-06	5.7770E-06	-2.8500E-05	-2.3830E-05	6.1703E-06
23	1.7190E-05	-2.2289E-05	-2.2486E-06	7.5096E-07	2.0222E-05	3.2833E-06
24	2.2281E-05	-6.6873E-06	-1.4634E-05	-1.0941E-05	-1.0571E-05	1.2072E-05
25	2.8683E-05	-5.0874E-06	-2.3375E-06	1.9315E-06	6.9714E-06	4.4425E-05
26	3.7349E-06	-3.3507E-05	9.0266E-06	5.1240E-06	-1.8771E-05	1.5857E-05
27	6.4434E-06	-2.0752E-05	-6.6346E-06	-4.9441E-06	1.4617E-05	3.5400E-06
28	2.9897E-06	-1.8972E-05	9.6363E-07	2.3364E-05	-1.2002E-05	1.5192E-05
29	2.0750E-05	-8.0259E-06	4.1266E-06	-9.5126E-06	1.6021E-05	-2.4537E-06
30	1.5987E-05	1.7031E-05	8.5365E-06	-3.9313E-06	-8.4404E-06	4.0220E-06
31	3.2494E-05	1.1351E-05	1.2779E-05	-1.1341E-05	-4.3477E-06	1.1710E-05

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
32	1.4908E-05	6.0532E-06	2.1371E-05	1.2384E-05	-1.5410E-05	1.8481E-05
33	2.0880E-05	1.3379E-05	2.5701E-07	1.0046E-05	-1.8497E-05	-4.0570E-06
34	1.4100E-05	4.6197E-06	-1.4988E-06	9.2205E-06	1.5257E-05	1.6949E-05
35	3.1909E-05	1.0848E-05	-1.3924E-05	-2.1839E-05	-1.2938E-05	1.3268E-05
36	2.1096E-05	-2.2934E-05	-2.1116E-05	-4.5523E-06	-1.1519E-06	1.6896E-05
37	1.1299E-05	-9.6066E-06	-3.3566E-05	-3.5329E-05	-2.5932E-06	-1.1961E-05
38	2.3527E-05	-6.9817E-06	1.5124E-05	-4.0584E-05	1.7778E-06	-7.3472E-06
39	9.3912E-06	-8.5287E-06	1.0294E-05	3.6253E-06	-2.4727E-05	-5.4216E-05
40	1.6870E-05	-8.0990E-06	-3.5293E-05	-4.3908E-05	1.7818E-05	-1.5492E-05
41	4.6602E-07	-2.7486E-05	4.7609E-06	-5.4912E-06	-2.5185E-05	-2.6237E-05
42	1.9741E-05	1.2801E-05	1.4576E-05	-1.0272E-05	-1.1888E-05	-5.8573E-06
43	6.4453E-06	4.7791E-06	-5.0891E-06	2.2774E-05	-1.7244E-05	-7.0231E-06
44	-4.6088E-06	-2.1665E-06	-2.2278E-05	-1.4371E-05	-3.2850E-07	-1.1735E-05
45	7.9399E-06	2.9175E-05	3.5963E-05	-1.8328E-05	9.1644E-06	-3.7139E-05
46	-1.1115E-05	4.7886E-05	1.6915E-05	6.9870E-06	-3.4569E-05	-4.1491E-05
47	-1.0860E-05	3.3801E-05	7.0109E-05	2.7184E-05	-3.0044E-05	-8.5932E-06
48	-5.5122E-06	4.5611E-05	8.2859E-05	3.4950E-05	4.6589E-07	-2.4626E-05
49	-7.0905E-06	4.1774E-05	4.1622E-05	3.0140E-05	1.4401E-05	1.0492E-06

Red Horizontal M3 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	2.5304E-08	1.0521E-08	1.4747E-08	-2.0323E-08	-8.4458E-08	-3.9278E-08
1	2.0387E-08	-4.2184E-08	3.2149E-08	-5.4868E-08	-5.0594E-08	-4.6024E-08
2	2.8958E-09	-3.4216E-08	-3.6534E-08	-9.2603E-08	-8.6996E-08	-5.7172E-08
3	3.2564E-08	-7.7447E-08	-3.3695E-08	-5.7367E-08	4.0840E-09	-6.8707E-08
4	3.0260E-08	-9.7856E-09	-7.0074E-08	-2.1146E-08	-4.6281E-08	-5.5718E-08
5	3.7237E-08	-4.2805E-08	-1.1422E-07	-4.4947E-08	-2.0923E-08	-7.7833E-08
6	1.4459E-08	1.7884E-08	3.5823E-08	4.5549E-08	1.3224E-08	-1.8686E-08
7	5.4131E-08	2.6281E-08	-1.6623E-08	2.0102E-08	3.8307E-08	-2.2218E-08
8	3.6822E-08	1.5035E-08	4.6167E-08	4.2552E-08	2.8434E-08	1.8471E-08
9	1.1250E-08	5.8734E-08	4.8412E-08	-5.2310E-09	-1.3570E-08	2.2111E-08
10	2.4576E-08	-4.1344E-09	6.1433E-08	-8.6584E-09	3.6869E-08	-5.0699E-08
11	1.7900E-08	-8.8033E-09	5.6017E-08	2.4771E-08	1.7121E-09	-7.7831E-09
12	1.5386E-08	-4.5344E-09	1.9025E-08	1.9424E-08	2.9395E-08	-4.1625E-08
13	3.8941E-08	1.4948E-08	1.9011E-08	-8.5531E-09	1.5367E-11	-4.8387E-09
14	3.0759E-08	3.9154E-08	3.0845E-08	5.5828E-09	4.3315E-08	-4.4879E-08
15	5.0453E-08	-1.7266E-08	7.1627E-09	5.4908E-09	2.2678E-08	1.4213E-09
16	4.4770E-08	4.2166E-08	5.9980E-08	2.0512E-08	2.4193E-08	-2.9243E-08
17	2.8612E-08	3.5001E-08	2.3589E-08	1.6059E-08	2.3658E-08	-6.8341E-08
18	5.5511E-09	2.3774E-09	2.0821E-08	-3.1509E-08	6.2769E-08	-2.7438E-08
19	-3.2633E-08	3.8501E-08	6.4137E-08	-4.7458E-09	5.7194E-08	-2.2963E-08
20	2.3569E-09	9.1440E-08	4.0947E-09	3.0225E-08	4.1663E-08	1.2086E-08
21	-1.0980E-08	3.1585E-08	4.8908E-08	-3.1304E-09	5.1338E-08	-3.9651E-08
22	-2.3485E-08	5.7462E-09	-6.4002E-09	4.5197E-08	3.6986E-08	-8.2839E-09
23	-1.5958E-08	2.8430E-08	5.1593E-09	1.9734E-09	-2.5965E-08	-1.8972E-09
24	-2.2425E-08	6.3260E-09	2.4074E-08	1.9612E-08	1.9749E-08	-1.8223E-08
25	-3.9388E-08	8.6390E-09	6.5893E-09	1.6627E-10	-7.5352E-09	-6.4723E-08

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
26	-7.3594E-09	4.5593E-08	-1.2241E-08	-3.8175E-09	2.9220E-08	-2.3635E-08
27	-1.1502E-08	2.8877E-08	1.1365E-08	1.0073E-08	-1.8066E-08	-5.4577E-09
28	-3.6624E-09	2.7706E-08	2.0291E-09	-2.9754E-08	2.2714E-08	-2.4848E-08
29	-2.7574E-08	1.1064E-08	-3.0619E-09	1.6071E-08	-1.8502E-08	1.1019E-09
30	-2.0153E-08	-2.6177E-08	-1.1782E-08	1.0383E-08	1.4056E-08	-5.7058E-09
31	-4.2142E-08	-1.7661E-08	-1.5084E-08	1.9170E-08	9.6158E-09	-1.7756E-08
32	-1.6233E-08	-1.2088E-08	-3.0175E-08	-1.7461E-08	2.4682E-08	-3.0068E-08
33	-2.6173E-08	-2.3515E-08	3.2549E-09	-1.2186E-08	3.0278E-08	1.9996E-09
34	-1.6593E-08	-7.3460E-09	4.5174E-09	-1.1177E-08	-1.8212E-08	-2.6817E-08
35	-4.0669E-08	-1.8632E-08	2.3006E-08	3.2832E-08	2.1222E-08	-2.0408E-08
36	-2.3615E-08	2.9057E-08	3.2772E-08	1.0910E-08	3.0082E-09	-2.5892E-08
37	-7.3613E-09	9.5502E-09	5.0062E-08	5.4679E-08	6.0702E-09	1.6772E-08
38	-2.4639E-08	6.0601E-09	-1.9603E-08	6.2737E-08	-1.8817E-10	6.9447E-09
39	-2.3252E-09	8.3173E-09	-1.2671E-08	-2.6972E-09	3.9894E-08	7.4775E-08
40	-1.2542E-08	6.9940E-09	5.0659E-08	6.6743E-08	-2.2994E-08	2.2476E-08
41	1.2432E-08	3.3582E-08	-5.9203E-09	9.5957E-09	4.1544E-08	3.6648E-08
42	-1.6108E-08	-2.5742E-08	-1.9173E-08	1.5541E-08	1.8199E-08	5.8283E-09
43	3.7916E-09	-1.1815E-08	3.4253E-09	-3.2777E-08	2.7274E-08	5.6796E-09
44	1.5126E-08	7.2421E-09	2.7727E-08	2.0145E-08	1.5040E-09	1.5076E-08
45	-4.0378E-10	-5.1866E-08	-5.8556E-08	2.2009E-08	-1.2724E-08	5.2021E-08
46	2.8776E-08	-7.9748E-08	-3.1210E-08	-1.5116E-08	4.9682E-08	5.9334E-08
47	2.7211E-08	-5.3078E-08	-1.0631E-07	-4.6385E-08	3.9270E-08	1.1585E-08
48	1.7625E-08	-6.7696E-08	-1.2700E-07	-5.1766E-08	-2.6194E-09	3.3968E-08
49	1.8351E-08	-6.0892E-08	-6.6057E-08	-4.8798E-08	-2.4494E-08	-6.2879E-09

Red Vertical...

Red Vertical M0 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	7.1338E-02	2.6999E-01	1.4498E+00	1.1150E+00	1.1302E+00	4.1050E-01
1	-2.1669E-02	7.1809E-01	1.6492E+00	1.0659E+00	9.3207E-01	-2.9572E-01
2	8.7976E-02	7.8631E-01	4.4950E-01	1.1372E+00	1.5654E+00	-3.2426E-01
3	-5.2137E-01	6.7338E-01	1.0110E+00	7.9889E-01	1.3591E+00	1.1082E-01
4	-3.5301E-01	6.0270E-01	1.0885E+00	8.3038E-01	1.0092E+00	-1.4206E-01
5	-5.0001E-01	8.3178E-01	9.3461E-01	9.6681E-01	1.2158E+00	1.1810E+00
6	-4.7799E-01	1.1276E+00	1.4227E+00	9.4585E-01	8.4720E-01	2.5420E-01
7	-7.3513E-01	7.1951E-01	9.5768E-01	1.0298E+00	1.2909E+00	-4.0974E-01
8	-7.0490E-01	4.6315E-01	8.5926E-01	1.1585E+00	1.2036E+00	4.7825E-01
9	-5.7767E-01	7.3368E-01	8.6911E-01	7.3092E-01	1.2751E+00	-1.6334E-01
10	-5.0501E-01	5.2893E-01	9.6839E-01	7.9747E-01	1.3069E+00	4.3641E-01
11	-2.5946E-01	3.7808E-01	9.7203E-01	1.4808E+00	1.4346E+00	3.9514E-01
12	1.6879E-01	9.8551E-01	2.7660E-01	9.4037E-01	1.4982E+00	5.9502E-01
13	-3.7370E-01	3.9297E-01	1.5541E+00	1.2432E+00	1.2911E+00	1.3457E+00
14	-2.8617E-01	1.0546E+00	1.0158E+00	8.2817E-01	1.7255E+00	1.6587E+00
15	-2.6824E-01	4.8505E-01	5.7577E-01	8.0284E-01	7.9107E-01	1.2769E+00
16	2.0063E-01	6.4931E-01	8.1599E-01	1.4122E+00	1.0115E+00	1.1651E+00
17	-2.3499E-02	8.2869E-01	3.2062E-01	8.7335E-01	7.7680E-01	1.2046E+00
18	-2.8131E-01	1.6875E+00	1.8184E-01	1.1027E+00	1.5140E+00	1.4433E+00
19	-8.2101E-01	7.8409E-01	1.0401E+00	1.0246E+00	1.5099E+00	1.0810E+00
20	-7.5817E-01	2.7318E-01	8.0600E-01	9.1634E-01	1.2175E+00	7.6860E-01
21	-4.5662E-01	4.7969E-01	1.1678E+00	1.2028E+00	1.1640E+00	9.6678E-01
22	-8.0118E-01	1.2267E+00	1.0654E+00	9.2252E-01	8.2149E-01	1.5930E+00
23	-3.9160E-01	7.3439E-01	1.0837E+00	1.3136E+00	9.9639E-01	1.4782E+00
24	-4.1820E-02	-2.3387E-01	5.6737E-01	7.8295E-01	1.1161E+00	1.0497E+00
25	-9.1605E-02	6.8518E-01	7.7830E-01	5.6280E-01	1.2046E+00	1.2941E+00
26	1.3931E-01	7.4526E-01	1.0662E+00	9.9997E-01	3.5277E-01	1.6995E+00
27	-1.1040E-01	9.1075E-01	1.2550E+00	8.7203E-01	8.9289E-01	1.7612E+00
28	9.8148E-03	4.7670E-01	4.9009E-01	7.7469E-01	1.4253E+00	1.4742E+00
29	4.0296E-02	5.5728E-01	7.7845E-01	1.0130E+00	1.4422E+00	1.2910E+00
30	-1.0490E-01	3.1361E-01	1.2259E+00	1.3043E+00	9.9814E-01	1.6540E+00
31	-1.3594E-01	1.1683E+00	8.7042E-01	1.0086E+00	9.6633E-01	1.3596E+00
32	1.8456E-01	9.5230E-01	1.0393E+00	1.1199E+00	9.0657E-01	1.4075E+00
33	-2.5731E-01	1.1098E+00	7.1075E-01	1.1662E+00	1.5211E+00	1.5206E+00
34	-3.0035E-01	2.8054E-01	1.0191E+00	8.4188E-01	1.5603E+00	1.4746E+00
35	7.5654E-03	5.1778E-01	4.7969E-01	1.4268E+00	9.1562E-01	2.0398E+00
36	1.9695E-01	9.1909E-01	9.4839E-01	1.3264E+00	1.5001E+00	1.8330E+00
37	1.0125E-01	1.1235E+00	1.1227E+00	1.1606E+00	1.0262E+00	1.7353E+00
38	7.6667E-02	8.3809E-01	4.4654E-01	1.7910E+00	1.3194E+00	1.9404E+00
39	5.2898E-01	9.8387E-01	1.0985E+00	1.4301E+00	1.3710E+00	1.5457E+00
40	1.0869E-01	4.9705E-01	1.1890E+00	7.8384E-01	1.1212E+00	1.5832E+00
41	-4.7203E-01	1.1598E+00	1.1815E+00	8.4159E-01	1.3364E+00	1.4505E+00
42	4.0707E-02	9.3485E-01	5.8363E-01	1.0224E+00	1.2426E+00	1.8615E+00
43	-7.0020E-01	1.0248E+00	8.9209E-01	1.4432E+00	7.1835E-01	1.6358E+00

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
44	-3.3856E-02	1.6476E+00	1.0304E+00	8.7359E-01	9.8850E-01	1.8396E+00
45	1.2414E-01	1.0943E+00	1.1212E+00	7.8853E-01	9.1869E-01	1.3641E+00
46	-9.4675E-03	1.2313E+00	6.6099E-01	7.5791E-01	1.5595E+00	1.8739E+00
47	3.0925E-01	6.1046E-01	3.3972E-01	1.2863E+00	1.7422E+00	1.2053E+00
48	4.1451E-02	6.6488E-01	1.3423E+00	6.5077E-01	9.8616E-01	8.4709E-01
49	-1.1783E+00	7.2869E-01	4.9793E-01	7.8746E-01	1.4524E+00	1.1009E+00

Red Vertical M1 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	-3.9621E-04	8.4053E-03	-6.0930E-03	-3.2268E-03	-3.1588E-03	5.5482E-03
1	1.6995E-03	3.6125E-03	-6.5340E-03	1.3404E-03	2.5025E-03	1.3657E-02
2	3.7119E-05	3.7523E-03	9.7695E-03	8.0845E-04	-6.3403E-03	1.4285E-02
3	8.9413E-03	4.8157E-03	2.1091E-03	4.8745E-03	-3.4083E-03	9.0718E-03
4	7.0310E-03	5.6608E-03	5.1335E-04	4.2421E-03	7.3949E-04	1.1886E-02
5	8.5801E-03	2.3945E-03	2.4250E-03	1.8095E-03	-2.7778E-03	-7.3716E-03
6	8.1600E-03	-1.2447E-03	-4.4135E-03	1.3142E-03	1.9436E-03	7.1610E-03
7	1.2253E-02	3.8392E-03	1.4036E-03	3.4582E-04	-4.7220E-03	1.6384E-02
8	1.1646E-02	7.2418E-03	2.8452E-03	-1.5956E-03	-4.0636E-03	5.2539E-03
9	1.0146E-02	3.4483E-03	3.2383E-03	3.6113E-03	-4.3429E-03	1.4020E-02
10	8.1351E-03	6.1733E-03	1.3589E-03	1.8729E-03	-4.6664E-03	5.8159E-03
11	4.8208E-03	7.7463E-03	8.6378E-04	-7.6806E-03	-6.6343E-03	7.0622E-03
12	9.4406E-04	-1.1191E-04	9.9462E-03	2.3103E-04	-8.4789E-03	4.6775E-03
13	1.1691E-02	8.5384E-03	-6.9858E-03	-2.9071E-03	-5.3955E-03	-4.0852E-03
14	1.1214E-02	-3.9123E-04	2.6405E-05	2.2829E-03	-1.1542E-02	-7.3729E-03
15	1.1661E-02	6.6543E-03	5.6236E-03	2.2027E-03	2.4435E-03	-2.2138E-03
16	5.3511E-03	4.5077E-03	2.4593E-03	-6.0896E-03	5.0056E-05	-1.6865E-04
17	8.1655E-03	2.1311E-03	9.7010E-03	1.2800E-03	2.6735E-03	-1.4161E-03
18	1.0310E-02	-9.6128E-03	1.0531E-02	-2.1790E-03	-8.0039E-03	-5.7210E-03
19	1.5607E-02	2.7222E-03	-1.4823E-03	-6.9560E-04	-6.8749E-03	-1.4422E-03
20	1.3995E-02	9.8009E-03	2.6924E-03	1.2446E-03	-2.1093E-03	3.6795E-04
21	9.5376E-03	6.9060E-03	-1.7560E-03	-2.9124E-03	-2.0180E-03	-2.0078E-03
22	1.3035E-02	-3.1881E-03	2.3554E-05	1.3024E-03	2.0697E-03	-9.4082E-03
23	6.8497E-03	2.9935E-03	-5.0835E-04	-4.3970E-03	3.5040E-04	-7.8363E-03
24	2.3013E-03	1.5272E-02	5.7183E-03	1.6910E-03	-2.0537E-03	-1.9291E-03
25	6.8146E-03	2.4718E-03	2.6801E-03	5.0911E-03	-3.8320E-03	-5.9210E-03
26	6.3644E-03	3.1201E-03	-9.2731E-04	-1.9523E-05	7.3401E-03	-1.1520E-02
27	9.5867E-03	9.7346E-04	-3.2784E-03	1.6685E-03	1.3762E-04	-1.2078E-02
28	8.1711E-03	6.8785E-03	6.6264E-03	2.8730E-03	-7.1704E-03	-8.0375E-03
29	7.9262E-03	5.1297E-03	2.7320E-03	-6.5790E-04	-8.0135E-03	-5.9965E-03
30	9.6792E-03	8.5524E-03	-3.5926E-03	-4.6411E-03	-2.5268E-03	-1.1502E-02
31	9.6011E-03	-3.7127E-03	9.2353E-04	-8.7450E-04	-2.6859E-03	-7.4508E-03
32	6.6865E-03	1.5931E-04	-7.2204E-04	-1.7030E-03	-2.1825E-03	-8.1610E-03
33	1.2878E-02	-1.2055E-03	4.1493E-03	-2.5756E-03	-1.0047E-02	-9.1129E-03
34	1.3660E-02	9.7413E-03	-4.4767E-04	1.8188E-03	-1.0424E-02	-8.5743E-03
35	9.8705E-03	5.9543E-03	6.7183E-03	-6.6725E-03	-8.2330E-04	-1.5510E-02
36	6.6180E-03	7.7845E-04	4.6524E-04	-4.7066E-03	-8.1169E-03	-1.2572E-02
37	7.4796E-03	-2.0557E-03	-1.5665E-03	-3.6126E-03	-1.1886E-03	-1.1184E-02

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
38	9.1243E-03	2.7080E-03	7.5703E-03	-1.1159E-02	-4.6635E-03	-1.3774E-02
39	3.6552E-03	9.0342E-04	-7.1941E-04	-5.6814E-03	-4.6962E-03	-8.0611E-03
40	9.2722E-03	8.0681E-03	-1.6424E-03	3.3491E-03	-5.4290E-05	-8.0348E-03
41	1.7306E-02	-3.0162E-04	-1.4745E-03	2.6408E-03	-2.8994E-03	-5.6308E-03
42	9.5824E-03	2.4933E-03	5.8662E-03	1.0779E-03	-1.3187E-03	-1.0853E-02
43	1.8671E-02	9.3265E-04	2.4968E-03	-5.0003E-03	5.7138E-03	-8.3893E-03
44	1.0947E-02	-7.6899E-03	6.1781E-04	2.9768E-03	2.6961E-03	-1.1100E-02
45	1.0191E-02	3.1331E-04	3.3380E-04	5.2044E-03	4.6055E-03	-3.6764E-03
46	1.2097E-02	-9.8613E-04	7.2921E-03	6.2675E-03	-3.5559E-03	-8.6626E-03
47	7.2598E-03	7.9549E-03	1.1413E-02	-2.9759E-04	-5.3733E-03	7.9042E-04
48	9.5680E-03	7.1979E-03	-2.2879E-03	8.0732E-03	4.2244E-03	5.2646E-03
49	2.1956E-02	4.9362E-03	7.7108E-03	4.0139E-03	-3.8146E-03	-3.7362E-04

Red Vertical M2 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	1.1364E-05	-3.7746E-05	1.8349E-05	7.9549E-06	2.2000E-06	-2.7014E-05
1	4.7890E-06	-1.0794E-05	2.6408E-05	-8.8989E-06	-2.4393E-05	-4.2286E-05
2	1.6175E-05	-1.3471E-05	-4.3513E-05	-6.3718E-06	1.7043E-05	-4.5527E-05
3	-2.4119E-05	-1.6290E-05	-9.5426E-06	-2.3570E-05	4.2187E-06	-2.3726E-05
4	-1.5440E-05	-2.1201E-05	-2.5927E-06	-2.2474E-05	-1.3309E-05	-3.7636E-05
5	-1.9723E-05	-7.3773E-06	-1.0713E-05	-1.0939E-05	3.8652E-06	4.0303E-05
6	-1.7534E-05	7.4229E-06	1.8269E-05	-7.7614E-06	-1.5490E-05	-2.2154E-05
7	-3.4223E-05	-1.3395E-05	-6.1479E-06	-2.5703E-06	1.5857E-05	-5.8518E-05
8	-3.0136E-05	-2.8506E-05	-1.2280E-05	6.0569E-06	1.3570E-05	-1.1351E-05
9	-2.4766E-05	-1.0706E-05	-1.5469E-05	-1.6747E-05	1.3726E-05	-5.0793E-05
10	-1.5234E-05	-2.4036E-05	-6.2859E-06	-1.0118E-05	1.6557E-05	-1.3964E-05
11	-2.6164E-07	-3.0555E-05	-2.9761E-06	3.3914E-05	2.5836E-05	-2.4441E-05
12	1.2076E-05	2.1804E-06	-4.4213E-05	-1.8779E-06	3.6086E-05	-2.5079E-05
13	-3.8483E-05	-3.6981E-05	3.1762E-05	1.0299E-05	2.3288E-05	7.9971E-06
14	-3.5189E-05	2.4436E-06	8.5055E-07	-9.8005E-06	5.4519E-05	2.2657E-05
15	-3.9585E-05	-2.7012E-05	-2.3388E-05	-7.3925E-06	-7.0237E-06	2.2866E-06
16	-1.1101E-05	-1.7596E-05	-9.3223E-06	2.8905E-05	5.0096E-06	-7.6634E-06
17	-2.2850E-05	-6.7903E-06	-4.3534E-05	-4.3964E-06	-5.8639E-06	1.2429E-06
18	-3.0085E-05	4.2907E-05	-4.4721E-05	1.1419E-05	3.8901E-05	2.4197E-05
19	-5.0648E-05	-1.3209E-05	8.8243E-06	3.3530E-06	2.9620E-05	9.8289E-06
20	-4.1565E-05	-4.1569E-05	-1.1771E-05	-5.1071E-06	6.6362E-06	7.9720E-06
21	-2.0557E-05	-2.7322E-05	7.5541E-06	1.4346E-05	9.4423E-06	1.3103E-05
22	-3.4376E-05	1.6781E-05	-7.6840E-07	-6.4620E-06	-6.7999E-06	4.2093E-05
23	-1.1616E-05	-9.6256E-06	1.6525E-06	2.0279E-05	-1.9940E-06	3.7070E-05
24	5.8256E-06	-6.2203E-05	-2.4546E-05	-5.7933E-06	1.0545E-05	8.7674E-06
25	-1.9008E-05	-6.3794E-06	-1.2339E-05	-2.2443E-05	1.8602E-05	2.2621E-05
26	-1.7477E-05	-1.2756E-05	4.1783E-06	-9.0338E-07	-2.8939E-05	4.3319E-05
27	-2.8563E-05	-2.3073E-06	1.4425E-05	-7.8223E-06	1.0647E-06	4.5345E-05
28	-2.4020E-05	-2.8598E-05	-2.7867E-05	-1.2566E-05	3.2172E-05	2.8637E-05
29	-2.4587E-05	-2.0441E-05	-1.1097E-05	2.9654E-06	3.6077E-05	2.1029E-05
30	-3.1270E-05	-3.5877E-05	1.7454E-05	2.0266E-05	1.1783E-05	4.5886E-05
31	-2.9353E-05	1.6487E-05	-3.6666E-06	2.5674E-06	1.3251E-05	2.4892E-05

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
32	-1.8930E-05	5.3466E-07	3.7105E-06	4.8745E-06	1.2942E-05	2.8343E-05
33	-4.5770E-05	5.1859E-06	-1.8871E-05	1.0089E-05	4.8567E-05	3.1273E-05
34	-5.0172E-05	-4.1486E-05	3.4953E-06	-9.4164E-06	5.2332E-05	2.9658E-05
35	-3.4080E-05	-2.3787E-05	-2.8034E-05	2.7826E-05	9.5633E-06	5.5828E-05
36	-1.7962E-05	-1.8227E-06	-3.9406E-07	1.9848E-05	4.2243E-05	4.3851E-05
37	-2.2036E-05	1.1231E-05	6.1896E-06	1.7746E-05	8.5861E-06	3.6709E-05
38	-3.0894E-05	-1.1858E-05	-3.3183E-05	4.9733E-05	2.5208E-05	4.7849E-05
39	-7.2526E-06	-3.1893E-06	2.4693E-06	2.5507E-05	2.3827E-05	2.3111E-05
40	-3.0434E-05	-3.5649E-05	7.5758E-06	-1.3263E-05	1.1366E-06	2.4497E-05
41	-6.5873E-05	4.2051E-07	7.5608E-06	-9.4778E-06	1.6372E-05	1.5453E-05
42	-2.8723E-05	-1.1076E-05	-2.2506E-05	-3.7074E-06	9.8195E-06	3.8185E-05
43	-6.7945E-05	-3.2535E-06	-1.0038E-05	2.3886E-05	-2.1902E-05	2.9647E-05
44	-3.8906E-05	3.4534E-05	-1.3576E-06	-1.3300E-05	-1.0511E-05	3.9889E-05
45	-3.7023E-05	-5.9164E-07	-4.2891E-07	-2.1206E-05	-2.0625E-05	7.6595E-06
46	-4.3669E-05	5.6447E-06	-3.1058E-05	-2.6042E-05	1.5293E-05	2.9401E-05
47	-1.8893E-05	-3.3877E-05	-4.7928E-05	3.3092E-06	2.1636E-05	-7.9035E-06
48	-2.7581E-05	-2.9817E-05	1.3312E-05	-3.3041E-05	-1.9841E-05	-2.5618E-05
49	-7.6669E-05	-1.8133E-05	-2.9494E-05	-1.0991E-05	1.8027E-05	-3.6271E-06

Red Vertical M3 Coefficients

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
0	-1.9949E-08	4.9191E-08	-2.4076E-08	-1.1190E-08	4.2214E-09	2.9036E-08
1	-8.1881E-09	8.8109E-09	-3.7249E-08	1.0874E-08	4.6974E-08	3.4870E-08
2	-2.8568E-08	1.6390E-08	6.2409E-08	7.2963E-09	-1.5208E-08	4.3380E-08
3	3.1458E-08	1.8342E-08	1.4123E-08	3.3067E-08	3.9260E-09	1.3180E-08
4	1.8074E-08	2.7463E-08	4.6402E-09	3.4799E-08	2.9519E-08	3.7982E-08
5	2.0992E-08	8.4737E-09	1.5450E-08	1.7410E-08	2.3595E-09	-6.8746E-08
6	1.8604E-08	-1.1750E-08	-2.4594E-08	1.3073E-08	2.9283E-08	1.7854E-08
7	4.0296E-08	1.6631E-08	1.0549E-08	4.7059E-09	-1.6767E-08	6.6930E-08
8	3.3148E-08	3.9878E-08	1.9058E-08	-7.3225E-09	-1.2804E-08	3.3715E-09
9	2.6543E-08	1.2170E-08	2.4958E-08	2.5371E-08	-1.0644E-08	6.2358E-08
10	1.2925E-08	3.3589E-08	1.1393E-08	1.6404E-08	-1.6646E-08	7.7477E-09
11	-9.4747E-09	4.2645E-08	5.0545E-09	-4.9104E-08	-2.9983E-08	2.8471E-08
12	-2.3292E-08	-2.5924E-09	6.6173E-08	5.2751E-09	-4.7323E-08	3.7809E-08
13	4.9767E-08	5.4825E-08	-4.6176E-08	-1.0769E-08	-3.1161E-08	-1.1791E-08
14	4.2130E-08	-1.1549E-09	-3.5421E-10	1.5550E-08	-7.9372E-08	-3.4324E-08
15	5.1849E-08	3.9354E-08	3.4752E-08	1.0548E-08	9.2024E-09	-7.4315E-09
16	9.7157E-09	2.5573E-08	1.3964E-08	-3.9903E-08	-1.0603E-08	8.2983E-09
17	2.6611E-08	1.0090E-08	6.6979E-08	9.8273E-09	4.9917E-09	-7.6855E-09
18	3.5151E-08	-5.8617E-08	6.6153E-08	-1.4188E-08	-5.5641E-08	-4.3971E-08
19	6.3558E-08	2.4104E-08	-1.1441E-08	-4.0044E-10	-3.7555E-08	-2.3407E-08
20	4.9527E-08	6.1557E-08	2.1442E-08	1.1615E-08	-4.1324E-09	-2.4251E-08
21	1.8297E-08	3.9438E-08	-6.7338E-09	-1.8370E-08	-1.2357E-08	-2.3671E-08
22	3.6804E-08	-2.2595E-08	5.4408E-09	1.4940E-08	9.3544E-09	-6.3455E-08
23	1.1355E-08	1.4588E-08	1.9859E-09	-2.6402E-08	6.3908E-09	-5.9505E-08
24	-1.1786E-08	8.8552E-08	3.8013E-08	1.1664E-08	-1.4111E-08	-1.7317E-08
25	2.4413E-08	8.2622E-09	2.1820E-08	3.6545E-08	-2.6674E-08	-3.5555E-08

Row	Col 0	Col 1	Col 2	Col 3	Col 4	Col 5
26	2.1127E-08	2.1428E-08	-2.0307E-09	5.9800E-09	3.8976E-08	-6.0428E-08
27	3.2990E-08	4.7406E-09	-1.6693E-08	1.5320E-08	-1.6859E-09	-6.4731E-08
28	2.9441E-08	4.3654E-08	4.2538E-08	2.1205E-08	-4.4381E-08	-4.1366E-08
29	3.0770E-08	3.1575E-08	1.8648E-08	-1.8158E-09	-5.0132E-08	-3.1899E-08
30	3.9662E-08	5.3895E-08	-2.3614E-08	-2.7844E-08	-1.5293E-08	-6.8214E-08
31	3.3663E-08	-1.8998E-08	9.0559E-09	-7.6190E-10	-1.8289E-08	-3.4070E-08
32	2.0759E-08	6.8291E-10	-3.5152E-09	-3.8952E-09	-2.0641E-08	-4.0530E-08
33	5.9653E-08	-3.8576E-09	3.0878E-08	-1.2525E-08	-7.3216E-08	-4.3799E-08
34	6.7568E-08	6.1489E-08	-4.0658E-09	1.6387E-08	-8.1669E-08	-4.2286E-08
35	4.4440E-08	3.4831E-08	4.0933E-08	-3.5201E-08	-2.0394E-08	-7.4376E-08
36	1.8565E-08	4.3308E-09	9.0587E-10	-2.4622E-08	-6.9692E-08	-5.9615E-08
37	2.5131E-08	-1.5315E-08	-5.3652E-09	-2.3855E-08	-1.6102E-08	-4.7416E-08
38	3.9137E-08	1.9747E-08	4.9747E-08	-6.8971E-08	-4.3838E-08	-6.3787E-08
39	5.9966E-09	6.0003E-09	4.1455E-10	-3.3430E-08	-3.9612E-08	-2.8953E-08
40	3.7400E-08	5.3788E-08	-8.6096E-09	2.1204E-08	-3.7480E-09	-3.3565E-08
41	8.8800E-08	2.8096E-09	-9.6282E-09	1.5463E-08	-2.8921E-08	-2.2581E-08
42	3.1597E-08	1.8048E-08	3.1635E-08	8.0472E-09	-2.0404E-08	-5.4384E-08
43	8.7990E-08	5.7571E-09	1.6315E-08	-3.2387E-08	2.6574E-08	-4.4893E-08
44	5.1292E-08	-4.8343E-08	2.1728E-09	2.4102E-08	1.1228E-08	-5.7783E-08
45	4.8775E-08	2.4457E-09	1.3084E-09	3.1235E-08	2.7668E-08	-1.2693E-08
46	5.6534E-08	-8.1278E-09	4.5183E-08	3.7446E-08	-2.3353E-08	-4.5964E-08
47	1.7273E-08	4.8180E-08	6.7925E-08	-5.8641E-09	-2.9472E-08	2.9768E-09
48	2.9160E-08	4.0616E-08	-2.2569E-08	4.5510E-08	2.9812E-08	2.6535E-08
49	9.6301E-08	2.3841E-08	3.9297E-08	1.0032E-08	-2.8595E-08	-1.5192E-10

Appendix 33 - Solar Aureole Non-Filter Model (nfm), Relative Spectral Response coefficients.

Note: Not to be confused with the Absolute Spectral Response map (M) coefficients, which are presented in appendix 32.

RSR-nfm Blue-Horizontal SA coefficients...

	M0	M1	M2	M3
Column 0	-1.57616100E+01	6.99121700E-02	-7.26166300E-05	0.00000000E+00
Column 1	-1.12047600E+02	6.77647200E-01	-1.34885800E-03	8.91719100E-07
Column 2	-5.45146400E+01	3.37199200E-01	-6.80249800E-04	4.55922500E-07
Column 3	1.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
Column 4	7.67037700E+01	-4.60767600E-01	9.32427300E-04	-6.27487900E-07
Column 5	1.27962600E+02	-7.73472800E-01	1.56672700E-03	-1.05540400E-06

RSR-nfm Blue-Vertical SA coefficients...

	M0	M1	M2	M3
Column 0	1.28779400E+02	-7.80315700E-01	1.58744900E-03	-1.07587200E-06
Column 1	1.07632900E+02	-6.41913300E-01	1.28751900E-03	-8.60467000E-07
Column 2	1.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
Column 3	1.03323000E+01	-5.10348800E-02	9.15237300E-05	-5.36202200E-08
Column 4	4.15834900E+01	-2.41389500E-01	4.77793700E-04	-3.14746300E-07
Column 5	1.06749300E+02	-6.31719700E-01	1.25664000E-03	-8.32492500E-07

RSR-nfm Red-Horizontal SA coefficients...

	M0	M1	M2	M3
Column 0	-6.95167000E+01	2.27274700E-01	-2.44080500E-04	8.73461500E-08
Column 1	9.83386800E+00	-2.76270000E-02	2.87432200E-05	-9.94673000E-09
Column 2	1.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
Column 3	-8.48815200E+01	2.77044900E-01	-2.98020200E-04	1.06901600E-07
Column 4	-1.48855500E+02	4.82454200E-01	-5.17877500E-04	1.85347500E-07
Column 5	-9.31938300E+01	3.02267700E-01	-3.23520900E-04	1.15494100E-07

RSR-nfm Red-Vertical SA coefficients...

	M0	M1	M2	M3
Column 0	9.03793700E+00	-2.48504800E-02	2.55599300E-05	-8.74453000E-09
Column 1	3.75023200E+02	-1.20569400E+00	1.29392400E-03	-4.62285500E-07
Column 2	9.08558500E+01	-2.90664600E-01	3.12609200E-04	-1.11784000E-07
Column 3	1.00000000E+00	0.00000000E+00	0.00000000E+00	0.00000000E+00
Column 4	1.89989500E+01	-6.00312500E-02	6.72272700E-05	-2.52571700E-08
Column 5	2.43612400E+01	-7.51385500E-02	8.20362300E-05	-3.03835200E-08

Appendix 34 - List of Solar Aureole Measurements at Titan.

This appendix summarizes the Solar Aureole (SA) data in the DISR Archive. The 'File #' corresponds to the index in the filename (i.e. File #*2* is SOLAR_*0002*_000312_9812.TAB). Additional data is also contained in the LABEL files of the Archive.

File #	Time (sec)	Temp (K)	Exp. (ms)	# of Cols	SA1 Mean	SA1 Max.	SA2 Mean	SA2 Max.	SA3 Mean	SA3 Max.	SA4 Mean	SA4 Max.	Sat?	Lamps
1	167.9	258.9	60	24	403.0	498	470.2	541	473.2	538	474.6	541		0000
2	193.0	259.1	60	4	2,588.9	3099	2,340.9	2565	1,789.1	2210	1,875.3	2243		0000
3	300.8	259.7	169	24	3,874.7	4095	4,046.6	4095	4,045.8	4095	4,046.8	4095	*	0000
4	311.9	259.7	239	4	11,406.0	13179	4,064.2	5222	2,178.7	4160	8,140.3	10596		0000
5	472.3	260.3	220	4	15,474.2	18795	16,185.0	18712	21,102.7	24570	20,922.6	24570	*	0000
6	488.9	260.3	17	24	127.7	159	146.7	174	148.2	171	147.6	171		0000
7	563.8	260.4	205	24	1,648.3	2038	1,930.6	2235	1,959.2	2258	1,985.6	2266		0000
8	585.2	260.4	110	4	5,324.6	6289	2,660.4	3502	1,941.5	4546	4,605.6	6620		0000
9	718.5	260.6	15	24	589.2	1007	615.7	996	606.2	951	592.5	902		1110
10	784.3	260.4	15	24	352.8	496	385.8	516	374.6	486	360.8	461		0000
11	807.5	260.2	0	24	17.5	19	18.1	20	18.1	20	17.7	19		0000
12	824.8	260.4	15	24	538.1	939	561.8	914	559.0	890	548.4	854		1110
13	915.2	260.3	205	4	9,834.1	12092	8,239.1	8831	7,267.1	9214	8,313.1	9452		0000
14	944.0	260.2	191	24	1,814.8	2273	2,131.9	2494	2,175.5	2510	2,215.6	2540		0000
15	976.0	260.2	209	4	11,376.9	13517	4,924.4	5832	3,486.3	7750	11,304.5	14787		0000
16	993.4	260.2	120	24	3,395.8	4095	3,633.4	4095	3,626.2	4095	3,613.4	4095	*	0000
17	1,056.5	260.0	166	4	22,273.9	24570	20,729.1	24570	24,193.7	24570	24,045.6	24570	*	0000
18	1,062.0	260.0	60	24	454.0	586	519.2	630	523.8	629	524.9	626		0000
19	1,139.2	259.6	83	4	11,549.3	15096	10,407.1	13582	17,938.9	22445	19,345.8	22958		0000
20	1,151.3	259.6	79	24	606.4	784	696.5	840	702.5	854	707.6	850		0000
21	1,248.0	259.2	41	4	2,127.7	2568	1,283.5	1417	1,236.0	2218	2,615.3	3331		0000
22	1,251.2	259.1	58	24	1,749.0	2873	1,890.9	2875	1,829.9	2747	1,768.8	2591	*	0000
23	1,320.4	258.7	143	4	17,551.1	23462	15,968.3	20241	23,074.4	24570	23,405.0	24570	*	0000
24	1,333.6	258.6	29	24	1,136.7	2271	1,206.1	2180	1,155.5	1992	1,106.5	1829	*	0000
25	1,460.5	257.6	14	24	121.9	157	138.3	166	139.7	170	140.2	168		0000
26	1,483.2	257.4	71	4	3,882.1	4652	2,183.5	2598	2,087.6	2982	5,357.9	6019		0000
27	1,554.2	256.7	87	24	711.3	929	814.6	995	825.3	1007	833.2	1015		0000
28	1,557.6	256.7	131	4	11,006.0	15026	9,725.1	12650	22,620.2	24570	23,052.9	24570	*	0000

File #	Time (sec)	Temp (K)	Exp. (ms)	# of Cols	SA1 Mean	SA1 Max.	SA2 Mean	SA2 Max.	SA3 Mean	SA3 Max.	SA4 Mean	SA4 Max.	Sat?	Lamps
29	1,631.4	255.8	66	4	5,792.0	7701	4,623.9	6670	11,856.3	22493	14,325.6	23782		0000
30	1,635.9	255.8	81	24	684.9	903	779.7	956	787.6	972	791.5	966		0000
31	1,720.9	254.8	34	4	1,984.2	2403	1,144.7	1441	1,149.7	1972	2,764.9	3510		0000
32	1,725.9	254.6	91	24	982.6	1403	1,102.0	1451	1,101.6	1444	1,101.7	1439	*	0000
33	1,811.3	253.5	126	4	8,168.7	10369	7,865.0	9633	19,893.7	24146	19,017.7	23955		0000
34	1,816.8	253.4	46	24	374.5	480	433.0	523	442.6	540	450.4	539		0000
35	1,898.9	252.1	15	24	530.8	927	553.4	916	548.8	884	539.5	850		1110
36	1,957.2	251.2	15	24	265.2	437	290.2	438	286.9	428	282.4	411		0000
37	1,978.5	250.8	0	24	12.0	13	12.2	14	12.4	14	12.1	14		0000
38	1,991.1	250.4	15	24	534.8	946	558.9	930	556.0	904	547.1	862		1110
39	2,019.6	250.0	63	4	3,161.8	3828	1,848.0	2125	1,883.9	2578	5,006.5	5432		0000
40	2,038.7	249.7	110	24	861.5	1142	976.4	1226	978.8	1227	975.9	1209		0000
41	2,121.4	248.0	129	4	6,212.1	7558	4,195.8	4977	5,026.6	6509	9,389.9	10090		0000
42	2,128.2	248.0	97	24	872.6	1181	983.7	1239	983.3	1253	980.1	1233		0000
43	2,230.4	245.7	141	4	8,606.7	11142	7,844.7	9723	21,261.7	24327	21,398.2	23964		0000
44	2,281.6	244.6	68	24	485.3	642	559.3	692	567.8	701	572.7	699		0000
45	2,334.1	243.4	71	4	5,260.1	6936	4,581.4	5934	15,559.9	21661	17,072.3	23220		0000
46	2,342.7	243.1	136	24	981.2	1293	1,135.2	1415	1,149.7	1420	1,160.1	1427		0000
47	2,427.6	241.0	138	24	1,022.3	1341	1,195.3	1470	1,216.7	1488	1,234.5	1493		0000
48	2,453.6	240.4	35	4	1,735.7	2097	1,076.0	1232	1,097.2	1412	2,657.6	2875		0000
49	2,510.8	238.9	15	24	546.1	971	574.1	950	567.8	927	559.6	882		1110
50	2,563.7	237.4	15	24	144.9	193	168.7	210	173.2	218	176.0	220		0000
51	2,579.3	236.8	0	24	10.0	11	10.0	11	10.1	11	10.0	11		0000
52	2,590.1	236.8	15	24	528.9	938	556.3	920	552.6	910	545.2	868		1110
53	2,639.2	235.4	117	24	816.9	1082	951.9	1182	966.0	1190	974.9	1199		0000
54	2,664.7	234.8	139	4	6,339.3	7873	4,006.5	4501	4,413.0	6126	9,853.8	10773		0000
55	2,720.8	233.2	143	24	2,247.3	4095	2,568.7	4095	2,608.5	4095	2,634.3	4095	*	0000
56	2,730.4	233.0	148	4	6,951.8	8479	4,325.7	4944	4,393.2	5531	10,714.7	11627		0000
57	2,811.2	230.9	71	24	629.4	850	740.6	922	759.4	953	773.6	971		0000
58	2,835.3	230.2	144	4	6,987.1	8510	5,667.1	6904	9,762.8	12798	11,775.9	13355		0000
59	2,909.7	228.1	126	4	5,940.9	7304	3,556.6	3993	3,262.1	4419	8,999.2	9954		0000
60	2,938.4	227.3	47	24	366.8	497	425.5	533	425.4	538	424.6	533		0000

File #	Time (sec)	Temp (K)	Exp. (ms)	# of Cols	SA1		SA2		SA3		SA4		Sat?	Lamps
					Mean	Max.	Mean	Max.	Mean	Max.	Mean	Max.		
61	3,050.9	224.2	75	24	490.5	659	574.3	719	578.0	720	579.3	712		0000
62	3,058.4	224.1	146	4	12,873.8	21253	10,936.4	18214	24,276.5	24570	23,678.3	24570	*	0000
63	3,132.0	222.1	157	24	1,319.0	1790	1,573.6	1971	1,614.7	2034	1,647.8	2060	*	0000
64	3,173.0	221.0	73	4	3,282.9	4078	2,747.1	3234	4,453.4	5225	4,738.9	5390		0000
65	3,206.7	220.2	156	4	12,179.4	18564	10,113.7	14593	24,231.1	24570	23,623.3	24570	*	0000
66	3,232.8	219.5	79	24	1,018.2	1883	1,166.7	1928	1,169.1	1851	1,159.4	1779	*	0000
67	3,319.7	217.3	39	24	272.0	367	326.1	400	333.3	407	338.6	411		0000
68	3,345.7	216.5	78	4	3,750.9	4559	3,087.6	3763	5,362.0	6977	6,153.1	7195		0000
69	3,418.0	214.8	138	24	882.8	1168	1,064.6	1304	1,086.6	1345	1,104.6	1348		0000
70	3,426.6	214.6	126	4	5,691.6	7079	3,740.8	4258	3,765.7	4468	8,069.2	9202		0000
71	3,473.3	213.4	144	24	936.6	1246	1,132.1	1394	1,157.5	1417	1,173.8	1423		0000
72	3,499.2	212.7	160	4	7,088.9	8669	4,876.0	5659	5,181.7	6239	10,050.3	11319		0000
73	3,589.4	210.5	154	24	961.0	1287	1,154.0	1432	1,165.2	1453	1,169.8	1445		0000
74	3,598.6	210.3	164	4	10,038.8	13289	8,525.7	10934	23,177.4	24570	22,622.5	24570	*	0000
75	3,712.8	207.7	82	4	3,395.8	4213	2,538.1	2941	3,144.0	3461	4,589.1	5287		0000
76	3,783.6	206.2	160	24	979.3	1311	1,195.1	1478	1,219.0	1501	1,232.7	1506		0000
77	3,834.7	205.1	182	4	9,516.4	12077	8,034.5	10008	20,437.2	24570	21,112.1	24570	*	0000
78	3,845.8	204.8	172	24	1,029.0	1387	1,257.3	1562	1,274.8	1587	1,289.4	1587		0000
79	3,909.2	203.5	173	24	1,069.3	1435	1,309.9	1623	1,332.1	1671	1,346.0	1651		0000
80	3,919.2	203.2	91	4	4,898.5	6406	4,164.5	5222	14,850.1	20492	15,987.0	21961		0000
81	4,004.2	201.5	47	4	2,118.8	2612	1,368.6	1554	1,164.5	1438	2,856.3	3321		0000
82	4,037.9	200.8	169	24	1,428.8	2142	1,746.2	2353	1,789.7	2430	1,824.6	2471	*	0000
83	4,092.9	199.7	165	4	8,123.6	10117	7,035.3	8676	16,856.7	21398	16,967.2	21407		0000
84	4,104.9	199.4	84	24	513.5	699	629.4	792	638.0	793	643.7	797		0000
85	4,183.9	198.0	87	4	4,485.4	5698	3,832.4	4785	11,406.1	15339	12,071.1	16599		0000
86	4,196.1	197.7	175	24	1,021.6	1388	1,262.1	1567	1,284.3	1599	1,295.9	1602		0000
87	4,277.1	196.3	61	4	2,670.9	3260	2,023.0	2409	2,675.0	3501	3,887.0	4589		0000
88	4,289.7	196.0	181	24	1,028.0	1395	1,267.2	1576	1,282.9	1590	1,291.7	1584		0000
89	4,372.7	194.6	154	4	7,521.4	9629	6,221.3	7723	18,086.9	24014	19,296.8	24570	*	0000
90	4,434.4	193.5	177	24	1,286.1	1861	1,577.9	2033	1,593.3	2041	1,597.8	2044	*	0000
91	4,936.6	187.9	77	4	3,071.7	3791	2,378.1	2821	3,030.1	3718	4,093.6	4861		0000
92	4,988.5	187.5	88	24	465.2	635	582.9	720	594.1	743	597.1	736		0000

File #	Time (sec)	Temp (K)	Exp. (ms)	# of Cols	SA1 Mean	SA1 Max.	SA2 Mean	SA2 Max.	SA3 Mean	SA3 Max.	SA4 Mean	SA4 Max.	Sat?	Lamps
93	5,230.0	185.4	209	24	1,367.1	2010	1,723.6	2227	1,769.0	2286	1,796.4	2340	*	0000
94	5,316.3	184.8	183	4	6,938.1	8531	5,191.2	6114	5,684.3	7027	8,911.2	10634		0000
95	5,805.4	181.3	201	4	7,087.2	8751	5,291.6	6194	5,246.3	6071	8,312.9	9929		0000
96	5,822.5	181.3	105	24	587.6	835	746.3	950	765.7	965	776.6	975	*	0000
97	6,173.9	179.2	234	4	8,032.4	9907	5,907.1	6946	5,482.6	6752	9,615.1	11576		0000
98	6,190.8	179.2	52	24	245.9	338	310.5	386	315.1	395	317.0	398		0000
99	6,481.3	177.6	165	24	851.8	1245	1,090.8	1409	1,108.7	1424	1,115.4	1427	*	0000
100	6,529.9	177.4	234	4	9,193.1	12381	7,636.8	10434	22,346.0	24570	21,836.0	24570	*	0000
101	6,819.7	176.0	83	24	347.0	482	448.5	562	457.6	568	462.1	574		0000
102	6,835.9	176.0	117	4	4,076.1	5288	3,359.4	4176	14,889.9	23790	15,635.7	24570	*	0000
103	7,154.4	174.6	58	4	1,886.1	2379	1,578.7	1931	3,912.2	5367	4,165.1	6212		0000
104	7,173.4	174.6	275	24	1,066.0	1485	1,392.1	1763	1,421.5	1788	1,436.1	1788		0000
105	7,467.5	173.5	292	24	1,063.9	1489	1,388.7	1746	1,419.5	1794	1,434.2	1797		0000
106	7,522.6	173.3	112	4	3,021.3	3762	2,184.7	2586	1,559.1	1721	3,253.1	4003		0000
107	7,827.3	172.4	323	4	8,097.8	10175	6,748.2	8213	9,815.3	12232	9,403.7	11787		0000
108	7,847.9	172.2	315	24	1,079.7	1525	1,417.0	1791	1,448.6	1827	1,471.0	1854		0000
109	8,224.9	171.4	202	24	617.3	866	807.3	1032	825.2	1047	834.6	1059		0000
110	8,233.9	171.4	374	24	1,120.2	1600	1,466.0	1874	1,498.6	1914	1,515.0	1924		0000
111	8,273.6	171.3	386	24	1,168.0	1649	1,534.3	1955	1,568.8	1992	1,588.9	2011		0000
112	8,419.6	170.9	321	24	983.1	1425	1,281.7	1663	1,305.7	1683	1,314.7	1687	*	0000
113	8,518.6	170.8	93	24	271.0	385	350.8	447	357.5	454	359.4	456		0000
114	8,714.2	170.4	380	24	1,059.8	1491	1,389.5	1786	1,420.8	1835	1,437.5	1827		0000
115	9,111.5	170.3	302	4	7,506.7	9140	5,590.2	6934	11,304.2	15157	11,791.2	17457		0001
116	9,133.3	170.2	202	24	625.9	882	821.6	1040	875.0	1084	913.2	1128		0001
117	9,479.8	171.3	208	4	5,258.8	6361	3,897.3	4836	7,867.5	10534	8,225.9	12177		0001
118	9,501.5	171.4	207	24	645.6	904	846.8	1065	901.8	1115	940.7	1160		0001
119	9,766.1	172.4	206	4	5,234.0	6342	3,877.8	4817	7,842.3	10533	8,222.7	12208		0001
120	9,828.8	172.6	207	24	656.4	911	852.9	1081	908.0	1120	943.6	1164		0001
121	10,093.4	174.1	204	4	5,235.3	6359	3,862.8	4814	7,855.5	10592	8,252.0	12192		0001
122	10,115.2	174.1	204	24	651.1	901	848.2	1059	900.3	1111	935.7	1159		0001
123	10,401.5	175.3	202	24	650.6	913	845.1	1062	900.2	1111	934.2	1148		0001
124	10,461.6	175.5	203	4	5,213.7	6327	3,842.6	4767	7,863.4	10649	8,282.6	12258		0001

File #	Time (sec)	Temp (K)	Exp. (ms)	# of Cols	SA1 Mean	SA1 Max.	SA2 Mean	SA2 Max.	SA3 Mean	SA3 Max.	SA4 Mean	SA4 Max.	Sat?	Lamps
125	10,707.0	176.6	200	4	5,162.9	6259	3,797.3	4713	7,803.8	10589	8,218.9	12223		0001
126	10,769.7	177.0	200	24	653.0	907	841.7	1064	894.3	1109	929.4	1141		0001
127	10,993.4	177.9	198	4	5,162.5	6251	3,782.6	4702	7,795.0	10572	8,227.2	12223		0001
128	11,056.0	178.2	198	24	654.3	898	836.7	1053	885.9	1096	918.4	1127		0001
129	11,279.8	179.2	198	4	5,161.9	6269	3,780.4	4682	7,832.0	10657	8,273.9	12275		0001
130	11,342.4	179.4	197	24	656.0	901	835.9	1048	884.1	1083	917.8	1130		0001
131	11,547.0	180.3	195	24	649.8	884	829.5	1045	878.9	1090	910.8	1118		0001
132	11,607.0	180.7	196	4	5,139.7	6208	3,753.5	4658	7,816.2	10625	8,268.8	12264		0001
133	11,812.0	181.5	194	4	5,095.7	6166	3,723.2	4634	7,776.2	10642	8,223.1	12223		0001
134	11,833.3	181.6	194	24	651.6	886	829.4	1041	878.1	1085	908.7	1108		0001
135	12,119.7	182.6	193	24	652.8	889	828.3	1040	874.6	1072	906.4	1112		0001
136	12,138.9	182.7	193	4	5,100.2	6160	3,714.1	4601	7,799.5	10706	8,260.7	12330		0001
137	12,406.1	183.7	191	24	649.8	877	821.4	1025	870.4	1078	901.2	1109		0001
138	12,425.2	183.7	191	4	5,069.1	6136	3,691.0	4592	7,771.5	10701	8,245.7	12294		0001
139	12,670.7	184.4	190	4	5,048.1	6126	3,666.2	4566	7,741.4	10625	8,221.8	12291		0001
140	12,692.4	184.6	190	24	653.0	892	824.7	1039	870.1	1069	901.1	1106		0001
141	12,916.1	185.2	189	4	5,040.4	6140	3,662.0	4541	7,730.1	10619	8,211.9	12263		0001
142	12,978.8	185.3	189	24	648.9	890	821.4	1031	868.2	1083	899.5	1106		0001

Appendix 35 -An Improved Method for Determining Dark Current in DISR CCD Exposures

May 20, 2012

Lyn Doose

Previous methods of determining the dark current present in DISR CCD exposures relied on a simple linear row dependence of the dark counts in the memory zone. The measured dark counts in exposures taken during the F16 flight checkout procedure permit a more accurate determination where each row (and perhaps each pixel) is allowed to have its own dark current "personality." Here we demonstrate this new method of dark current determination for the SLI Strip data.

The dark current on the CCD chip was measured during the F16 checkout, which occurred on November 23, 2004. Two measurements of each CCD area were obtained with both 1000 ms and 0.5 ms exposures, beginning at 02:33:09 and ending at 03:24:50 mission time. The dark count rates from the image zone can be determined by subtracting the short exposure from the long exposure, and the dark counts from the memory zone can be determined by subtracting the image zone counts in 0.5 ms from the shorter exposure. When this is done, the two sets of exposures show that the dark current is very consistent, with "hot" pixels repeating between the two sets. Figure 1 shows are comparison of the two 1000 ms counts from a small area of the Side-Looking-Imager used in the SLI strip data. A few pixels with high dark counts are noted in red, and a few with low counts are noted in green.

Table 1. 1000 ms dark SLI data at 03:04:12

Row	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
0	53	44	45	28	23	19	45	33
1	58	30	27	35	59	19	34	60
2	41	28	43	42	38	40	56	52
3	72	78	47	26	41	92	33	38
4	81	74	28	27	59	46	44	48
5	34	60	30	47	39	54	61	79
6	33	29	36	54	37	61	57	45
7	76	66	55	65	33	52	51	52
8	24	63	49	41	34	47	30	52
9	32	38	31	85	32	151	31	46
10	63	41	47	55	89	39	55	58
11	41	78	55	69	58	36	45	156
12	25	29	50	91	115	59	34	80
13	23	35	32	69	43	31	54	28
14	26	55	42	34	78	66	77	47
15	33	44	58	30	27	96	44	150

1000 ms dark SLI data at 03:11:01

Row	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
0	54	44	45	30	25	20	45	34
1	63	31	31	35	62	20	35	64
2	42	30	43	41	42	43	58	53
3	77	78	47	30	43	92	32	41
4	82	75	29	27	61	47	42	52
5	35	60	32	49	42	56	60	84
6	33	31	38	55	42	64	58	47
7	80	68	56	66	37	59	52	54
8	25	65	51	43	33	50	31	58
9	31	38	32	86	33	160	31	48
10	65	42	47	56	97	42	57	60
11	42	78	53	71	60	37	44	161
12	24	30	52	93	118	60	33	89
13	23	39	31	68	46	31	56	35
14	26	58	41	35	83	70	78	50
15	36	45	61	29	27	97	43	132

Inspection shows that pixels tend to closely repeat their values between the two exposures, indicating that the variation in the level of counts in the pixels is due to permanent characteristics of the pixels and not noise.

The following recipe is suggested for evaluation the dark counts in a CCD descent data set.

1. Determine the dark counts in the F16 1000 ms exposures by averaging to get the dark counts at the mid-time of the 1000 ms exposures.
2. Determine the dark counts in the F16 0.5 ms exposures by interpolating in time to get the dark counts at the mid-time of the 1000 ms exposures.
3. Subtract the electronic bias (assumed here to be 8.9 counts for each pixel). The remaining counts will all have a dependence on temperature.
4. Subtract the 0.5 ms exposure from the 1000 ms exposure to get image zone count rates in 999.5 ms. Divide by 999.5 to get image zone counts per ms.
5. Subtract the image zone counts in 0.5 ms from the 0.5 ms exposure counts to get memory zone counts.
6. Find nearby Dark data sets, and interpolate them in time to get dark counts at the mid-time of the 1000 ms exposures (described in step 1).
7. Subtract the bias from each dark pixel count and sum the remainders for all 4 x 256 pixels.
8. Interpolate in the Dark data set exposure times to get summed counts for a 10 ms Dark exposure time. The descent data contains many 10 ms Dark data sets.

The imager dark counts and rates should then be proportional to the Dark data set counts. Both should vary equally with temperature as the CCD chip cools during the real descent.

As a test of this method the dark counts in SLI strips were predicted for the F16 data. The predicted counts were then compared to actual measured counts in SLI strip data sets. Figures 1 - 4 show typical comparisons between actual and predicted dark counts. The IDL code which computes the SLI Strip dark model from the steps above and performs the comparison between real and predicted data is contained in Appendix 1.

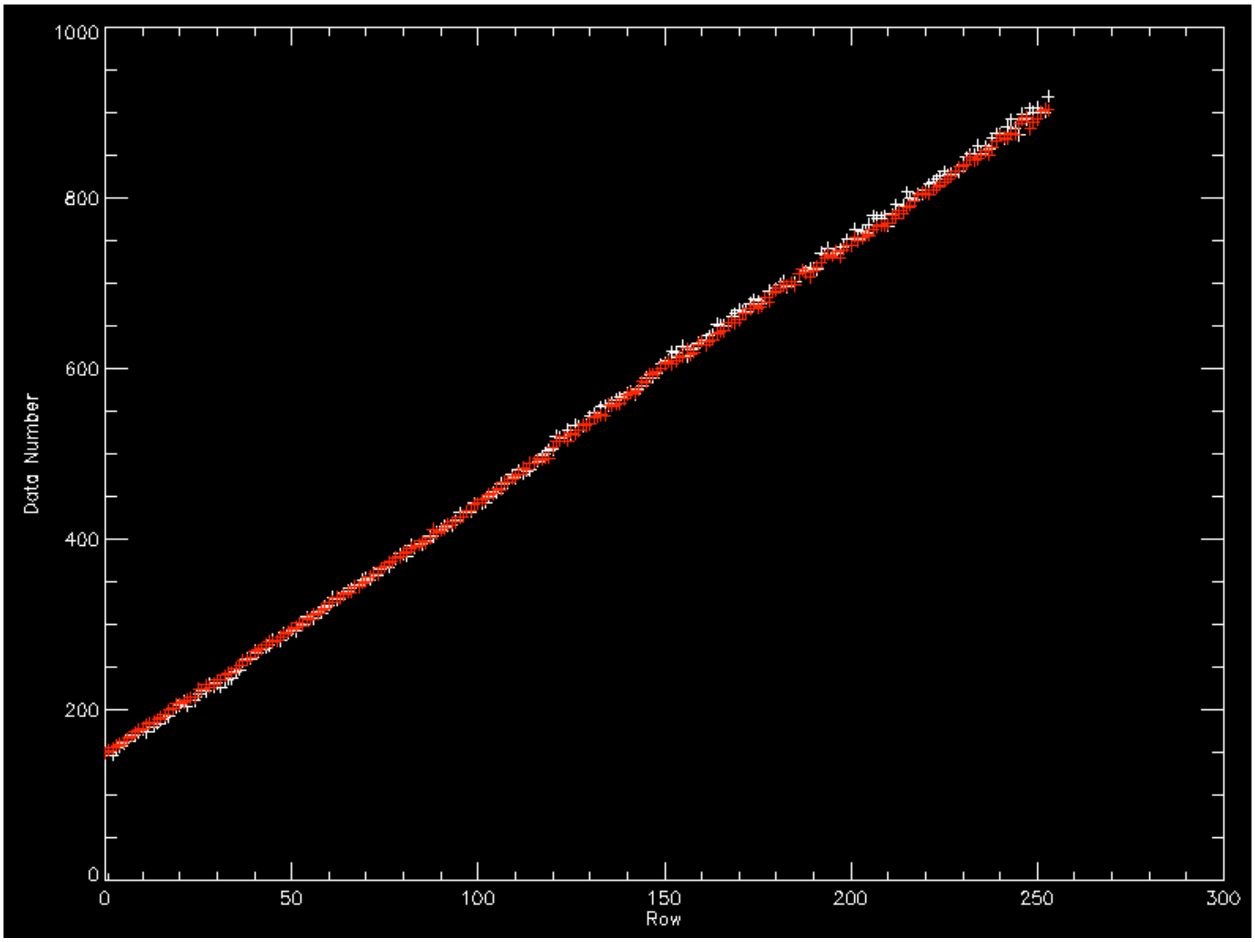


Figure 1. SLI Strip data from columns 6 – 18 of the SLI. White symbols are actual Strip data. Red symbols are predicted data. This is the first SLI strip of the F16 at 00:08:27.7770 mission time. The exposure time is 2.5 ms.

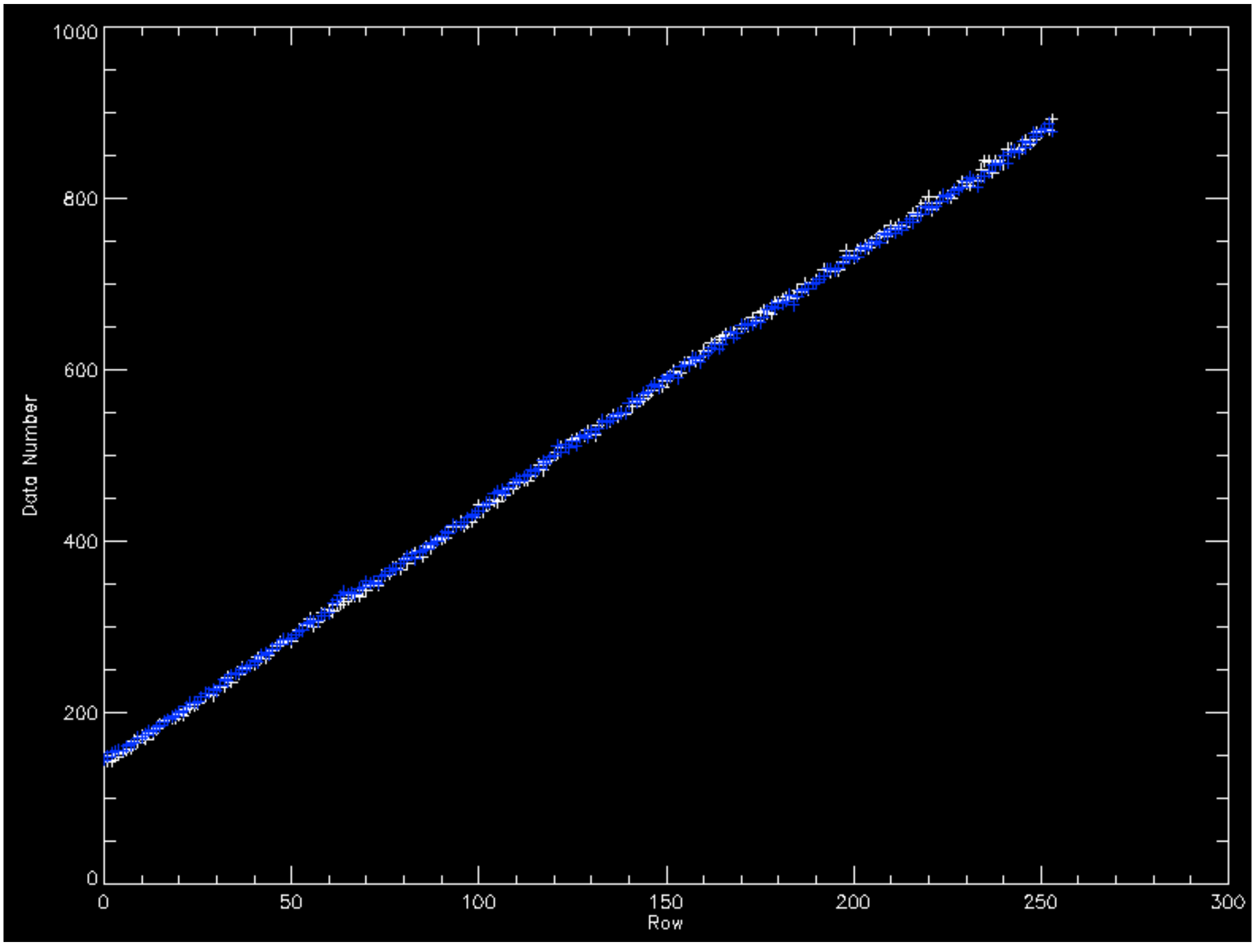


Figure 2. SLI Strip data from columns 109 – 121 of the SLI. White symbols are actual Strip data. Bluesymbols are predicted data. This is the first SLI strip of the F16 at 00:08:27.7770 mission time. The exposure time is 2.5 ms.

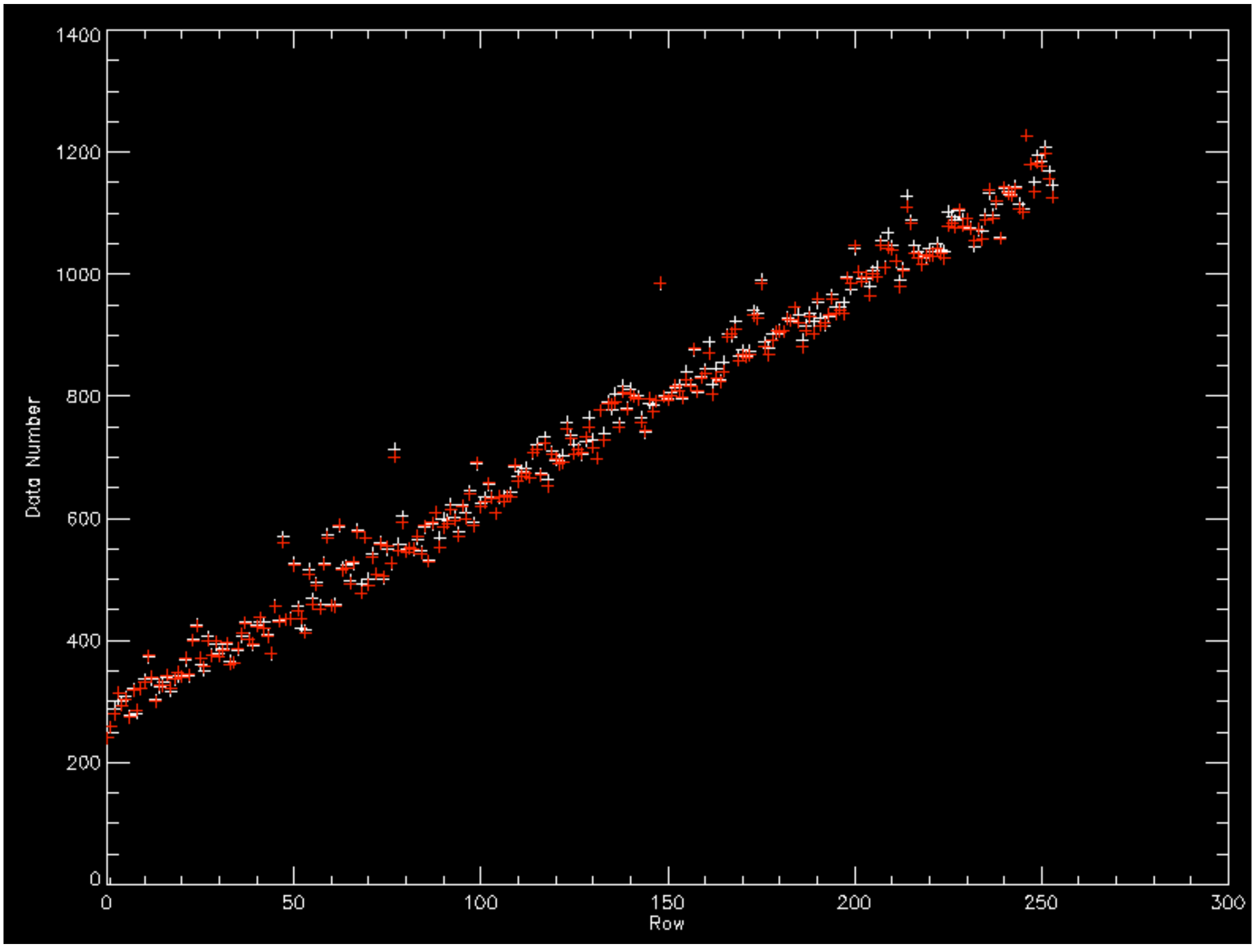


Figure 3. SLI Strip data from columns 6 – 18 of the SLI. White symbols are actual Strip data. Red symbols are predicted data. This is the last SLI strip of the F16 at 01:22:51.9926 mission time. The exposure time is 381.5 ms.

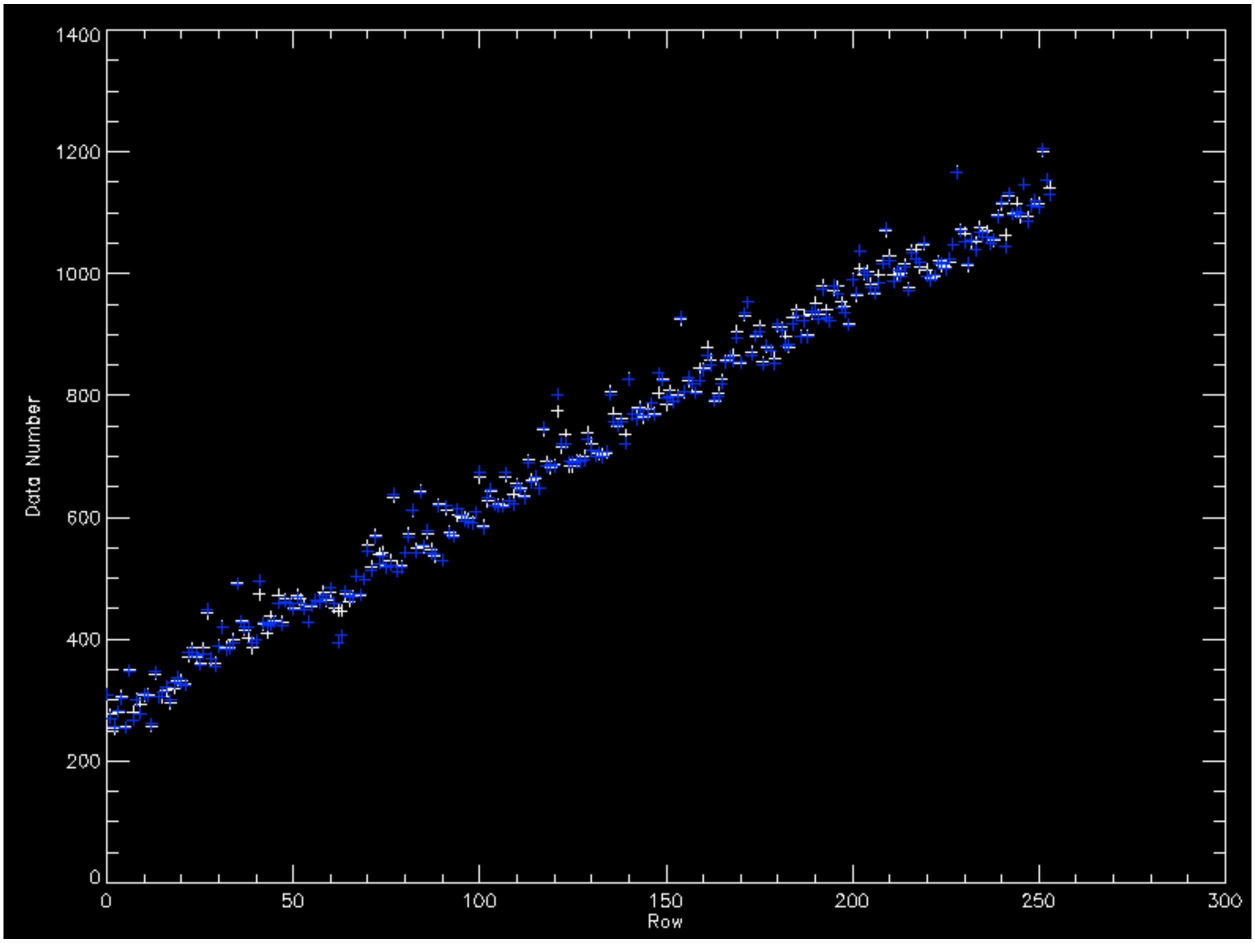


Figure 4. SLI Strip data from columns 109 – 121 of the SLI. White symbols are actual Strip data. Blue symbols are predicted data. This is the last SLI strip of the F16 at 01:22:51.9926 mission time. The exposure time is 381.5 ms.

Appendix A35-1. IDL code to create a dark model for SLI Strip data in the F16 checkout. The code is designed to run under IDL 6 on a windows platform. In this case the data is in XDR format (common to DISR raw data), and located on drive F as:

```
F:\df3\df3_3\23Nov04\Log\F16_all_23Nov04.1
```

```
pro strip_dark_current2

; Form a model of the SLI strip dark current using F16 imager data
; Read the uncompressed 1000 ms and 0.5 ms images
cd,'F:\df3\df3_3\23Nov04\Log\F16_all_23Nov04.1\DB\Image'

file1000a='V_00806I.MMX_03%11%06.1316_Img'
file1000b='V_00812I.MMX_03%24%49.1325_Img'
filep5a='V_00803I.MMX_03%04%17.1332_Img'
```

```
filep5b='V_00809I.MMX_03%18%00.1320_Img'
d_read,file1000a,h1000a,p1000a
d_read,file1000b,h1000b,p1000b
d_read,filep5a,hp5a,pp5a
d_read,filep5b,hp5b,pp5b

strip1000aleft=fltarr(254)
strip1000aright=fltarr(254)
strip1000bleft=fltarr(254)
strip1000bright=fltarr(254)
stripp5aleft=fltarr(254)
stripp5aright=fltarr(254)
stripp5bleft=fltarr(254)
stripp5bright=fltarr(254)

; Form the left and right strips for each input image and subtract the bias
for i=0,253 do begin
  strip1000aleft[i]=total(p1000a[6:18,i])-13.0*8.9
  strip1000aright[i]=total(p1000a[109:121,i])-13.0*8.9
  strip1000bleft[i]=total(p1000b[6:18,i])-13.0*8.9
  strip1000bright[i]=total(p1000b[109:121,i])-13.0*8.9
  stripp5aleft[i]=total(pp5a[6:18,i])-13.0*8.9
  stripp5aright[i]=total(pp5a[109:121,i])-13.0*8.9
  stripp5bleft[i]=total(pp5b[6:18,i])-13.0*8.9
  stripp5bright[i]=total(pp5b[109:121,i])-13.0*8.9
endfor

; Use the midtime between the two 1000 ms exposures as the reference time
mtp5a=d_value(hp5a,88)
mtp5b=d_value(hp5b,88)
mt1000a=d_value(h1000a,88)
mt1000b=d_value(h1000b,88)
midmtp5=(mtp5a+mtp5b)/2.0
midmt1000=(mt1000a+mt1000b)/2.0

; These are summed counts (without bias) interpolated to the midtime of the
1000 ms exposures
strip1000left=strip1000aleft+((midmt1000-mt1000a)/(mt1000b-
mt1000a))*(strip1000bleft-strip1000aleft)
strip1000right=strip1000aright+((midmt1000-mt1000a)/(mt1000b-
mt1000a))*(strip1000bright-strip1000aright)
stripp5left=stripp5aleft+((midmt1000-mtp5a)/(mtp5b-mtp5a))*(stripp5bleft-
stripp5aleft)
stripp5right=stripp5aright+((midmt1000-mtp5a)/(mtp5b-mtp5a))*(stripp5bright-
stripp5aright)

; (1000 counts - p5 counts) = Image zone counts in 0.9995 seconds exposure
time
strip995left=strip1000left-stripp5left
```

```
strip995right=strip1000right-stripp5right

; Compute image zone counts per ms at reference time
iz1msleft=strip995left/999.5
iz1msright=strip995right/999.5

; Subtract the image zone counts in 0.5 ms to get the memory zone counts at
this time
mzleft=stripp5left-(0.5/1.0)*iz1msleft
mzright=stripp5right-(0.5/1.0)*iz1msright

; Change two values of mzright based on visual editing
mzright[62]=325.0
mzright[63]=333.0

; Make sure we can reproduce the original data at 0.5 ms and 1000 ms
;repro1000left=mzleft+iz1msleft*1000.0
;repro1000right=mzright+iz1msright*1000.0
;reprop5left=mzleft+iz1msleft*0.5
;reprop5right=mzright+iz1msright*0.5
;plot,findgen(254),repro1000left,psym=1
;oplot,findgen(254),strip1000left,psym=1,color='0000FF'X
;plot,findgen(254),repro1000right,psym=1
;oplot,findgen(254),strip1000right,psym=1,color='0000FF'X
;plot,findgen(254),reprop5left,psym=1
;oplot,findgen(254),stripp5left,psym=1,color='0000FF'X
;plot,findgen(254),reprop5right,psym=1
;oplot,findgen(254),stripp5right,psym=1,color='0000FF'X

; Read the Dark data sets
cd,'F:\df3\df3_3\23Nov04\Log\F16_all_23Nov04.1\DB\Dark'

dark1000a='V_00112K.MMX_03%04%12.1312_Drk'
dark1000b='V_00114K.MMX_03%11%01.1317_Drk'
dark1000c='V_00116K.MMX_03%17%50.1321_Drk'
dark1000d='V_00118K.MMX_03%24%44.1325_Drk'
darkp5a='V_00111K.MMX_03%04%08.1312_Drk'
darkp5b='V_00113K.MMX_03%10%57.1317_Drk'
darkp5c='V_00115K.MMX_03%17%46.1322_Drk'
darkp5d='V_00117K.MMX_03%24%40.1325_Drk'

d_read,dark1000a,hd1000a,d1000a
d_read,dark1000b,hd1000b,d1000b
d_read,dark1000c,hd1000c,d1000c
d_read,dark1000d,hd1000d,d1000d
d_read,darkp5a,hdp5a,dp5a
d_read,darkp5b,hdp5b,dp5b
d_read,darkp5c,hdp5c,dp5c
d_read,darkp5d,hdp5d,dp5d
```

```
; Sum all the dark pixels and remove the bias
dsum1000a=total(d1000a)-256.0*4.0*8.9
dsum1000b=total(d1000b)-256.0*4.0*8.9
dsum1000c=total(d1000c)-256.0*4.0*8.9
dsum1000d=total(d1000d)-256.0*4.0*8.9
mtd1000a=d_value(hd1000a,88)
mtd1000b=d_value(hd1000b,88)
mtd1000c=d_value(hd1000c,88)
mtd1000d=d_value(hd1000d,88)
dsump5a=total(dp5a)-256.0*4.0*8.9
dsump5b=total(dp5b)-256.0*4.0*8.9
dsump5c=total(dp5c)-256.0*4.0*8.9
dsump5d=total(dp5d)-256.0*4.0*8.9
mtdp5a=d_value(hdp5a,88)
mtdp5b=d_value(hdp5b,88)
mtdp5c=d_value(hdp5c,88)
mtdp5d=d_value(hdp5d,88)

plot,[mtdp5a,mtdp5b,mtdp5c,mtdp5d],[dsump5a,dsump5b,dsump5c,dsump5d],/ynozero
,psym=1
;wait,5.0
plot,[mtd1000a,mtd1000b,mtd1000c,mtd1000d],[dsum1000a,dsum1000b,dsum1000c,dsu
m1000d],/ynozero,psym=1

; Interpolate the dark sums to the standard time (midmt1000)
lagrn2,[mtd1000a,mtd1000b,mtd1000c,mtd1000d],[dsum1000a,dsum1000b,dsum1000c,d
sum1000d],midmt1000,dark1000
lagrn2,[mtdp5a,mtdp5b,mtdp5c,mtdp5d],[dsump5a,dsump5b,dsump5c,dsump5d],midmt1
000,darkp5

; Interpolate to get dark for 10 ms exposure time
dark10=darkp5+((dark1000-darkp5)/(1000.0-0.5))*(10.0-0.5)

; The basic quantities for predicting strip dark currents are
; 1. The memory zone dark current at the standard temperature:  mzleft and
mzright
; 2. The image zone dark current per millisecond at the standard temperature:
iz1msleft and iz1msright
; 3. The mean Dark data set number (bias removed):  dark10
;
; The dark current for any Strip data set can be computed from
; Strip dark DN = (current dark)/dark10*(mzleft + iz1msleft*(exposure time in
ms)) + 13*8.9
; A similiar equations applies for the right strip.
; (current dark) is the mean of all the double pixels in the current Dark
data set with the bias removed
; The result will be the dark data number for each of the 254 strip rows.
```

```
; Test the model by computing the Strip dark DN for the Strip data sets in
the F16.

cd,'F:\df3\df3_3\23Nov04\Log\F16_all_23Nov04.1\DB\Strip'
files=t_getfil()
cd,'F:\df3\df3_3\23Nov04\Log\F16_all_23Nov04.1\DB\Dark'
darkfiles=t_getfil()

; Form a table of current dark DN vs mission time
nfiles=n_elements(darkfiles)
mtdark=fltarr(nfiles)
currentdark=fltarr(nfiles)
n=0
for i=0,nfiles-1 do begin
  d_read,darkfiles[i],h,p
  exptime=d_value(h,36)
  if exptime eq 10.0 then begin
    mtdark[n]=d_value(h,88)
    currentdark[n]=total(p)-256.0*4.0*8.9
    n=n+1
  endif
endfor
mtdark=mtdark[0:n-1]
currentdark=currentdark[0:n-1]
plot,mtdark,currentdark,psym=1,/ynozero

cd,'F:\df3\df3_3\23Nov04\Log\F16_all_23Nov04.1\DB\Strip'
files=t_getfil()
nfiles=n_elements(files)
for i=0,nfiles-1 do begin
;for i=nfiles-1,nfiles-1 do begin
  d_read,files[i],h,p
  mt=d_value(h,88)
; Override and set mt to standard time
;  mt=midmt1000
  lagrn2,mtdark,currentdark,mt,currd
  exptime=d_value(h,36)
; Override and set exptime to 1000 ms
;  exptime=1000.0
  predstripDNleft = currd/dark10*(mzleft + iz1msleft*exptime) + 13.0*8.9
  predstripDNright = currd/dark10*(mzright + iz1msright*exptime) + 13.0*8.9
; Override and set dark current factor to 1.0
;  predstripDNleft = (mzleft + iz1msleft*exptime)
;  predstripDNright = (mzright + iz1msright*exptime)
;  plot,findgen(254),strip1000left,psym=1
;  oplot,findgen(254),predstripDNleft,psym=1,color='0000FF'X
;  plot,findgen(254),strip1000right,psym=1
;  oplot,findgen(254),predstripDNright,psym=1,color='0000FF'X
  realstripDNleft = p[0,*]
```

```
  realstripDNright = p[1,*]
; Override and set real DNs to average of 1000 ms image DNs
;  realstripDNleft=(strip1000aleft+strip1000bleft)/2.0
;  realstripDNright=(strip1000aright+strip1000bright)/2.0
  window,0
  plot,findgen(254),realstripDNleft,psym=1,xtitle='Row',ytitle='Data Number'
  oplot,findgen(254),predstripDNleft,psym=1,color='0000FF'X
  window,1
  plot,findgen(254),realstripDNright,psym=1,xtitle='Row',ytitle='Data Number'
  oplot,findgen(254),predstripDNright,psym=1,color='FF0000'X
  for r=0,253 do begin
    print,r,realstripDNleft[r],predstripDNleft[r],realstripDNleft[r]-
predstripDNleft[r]
  endfor
  stupid=1
endfor

; Save the dark current constants to a file
close,1
openw,1,'C:\cal_soft\idl_programs\strip_dark_current_constants.dat'
for i=0,253 do printf,1,i,mzleft[i],iz1msleft[i],mzright[i],iz1msright[i]
close,1
end
```

Appendix 36 - IR spectrometer g structure

IR 'g' data structure explained. Housekeeping data included with the telemetry are sufficient to determine the times when the shutter was open and closed in each sector in each rotation of the instrument when IR data were collected. The “g” array in housekeeping telemetry is used as follows for this purpose.

The “g” array actually consists of three separate arrays: the Regions array, the Readings array, and the Bins array.

Regions Table...

Table A36-1. Example of Regions Array

Index	Regions (0,i)	Regions (1,i)	Regions (2,i)	Regions (3,i)	Regions (4,i)
i	region	100*starting location (degrees)	100*ending location (degrees)	Up bin number	Down bin number
0	1	0	4500	11	1
1	2	4500	7000	12	2
2	3	9000	13500	13	3
3	4	13500	18000	14	4
4	5	18000	22500	14	5
5	6	22500	27000	13	6
6	7	29000	31500	12	7
7	8	31500	36000	11	8

"Regions" is a 5 by N array where N is the number of regions each rotation is divided into. Each line contains the following 5 elements

(0,x) = Azimuth region number, from sun CCW viewed from above.

(1,x) = Start azimuth in integer 100th's of degrees. az = g.regions(1,x)/100.0

(2,x) = Ending azimuth in integer 100th's of degrees. az = g.regions(2,x)/100.0

(3,x) = Up bin index. Indicates the bin number (from Bins table) in which the ULIS data sum will be accumulated.

(4,x) = Down bin index. Indicates the bin number (from Bins table) in which the DLIS data sum will be accumulated.

Reading Table...

Table A36-2. A Portion of a Sample Readings Array

index	Reading(0,i)	Reading (1,i)	Reading (2,i)	Reading (3,i)	Reading (4,i)	Reading (5,i)
i	Rotation	Region	Start Time of this sector (0.0001*sec)	Collection Time (8.064 ms)	Shutter Time (8.064 ms)	Sample Time (8.064 ms)
0	1	3	40654412	342	168	84
1	1	4	40682152	342	168	84
2	1	5	40709972	342	168	84
3	1	6	40737713	342	168	84
4	1	7	40777710	190	92	46
5	1	8	40793193	342	168	84
6	1	1	40821014	342	168	84
7	1	2	40849964	190	92	46
8	2	3	40877704	346	170	85
9	2	4	40905686	346	170	85
10	2	5	40933588	346	170	85
11	2	6	40961489	346	170	85
12	2	7	41001890	190	92	46
13	2	8	41017292	346	170	85
14	2	1	41045274	346	170	85
15	2	2	41074707	190	92	46
16	3	3	41102689	346	170	85
17	3	4	41130752	346	170	85
18	3	5	41158895	346	170	85
19	3	6	41186958	346	170	85
20	3	7	41227439	194	94	47
21	3	8	41243164	346	170	85
22	3	1	41271227	346	170	85
23	3	2	41300741	194	94	47

The "Reading" table is a 6 by N*S array, where S is the number of probe spin rotations used for data gathering, and N (again) is the number of regions each rotation is divided into. It presents the data collection in chronological order.

Each line contains the following:

(0,x) = Rotation number (1 to S)

(1,x) = Region of rotation used. This often does NOT start with 1.

(2,x) = mission time at start of the rotation/region read in 10,000th's of a second.
Mission time (sec) = g.reading(1,x)/10000.0

(3,x) = IR spectrometer operation time (collection time) in this rotation/region.
Duration (msec) = g.reading(3,x)*8.064

(4,x) = IR shutter period for this rotation/region. This is the time the shutter stays fully open in units of 8.064 msec steps. In addition to this time, there are 2 * 8.064 msec steps at the end of each shutter open or shutter closed state to allow for the time it takes the shutter to change states. The normal sequence of operations is composed of shutter time/2 closed, transition to open, followed by shutter time open, transition to closed, followed by any integer number of complete shutter complete cycles, followed by shutter time/2 closed in each region and rotation.

(5,x) = IR sample time. This is the time to use to normalize all IR data into counts per second. Sample time (msec) = g.reading(5,x)*8.064 It is analogous to exposure time.

The number of cycles per row, and spectrometer operation time per row can be calculated from the Reading table entries by :

Number of Cycles = (Collection(raw) - 2)/(Shutter(raw)*2 + 4)

Operation Time (msecs) = ((Shutter(raw)*2*cycles + 4*cycles + 2)*8.064 msec, which is the same as the Collection time.

The number of shutter cycles in a collection is not stored in the reading array, and must be deduced from the above equation.

The Bins Table...

Table A36-3. A Sample Bins Array for elements (0,i to 5,i)

index	Bins (0,i)	Bins (1,i)	Bins (2,i)	Bins (3,i)	Bins (4,i)	Bins (5,i)
i	Bin number	Up/Down code, 0=DLIS, 1=ULIS	Shutter State, 1=open, 0=closed	Total shutter open time (sec's * 10,000)	Number of samples	Data table Column
0	1	0	0	40965	6	0
1	2	0	0	22417	6	1
2	3	0	0	40965	6	2
3	4	0	0	40965	6	3
4	5	0	0	40965	6	4
5	6	0	0	40965	6	5
6	7	0	0	22417	6	6
7	8	0	0	40965	6	7
8	1	0	1	40965	6	8
9	2	0	1	22417	6	9
10	3	0	1	40965	6	10
11	4	0	1	40965	6	11
12	5	0	1	40965	6	12
13	6	0	1	40965	6	13
14	7	0	1	22417	6	14
15	8	0	1	40965	6	15
16	11	1	0	81930	12	16
17	12	1	0	44835	12	17
18	13	1	0	81930	12	18
19	14	1	0	81930	12	19
20	11	1	1	81930	12	20
21	12	1	1	44835	12	21
22	13	1	1	81930	12	22
23	14	1	1	81930	12	23

The Bins table is a 6 by M array, where M in the number of rows of data in the pixel data array. It is not unusual for there to be a gap between the highest down bin number and the lowest up bin number (g.bins(0,*).

Each line contains the follow entries:

(0,x) = Bin ID number. This is NOT a continuous sequence.

(1,x) = Indicates if this bins is a DLIS or ULIS bin. 0 = DLIS (down bin), 1 = ULIS (up bin)

(2,x) = Indicates shutter state, open or closed. 0 = open, 1 = closed

(3,x) = Total shutter open data collection time over all rotations for that bin (region) in 10,000th's of a second. Total time (sec) = g.bins(3,x)/10000.0

(4,x) = Total number of samples taken with shutter open (or closed) for that bin (region)
g.bins(4,x) = sum of [#cycles * (shutter/sample)] for bin_i over all rotations.
g.bins(4,x) = Σ [#cycles*g.reading(4,i)/g.reading(5,i)] where g.reading(1,i) = g.bins(0,i)

(5,x) = Row of the pixel data array that corresponds to this bin.
Pixel(j,g.bins(5,x)) contains the per sample averaged data for bin g.bins(0,x)

The data production rate is calculated from the information in the Data Table and Bins table using the equation:

DN/sec = (data value closed – data value open)/ [0.0001*Bins (3,i)/Bins (4,i)].

DISR Bibliography
2nd February 2009

A list of papers associated with the conception, design, creation, execution, and data analysis of the DISR Huygens project.

TI: Titan: evidence for seasonal change-a comparison of Hubble Space Telescope and Voyager images
AU: Caldwell,-J.; Cunningham,-C.-C.; Anthony,-D.; White,-H.-P.; Groth,-E.-J.; Hasan,-H.; Noll,-K.; Smith,-P.-H.; Tomasko,-M.-G.; Weaver,-H.-A.
SO: Icarus-. May 1992; 97(1): 1-9

TI: Fused fiber image guides for planetary exploration
AU: Espitallier-D
SO: Proceedings-of-the-SPIE-The-International-Society-for-Optical-Engineering. 1996; 2611: 14-22
PB: SPIE-Int. Soc. Opt. Eng

TI: "The Descent Imager/Spectral Radiometer (DISR) instrument aboard the Huygens Probe of Titan",
AU: M.G. Tomasko, L.R. Doose, P.H. Smith, C. Fellows, B. Rizk, C. See, M. Bushroe, E. McFarlane, E. Wegryn, E. Frans, R. Clark, M. Prout and S. Clapp, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ, 85721, USA.
SO: SPIE Proceedings Series, Vol. 2803, p. 64 - 74, 1996.

TI: The Descent Imager/Spectral Radiometer (DISR) aboard Huygens.
AU: M.G. Tomasko, L.R. Doose, P.H. Smith, R.A. West, L.A. Soderblom, M. Combes, B. Bezard, A. Coustenis, C. deBergh, E. Lellouch, J. Rosenqvist, O. Saint-Pe, B. Schmitt, Hu. U. Keller, N. Thomas & F. Gliem. In A. Wilson, editor,
SO: Huygens -- Science, Payload and Mission, volume SP-1177:109-138, 1997.
PB: ESA Publications Division, ESTEC, Noordwijk, The Netherlands, August 1997.

TI: Private life of an integrating sphere: the radiant homogeneity of the Descent Imager-Spectral Radiometer calibration sphere
AU: Rizk,Bashar.
SO: Applied-Optics. 1 May 2001; 40(13): 2095-101
PB: Opt. Soc. America

TI: Inverse radiation modeling of Titan's atmosphere to assimilate solar aureole imager data of the Huygens probe.
AU: Grieger, B.; Lemmon, M.T.; Markiewicz, W.J.; Keller, H.U..
SO: Planetary & Space Science, (Feb 2003), Vol. 51 Issue 2, p147, 12p
PB: Elsevier
Abstract: During the descent of the Huygens probe through Titan's atmosphere in January 2005, the Descent Imager/Spectral Radiometer (DISR) will perform upward and downward looking measurements at various spectral ranges and spatial resolutions. This internal radiation density could be estimated by radiative transfer calculations for Titan's atmosphere. However, to do this, the optical properties (i.e. volume extinction coefficient, single scattering albedo and scattering phase function) have to be prescribed at every altitude, and these are apriori not known. Herein, an inverse approach is investigated, which retrieves the single scattering albedo and the phase function of the aerosols from DISR observations. The method uses data from a DISR subinstrument, the Solar Aureole imager (SA), to estimate the optical properties of the atmospheric layer between two successive observation altitudes. A unique solution for one layer can in principle be calculated directly from a linear system of equations, but due to the sparseness of the data and the unavoidable noise in the

measurements, the inverse problem is ill-posed. The problem is stabilized by the regularization method requiring smoothness of the resultant solution. A consistent set of solutions for all layers is obtained by iterating several times downward and upward through the layers. The method is tested in a simulated radiation density scenario for Titan, which is based on a microphysical aerosol model for the haze layer. Within this scenario, the expected coverage of SA data allows a reconstruction of the angular dependence of the scattering phase 90%. [ABSTRACT FROM AUTHOR; Copyright 2003 Elsevier]

TI: The Descent Imager/Spectral Radiometer (DISR) instrument aboard the Huygens Probe of Titan
AU: M. G. Tomasko, D. Buchhauser, M. Bushroe, L. E. Dafoe, L. R. Doose, A. Eibl , C. Fellows,. E. McFarlane, G. M. Prout, M. J. Pringle, B. Rizk, C. See, P. H. Smith and K. Tsetsenekos. Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ, 85721, USA.
SO: Space Science Reviews. 104 (1-4): 469-551, Annual 2002
PB: 2003 Kluwer Academic Publishers

TI: Simultaneous retrieval of optical depths and scattering phase functions in Titan's atmosphere from Huygens/DISR data.
AU: Grieger, B.; Rodin, A.V.; Salinas, S.V.; Keller, H.U..
SO: Planetary & Space Science, (Dec. 2003), Vol. 51 Issue 14/15, p991, 11p
PB: Elsevier
Abstract: In January 2005, the Huygens probe will descent through Titan's atmosphere and the Descent Imager/Spectral Radiometer (DISR) will perform upward and downward looking observations at various spectral ranges and spatial resolutions. One of the subinstruments, the Upward Looking Visible Spectrometer (ULVS), measures the total downward radiation flux including the direct solar beam and also, with a shadow bar over the Sun, the diffuse downward flux. The intensity of the direct solar beam and thus the optical depth can be calculated from the difference of these two measurements. But <f>10°</f> wide shadow bar also obscures the Solar Aureole Imager (SA) and therefore removes a considerable fraction of the diffuse downward radiation. This fraction can be estimated taking into account the brightness distribution of the SA which is estimated with the Titan Inverse Radiation Model (TIRM). Input to the model are a first guess of the optical depth in dependence on the altitude calculated directly from ULVS measurements and data from another DISR subinstrument, the Solar Aureole Imager SA imager. By assimilating the sparse SA data, TIRM yields a consistent estimate of the scattering phase function and the complete radiance field in dependence on the altitude. By iteratively correcting the initial optical depth estimation using the resultant radiance field and passing it again to TIRM, the model is used to simultaneously solve for optical depths and scattering phase functions. [ABSTRACT FROM AUTHOR; Copyright 2003 Elsevier]

TI: A spherical model for computing polarized radiation in Titan's atmosphere.
AU: Salinas, Santo V.; Grieger, Björn; Markiewicz, Wojtek J.; Keller, Horst U..
SO: Planetary & Space Science, (Dec 2003), Vol. 51 Issue 14/15, p977, 13p
PB: Elsevier
Abstract: The Huygens descent through Titan's atmosphere in January 2005 will provide invaluable information about Titan's atmospheric composition and aerosol properties. The Descent Imager/Spectral Radiometer (DISR) will perform upward and downward looking radiation observations at various spectral ranges and spatial resolutions. To prepare the DISR data interpretation we have developed a new model for radiation transfer in Titan's atmosphere. The model solves for the full three-dimensional polarized radiation field in spherical geometry. However, the atmosphere itself is assumed to be spherically symmetric. The model is initialized with a fast-to-compute plane-parallel solution based on the doubling

and adding algorithm that incorporates a spherical correction for the incoming direct solar beam. The full three-dimensional problem is then solved using the characteristics method combined with the Picard iterative approximation as described in Rozanov et al. (J. Quant. Spectrosc. Radiat. Transfer 69 (2001) 491). Aerosol scattering properties are calculated with a new microphysical model. In this formulation, aerosols are assumed to be fractal aggregates and include methane gas absorption embedded into the extinction coefficient. The resulting radiance of the model atmosphere's internal field is presented for two prescribed DISR wavelengths. [ABSTRACT FROM AUTHOR; Copyright 2003 Elsevier]

TI: Simulating Titan's tropospheric circulation with the Portable University Model of the Atmosphere
AU: B. Grieger, J. Segschneider, H. U. Keller, A. V. Rodin, F. Lunkeit, E. Kirk, and K. Fraedrich
SO: Advanced Space Research, 34(8), 1650--1654, doi:10.1016/j.asr.2003.08.079, 2004.
PB: Advanced Space Research

TI: "Recovering the Attitude of the Huygens Descent Module Using the DISR Data",
AU: B. Rizk, M.G. Tomasko, M.W. Bushroe, E. A. McFarlane and C. See.
SO: Proc. Int. Workshop 'Planetary Probe Atmospheric Entry and Descent Trajectory Analysis and Science'
PB: ESA SP-544: 183-189, 2004.

TI: SATURN AT LAST!
AU: Lunine, Jonathan I..
SO: Scientific American, (Jun 2004), Vol. 290 Issue 6, p56-63, 8p, 3 diagrams, 1c;
Abstract: Focuses on the journey of the Cassini-Huygens spacecraft to explore the solar system's second-largest planet, Saturn and its giant moon, Titan. Launch of the robotic spacecraft, the Cassini orbiter and the attached Huygens probe, from Cape Canaveral, Florida in 1997; Expectation for the spacecraft to go into orbit around Saturn in July 2004; Background on the mission and what is already known about Saturn and Titan; How the probe will investigate the planet's atmosphere, moons, rings and magnetic field during its four-year orbit; Indication that the Huygens probe will be sent toward Titan in December to study the surface for liquid hydrocarbons; How Cassini gained velocity through gravity assists after its launch; The probe's Descent Imager and Spectral Radiometer to take photos of the methane clouds; Interest in whether complex organic chemicals have evolved on Titan; Question of whether seas exist on Titan.

TI: Image data compressor for Huygens' DISR instrument compared to state of the art compression schemes
AU: Rueffer-P; Michalik-H; Gliem-F; Rabe-F
SO: IGARSS-2004.-2004-IEEE-International-Geoscience-and-Remote-Sensing-IEEE-Cat.-No.04CH37612. 2004: 2518-21 vol.4
PB: IEEE, Piscataway, NJ, USA

TI: Huygens Mission: Score a Big Win For International Effort.
SO: Aviation Week & Space Technology, 1/24/2005, Vol. 162 Issue 4, p58-58, 1/2p
Abstract: The article reports on the success of the European Space Agency (ESA) team in dropping the plucky Huygens probe down on the surface of Titan. It isn't surprising that the French engineers from Alcatel Space, the probe's prime contractor, found the early images from the Descent Imager/Spectral Radiometer strangely familiar. The team rallied when it realized that the initial mission plan wouldn't work because Cassini orbiter of National Aeronautics and Space Administration, would be moving away from the descending probe too fast for an

effective radio link. Under the steady leadership of ESA's Jean-Pierre Lebreton, the mission manager and project scientist, the truly international team that put the probe together and made it work has started reaping its rewards.

TI: Shading under Titan's sky.
AU: Grieger, B..
SO: Planetary & Space Science, (Apr 2005), Vol. 53 Issue 5, p577-585, 9p
PB: Elsevier
Abstract: During the descent of the Huygens probe in January 2005, its Descent Imager/Spectral Radiometer (DISR) will take the first close up images of Titan's surface. The shading imposed by the illumination of a planetary surface contains information on its topography. For planetary bodies without an optically thick atmosphere, the light can be assumed to stem from a point source. In this case, methods are available in order to estimate the shape of surface features from shading. The situation is quite different for Titan, as its atmosphere is optically thick at optical wavelengths. The sun is visible from the surface, but the illumination is dominated by diffuse radiance. In order to investigate the characteristics of shading under Titan's sky and to assess methods to retrieve the shape, different digital terrain models (DTMs) are used to simulate images according to different types of illumination. For an idealized DTM, the shape is retrieved from the shading in the simulated images. Deriving the shape from shading under Titan's sky using existing methods is only possible if the topography is relatively flat, i.e. in the absence of steep slopes. [ABSTRACT FROM AUTHOR; Copyright 2005 Elsevier];

TI: Huygens probe entry and descent trajectory analysis and reconstruction techniques.
AU: Atkinson, D.H.; Kazeminejad, B.; Gaborit, V.; Ferri, F.; Lebreton, J.-P..
SO: Planetary & Space Science, (Apr 2005), Vol. 53 Issue 5, p586-593, 8p
PB: Elsevier
Abstract: Cassini/Huygens is a joint National Aeronautics and Space Administration (NASA)/European Space Agency (ESA)/Agenzia Spaziale Italiana (ASI) mission on its way to explore the Saturnian system. The ESA Huygens Probe is scheduled to be released from the Orbiter on 25 December 2004 and enter the atmosphere of Titan on 14 January 2005. Probe delivery to Titan, arbitrarily defined to occur at a reference altitude of 1270km above the surface of Titan, is the responsibility of the NASA Jet Propulsion Laboratory (JPL). ESA is then responsible for safely delivering the probe from the reference altitude to the surface. The task of reconstructing the probe trajectory and attitude from the entry point to the surface has been assigned to the Huygens Descent Trajectory Working Group (DTWG), a subgroup of the Huygens Science Working Team. The DTWG will use data provided by the Huygens Probe engineering subsystems and selected data sets acquired by the scientific payload. To correctly interpret and correlate results from the probe science experiments and to provide a reference set of data for possible 'ground-truthing' Orbiter remote sensing measurements, it is essential that the trajectory reconstruction be performed as early as possible in the post-flight data analysis phase. The reconstruction of the Huygens entry and descent trajectory will be based primarily on the probe entry state vector provided by the Cassini Navigation Team, and measurements of acceleration, pressure, and temperature made by the Huygens Atmospheric Structure Instrument (HASI). Other data sets contributing to the entry and descent trajectory reconstruction include the mean molecular weight of the atmosphere measured by the probe Gas Chromatograph/Mass Spectrometer (GCMS) in the upper atmosphere and the Surface Science Package (SSP) speed of sound measurement in the lower atmosphere, accelerations measured by the Central and Radial Accelerometer Sensor Units (CASU/RASU), and the ... [ABSTRACT FROM AUTHOR; Copyright 2005 Elsevier];

TI: Power and Propulsion for the Cassini Mission.
AU: Johnson, Kevin S.; Cockfield, Robert D..
SO: AIP Conference Proceedings, 2005, Vol. 746 Issue 1, p232-239, 8p
PB: AIP
Abstract: Lockheed Martin contributions to the Cassini mission included power and propulsion for the spacecraft, the Descent Imager / Spectral Radiometer, DISR instrument for the Huygens Probe, as well as the Titan IVB launch vehicle. Cassini is currently in orbit around Saturn performing its primary science mission, investigating Saturn, its many moons, and its complex and beautiful ring system. The Space Power Programs organization in King of Prussia, Pennsylvania, an offsite of Lockheed Martin Space Systems Company, provided the three General Purpose Heat Source - Radioisotope Thermoelectric Generators (GPHS-RTGs) used to provide electric power to the spacecraft during its mission to Saturn and its moons. The RTGs were the same design as those used to power the Galileo spacecraft on its mission to Jupiter and its moons, and the ESA Ulysses spacecraft on its mission to explore the Sun. Three RTGS provided 880 Watts of electrical power to the spacecraft at the beginning of mission, shortly after launch, 50% more than the power available for the Galileo mission. Other papers will describe the extensive science instrumentation made possible by the abundance of continuous, reliable, and long-lived power, unprecedented for a deep space planetary mission. The Cassini Propulsion Module Subsystem is the largest interplanetary propulsion system ever to successfully enter orbit around another planet. The propulsion system was designed to be fully redundant for this critical, 11-year scientific mission to Saturn. The system was designed, assembled and tested at Lockheed Martin's Space Exploration Systems Company in Littleton, Colorado, before being delivered to the Jet Propulsion Laboratory, JPL in Pasadena California for integration and testing with the spacecraft. The bi-propellant system design holds 3,000 kg of Monomethyl Hydrazine, MMH and Nitrogen Tetroxide, NTO and uses 132 kg of High Purity Grade Hydrazine for 3-axis attitude control and Reaction Wheel...[ABSTRACT FROM AUTHOR];

TI: Topographic Mapping of the Huygens Landing Site on Titan,
AU: Brent A. Archinal, Martin G. Tomasko, Bashar Rizk, Larry A. Soderblom, Randolph L. Kirk, Debbie A. Cook, Elpitha Howington-Kraus, Tammy L. Becker, Mark R. Rosiek, and the DISR Science Team
SO: Asia Oceania Geosciences Society's 2nd Annual Meeting, Singapore, 2005 June 20-24. Abstact only.
PB: Asia Oceania Geosciences Society
Abstract: The Huygens probe successfully accomplished the first descent and landing on Saturn's moon Titan on 2005 January 14. The onboard Descent Imager-Spectral Radiometer (DISR) experiment1 included three imaging cameras: high resolution (HRI), medium resolution (MRI), and side looking (SLI), which returned the first ever high resolution (~60 m/pixel to a few mm/pixel) images of the surface of Titan. Approximately 596 separate images were returned. Many of these images were taken above ~40 km and showed no surface detail due to haze, or were repeated images of the same scene from the surface. Still, about 40% of the images show surface features of Titan (e.g. Figure 1). Although not possible in some areas due to lost images, we plan to photogrammetrically derive topographic information from these images, from which detailed geologic studies can proceed. As part of this process we expect to recover a history of spacecraft pointing and position, constrained in part by altimetry and Earth-based VLBI tracking, thus providing a trajectory estimate with which other (e.g. atmospheric) data can be associated. Planned products consist of a series of image mosaics, digital elevation models, and orthomosaics, at multiple resolutions and nested within each other as appropriate. We plan to present early versions of such products. Later efforts will also concentrate on

analyzing and merging the imaging and topographic information of these images with that of the Cassini RADAR, ISS, and VIMS imaging experiments, to develop a consistent global (horizontal and vertical) reference system for Titan to which these and future data sets can be referred. Reference: [1] M. Tomasko et al. Spc. Sci. Rev. 104, 469-551 (2002). Figure 1: A mosaic of 3 DISR HRI images (http://photojournal.jpl.nasa.gov/catalog/PIA07236)

TI: Titan Zonal Wind Corroboration via the Huygens DISR Solar Zenith Angle Measurement
AU: Michael Allison, David H. Atkinson, Michael K. Bird, Martin G. Tomasko
SO: Planetary Probe Entry Workshop, ESA SP-544, October 2003, pp. 125-130
PB: ESA Publications Division, ESTEC. Noordwijk, The Netherlands

TI: Observations of Titan's Surface and Atmosphere from the Descent Imager/Spectral Radiometer (DISR) on the Huygens Probe
AU: L. Soderblom, M. Tomasko, B. Archinal, T. Becker, B. Bézard, M. Bushroe, M. Combes, D. Cook, A. Coustenis, C. de Bergh, L. Dafoe, L. Doose, S. Douté, A. Eibl, S. Engel, F. Gliem, B. Grieger, T. Hare, K. Holso, A. Howington-Kraus, E. Karkoschka, H. Keller, R. Kirk, R. Kramm, M. Küppers, P. Lanagan, E. Lellouch, M. Lemmon, J. Lunine, E. McFarlane, J. Moores, M. Prout, B. Rizk, M. Rosiek, P. Rüffer, S. Schröder, B. Schmitt, C. See, P. Smith, N. Thomas, R. West
SO: AAS Division of Planetary Sciences meeting, 2005 September 4-9, Cambridge, UK. Abstract only. Number 2.06.
PB: AAS
Abstract: DISR characterized atmospheric radiation (350-1600 nm) and returned images and spectra of the surface of Titan. Linear polarization of the aerosol haze extending to the surface is i~50% at visible wavelengths. Monomers making up the aerosol particles are modeled at ~0.1 microns, several 100 monomers making up a haze particle. The extinction optical depth at the surface is ~4.5 at 531 nm, ~2 at 939 nm and ~0.5 at 1500 nm. The near-surface methane mole fraction is ~5% (relative humidity ~50%); methane fog or rain at the landing site is currently unlikely. Below ~8 km the eastward zonal wind dropped to <1m/s and reversed back to the west indicative of a boundary layer. Surface reflectance is ~0.13 at 531 nm, ~0.18 at 830 nm, decreasing to ~0.06 at 1500 nm consistent with dirty water ice. DISR images show brighter, higher terrains with stubby and higher-order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded gravels in a dry river bed. DISR-derived topography for the drainages in the bright terrain show extremely rugged terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: Topographic Mapping of the Huygens Landing Site on Titan
AU: Randolph L. Kirk, Brent A. Archinal, Martin G. Tomasko, Bashar Rizk, Larry A.Soderblom, Debbie A. Cook, Elpitha Howington-Kraus, Tammy L. Becker, Mark R. Rosiek, and the DISR Science Team
SO: AAS Division of Planetary Sciences meeting, 2005 September 4-9, Cambridge, UK. Abstract only. Number 46.08.
PB: AAS
Abstract: The Huygens probe successfully accomplished the first descent and landing on Saturn's moon Titan on 2005 January 14. The onboard Descent Imager-Spectral Radiometer (DISR) experiment[1] included three imaging cameras: high resolution (HRI), medium resolution (MRI), and side looking (SLI), which returned the first ever high resolution (~ 60 m/pixel to a few mm/pixel) images of the surface of Titan. Approximately 596 separate images were returned. Many images, taken above ~40 km, showed no surface detail due to haze; others were repeated images of the same scene from the surface. Still, about 40% of the images show surface features of Titan. We are analyzing these images

photogrammetrically to derive topographic information for as much of the landing area as possible, from which detailed geologic studies can proceed. As part of this process we expect to recover a history of spacecraft pointing and position, constrained in part by altimetry and Earth-based VLBI tracking, thus providing a trajectory estimate with which other (e.g. atmospheric) data can be associated. Planned products consist of a series of image mosaics, digital elevation models, and orthomosaics, at multiple resolutions and nested within each other as appropriate. The first such products will be shown; they indicate total relief of ~250 m in the higher albedo "highlands" near the landing point, with dark dendritic channels confined to the floors of canyons with side slopes up to 30 deg, indicating extremely active erosion. Later efforts will also concentrate on analyzing and merging the imaging and topographic information of these images with that of the Cassini RADAR, ISS, and VIMS imaging experiments, to develop a consistent global (horizontal and vertical) reference system for Titan to which these and future data sets can be referred. Reference: [1] M. Tomasko et al. Spc. Sci. Rev. 104, 469-551 (2002).

TI: First Analysis of the Infrared Spectra of Titan's Atmosphere and Surface from the Huygens/DISR Instrument
AU: B. Bézard, E. Lellouch, B. Schmitt, S. Douté, M. Tomasko, S. Engel
SO: AAS Division of Planetary Sciences meeting, 2005 September 4-9, Cambridge, UK. Abstract only. Number 51.11.
PB: AAS
Abstract: Throughout the descent and at the surface, the downward-looking (DLIS) and upward-looking (ULIS) infrared spectrometers from the DISR/Huygens instrument recorded spectra of the atmospheric radiation and of the surface at the landing site. These spectrometers cover the range 850--1700 nm with a resolution of 15--20 nm. ULIS measurements of the downward flux in the stratosphere are consistent with the 1.6 \% methane mole fraction inferred by Cassini/CIRS and Huygens/GCMS. ULIS spectra recorded in the lowest km of the atmosphere strogly vary in intensity depending whether the Sun is within the instrument field of view or not. The contrast in the methane windows, increasing from 4 at 940 nm up to 18 at 1600 nm, is strongly sensitive to the total aerosol optical depth. Using an aggregate haze particle model derived from visible spectra and solar aureole data from DISR, we derived optical depths of about 2 at 940 nm decreasing to 0.5 at 1600 nm. The set of ULIS spectra recorded during the descent provides constraints on the vertical profile of the aerosols in the range 150-40 km, using the residual intensity in the core of the methane bands. A constant-with-height particule concentration provides a good fit of the spectra whereas a cutoff in the lower stratosphere is at odds with the data. A spectrum at an altitude of 20 m with the DISR 20-W lamp turned on indicates a methane mole fraction of 5$\pm$1 \%, corresponding to a relative humidity of 50 \% near the surface. The reflectivity of the dark terrain at the landing site decreases from about 0.18 near 830 nm to 0.06 near 1500 nm and is relatively low and flat from 1500 to 1600 nm. This spectrum is consistent with water ice mixed with an unidentified dark material showing a featureless``blue slope'' in the infrared.

TI: Titan's surface and atmosphere observed by the DISR/Huygens instrument
AU: B. Bézard, and the DISR investigation team
SO: SF2A Scientific Highlights 2005, pp. 125-128
PB: EDP Sciences, Les Ulis, France
Abstract: The Descent Imager / Spectral Radiometer (DISR) aboard the Huygens probe measured solar radiation in the atmosphere of Titan and took images and spectra of its surface. A summary of the early data analysis is presented. The images taken by DISR show brighter highland regions with channel and river systems draining into relatively flat, dark lowland terrain. The reflectivity of

the dark terrain at the landing site reaches a maximum near 830 nm and decreases gradually at longer wavelengths. The infrared portion of the spectrum is consistent with dirty water ice but the nature and composition of the dark material forming the ``dirt'' is unknown. Several haze properties were determined. The haze extends from the highest measured altitude (150 km) down to the surface. Its optical depth is about 2 at 940 nm and decreases with wavelength. The particles are irregular and can be modelled as aggregates of several hundreds of 0.05-micron radius monomers. A methane mixing ratio of 5% +/-1% was inferred near the surface using a downward-looking spectrum at an altitude of 20 m with the DISR lamp turned on.

TI: Titan’s Surface as Viewed from the Huygens Probe by the Descent Imager/Spectral Radiometer
AU: L. Soderblom, M. Tomasko, B. Archinal, T. Becker, B. Bézard, M. Bushroe, M. Combes, D. Cook, A. Coustenis, C. de Bergh, L. Dafoe, L. Doose, S. Douté, A. Eibl, S. Engel, F. Gliem, B. Grieger, T. Hare, K. Holso, A. Howington-Kraus, E. Karkoschka, H. Keller, R. Kirk, R. Kramm, M. Küppers, P. Lanagan, E. Lellouch, M. Lemmon, J. Lunine, E. McFarlane, J. Moores, M. Prout, B. Rizk, M. Rosiek, P. Rüffer, S. Schröder, B. Schmitt, C. See, P. Smith, N. Thomas, R. West
SO: Geological Society of America, 2005 October 16-19, Salt Lake City, UT. Abstract only. Number 102-9.
PB: Geological Society of America
Abstract: The Descent Imager/Spectral Radiometer (DISR) aboard the Huygens Probe characterized atmospheric radiation (350-1600 nm) and returned images and spectra of Titan's surface. The near-surface methane mole fraction is ~5% (relative humidity ~50%); making methane fog or rain at the landing site unlikely at present. Below ~8 km the eastward zonal wind dropped to <1m/s and reversed back to the west indicative of a boundary layer. Surface reflectance is ~0.08 at 531 nm, ~0.13 at 830 nm, decreasing to ~0.1 at 1500 nm consistent with dirty water ice. DISR images show brighter, higher terrains with stubby and higher-order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded cobbles in a dry river bed. DISR-derived topography for the drainages in the bright terrain show extremely rugged terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: The Character of the Surface of Titan as viewed from the Cassini Orbiter and the Huygens Probe
AU: Soderblom, L. A.
SO: AGU, Fall Meeting 2005, abstract #U23A-04,12/2005
PB: American Geophysical Union [2005AGUFM.U23A..04S]
Abstract: Images of the surface of Titan continue to be acquired by three instruments aboard the NASA Cassini Orbiter (ISS or Imaging Science Subsystem, the Cassini RADAR, and VIMS or Visible and Infrared Mapping Spectrometer) and were acquired by one instrument (DISR or Descent Imager/Spectral Radiometer) aboard the ESA Huygens Probe during its descent to the surface in January 2005. ISS can image the surface globally and temporally down to about 1 km resolution. RADAR, unhampered by the atmosphere, acquires synthetic aperture images down to about 300 m but will cover only about 0.2 of the surface during the nominal mission. VIMS acquires spectral images the surface to about 1 km resolution through several atmospheric windows but with limited coverage at the highest resolution. The ISS, RADAR, and VIMS images reveal a surface rich in geological diversity. The images show ample evidence for volcanic, fluvial, lacustrine, eolian, and tectonic processes. DISR results reveal that the near-surface methane relative humidity is about 0.5, making methane fog or rain at the landing site unlikely at present. Below about 8 km the eastward zonal wind dropped to <1m/s and reversed back to the west indicative of a boundary layer.

Visible and near-infrared surface reflectance is consistent with dirty water ice. DISR images show brighter, higher terrains with stubby and higher-order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded gravels in a dry river bed. DISR-derived topography for the drainages in the bright terrain show extremely rugged terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: Rain, winds and haze during the Huygens probe's descent to Titan's surface.
AU: Tomasko-MG; Archinal-B; Becker-T; Bézard-B; Bushroe-M; Combes-M; Cook-D; Coustenis-A; de-Bergh-C; Dafoe-LE; Doose-L; Doute-S; Eibl-A; Engel-S; Gliem-F; Grieger-B; Holso-K; Howington-Kraus-E; Karkoschka-E; Keller-HU; Kirk-R; Kramm-R; Kuppers-M; Lanagan-P; Lellouch-E; Lemmon-M; Lunine-J; McFarlane-E; Moores-J; Prout-GM; Rizk-B; Rosiek-M; Rueffer-P; Schroder-SE; Schmitt-B; See-C; Smith-P; Soderblom-L; Thomas-N; West-R
SO: Nature, (8 Dec. 2005), Vol. 438 Issue 7069, p765-778, 14p, 13 graphs, 3c, 6bw
PB: Nature Publishing Group
Abstract: The irreversible conversion of methane into higher hydrocarbons in Titan's stratosphere implies a surface or subsurface methane reservoir. Recent measurements from the cameras aboard the Cassini orbiter fail to see a global reservoir, but the methane and smog in Titan's atmosphere impedes the search for hydrocarbons on the surface. Here we report spectra and high-resolution images obtained by the Huygens Probe Descent Imager/Spectral Radiometer instrument in Titan's atmosphere. Although these images do not show liquid hydrocarbon pools on the surface, they do reveal the traces of once flowing liquid. Surprisingly like Earth, the brighter highland regions show complex systems draining into flat, dark lowlands. Images taken after landing are of a dry riverbed. The infrared reflectance spectrum measured for the surface is unlike any other in the Solar System; there is a red slope in the optical range that is consistent with an organic material such as tholins, and absorption from water ice is seen. However, a blue slope in the near-infrared suggests another, unknown constituent. The number density of haze particles increases by a factor of just a few from an altitude of 150 km to the surface, with no clear space below the tropopause. The methane relative humidity near the surface is 50 per cent. [ABSTRACT FROM AUTHOR];

TI: Imaging technique of the DISR camera on the Huygens lander
AU: J. R. Kramm, H. U. Keller, R. Bredthauer, and M. Tomasko
SO: Scientific Detectors for Astronomy 2005, (edited by J. E. Beletic, J. W. Beletic, and P. Amico), pp. 199–204
PB: Springer, Dordrecht, The Netherlands, 2006.

TI: Topographic Mapping of the Huygens Landing Site on Titan: New Results and Error Analyses
AU: B. A. Archinal, M. G. Tomasko, B. Rizk, L. A. Soderblom, R. L. Kirk, E. Howington-Kraus, D. A. Cook, T. L. Becker, M. R. Rosiek, D. Galuszka, B. L. Redding, T. L. Hare, and the DISR Science Team
SO: Proceedings of the 37th Lunar and Planetary Science Conference, 2006 March 13-17, Houston, Texas), abstract no. 2089.
PB: Lunar and Planetary Science Institute, Houston, TX.
Abstract Summary: A new DTM of the hills near the Huygens landing site on Titan is presented, as generated from 5 DISR images. We describe our investigation of possible error sources, such as from the merging of DTMs from stereo pairs and from camera calibration.

TI: Charging and coagulation processes in Titan tholin haze as inferred from Huygens/DISR spectrophotometry data
AU: A.V. Rodin, Yu.V. Skorov, B. Grieger, S. Schroeder, H.U. Keller and M.G. Tomasko
SO: EGU 3rd General Assembly, April 02-07, Vienna, 1607-7962/gra/EGU06-A-09899
PB: European Geosciences Union, Geophysical Research Abstracts, Vol. 8, 09899
Abstract: We present a 1-D microphysical model of the aerosols in Titan atmosphere taking into account photochemical production, collisional and photoelectric charging, coagulation, sedimentation and eddy mixing on the tholin particles...

TI: Recent Results on Titan’s Surface from the Cassini Orbiter and Huygens Probe
AU: Soderblom, L.
SO: EGU 3rd General Assembly, April 02-07, Vienna, EGU06-A-01683, 2006
PB: European Geosciences Union, Geophysical Research Abstracts, Vol. 8, 01683
Abstract: Spectra and images of the surface of Titan continue to be acquired by the Cassini Radar and Cassini VIMS (Visible and Infrared Mapping Spectrometer) aboard the NASA Cassini Orbiter. Images and spectra were also acquired by DISR (Descent Imager/Spectral Radiometer) aboard the ESA Huygens Probe during its descent to thes urface in January 2005. Radar, unhampered by the atmosphere, acquires synthetic aperture images down to about 300 m and will cover about 0.2 of the surface during the nominal mission. VIMS acquires spectral images from 0.35 to 5.1 microns and can see clearly to the surface through several atmospheric windows in the near IR with a best resolution of 1-to-2 km. The RADAR and VIMS images reveal a surface rich in geological diversity: including evidence for volcanic, fluvial, lacustrine, eolian, and tectonic processes. The Radar images reveal vast regions pervaded by radar-dark longitudinal sand dunes. Correlation of the Radar and DISR images reveal the landing site to be about 40 km south of a region laced by these long, dark, longitudinal dunes; they are seen in both Radar and DISR SLI (side-looking) images. DISR images of regions near the landing site show brighter, higher terrains with stubby and higher order drainage systems that border darker, lower-lying plains scoured by flow. Surface images show rounded gravels in a dry river bed. Six new photogrammetric models using DISR stereo pairs reveal extremely rugged topography for the drainages in the bright terrain with slopes as high as 30 degrees. This suggests relatively rapid erosion by flows in the river beds resulting in the deeply incised valleys.

TI: Microphysical transition of tholin aerosols in Titan atmosphere.
AU: H.U. Keller, A.V. Rodin, Yu.V. Skorov, B. Grieger, and M.G. Tomasko
SO: American Geophysical Union, December 2006 (abstract #P21B-0)
Abstract: A rapid transition of the tholin particles scattering properties below approximately 80 km was observed by DISR during the descent of the Huygens probe. Single scattering albedo and volume extinction also show a stepwise increase. A self-consistent 1D microphysical model of the Titan tholin haze has been developed...

TI: Saturn’s Titan reveals earthlike surprises
AU: Rizk, Bashar
SO: Astronomy magazine (May 2006)

TI: By the Light of a Coppery Moon.
SO: Science, (19 May 2006), Vol. 312 Issue 5776, p977-977, 1/4p;
Abstract: The article reports that the U.S. National Aeronautics and Space Administration, the European Space Agency and the University of Arizona have released two videos showing the space satellite Huygens probing onto the surface of planet Saturn's moon Titan. The videos captured the landing, condensed

several hours of data taken by the spacecraft's Descent Imager/Spectral Radiometer. One of the videos discloses a readout of the craft's trajectory and other data.

TI: A new image of Titan Titan as seen from Huygens
AU: F. Raulina, M.-C. Gazeaua and J.-P. Lebreton
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1843-1844
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: On January 14, 2005, the Huygens atmospheric probe, after a 7-year journey attached to the Cassini Orbiter and 3 weeks of free flying on a ballistic trajectory, entered into the Titan's atmosphere. It carried six scientific instruments...

TI: Huygens’ entry and descent through Titan's atmosphere-Methodology and results of the trajectory reconstruction
AU: Bobby Kazeminejad, David H. Atkinson, Miguel Pérez-Ayúcar, Jean-Pierre Lebreton and Claudio Sollazzo
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1845-1876
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The European Space Agency's Huygens probe separated from the NASA Cassini spacecraft on 25 December 2004, after having been attached for a 7-year interplanetary journey and three orbits around Saturn. The probe reached the predefined NASA/ESA interface point on 14 January 2005 at 09:05:52.523 (UTC) and performed a successful entry and descent sequence. The probe softly impacted on Titan's surface on the same day at 11:38:10.77 (UTC) with a speed of about 4.54 m/s. The probe entry and descent trajectory was reconstructed from the estimated initial state vector provided by the Cassini Navigation team, the probe housekeeping data, and measurements from the scientific payload. This paper presents the methodology and discuss the results of the reconstruction effort. Furthermore the probe roll rate was reconstructed prior to the main entry phase deceleration pulse and throughout the entire descent phase under the main and drogue parachute.

TI: The Huygens Probe Descent Trajectory Working Group: Organizational framework, goals, and implementation
AU: David H. Atkinson, Bobby Kazeminejad, Jean-Pierre Lebreton, Olivier Witasse, Miguel Pérez-Ayúcar and Dennis L. Matson
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1877-1885
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: ...This paper presents an overview of the Descent Trajectory Working Group, including the history, rationale, goals and objectives, organizational framework, rules and procedures, and implementation.

TI: Huygens Probe descent dynamics inferred from Channel B signal level measurements
AU: Y. Dzierma, M.K. Bird, R. Dutta-Roy, Miguel Pérez-Ayúcar, D. Plettemeier and P. Edenhofer
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1886-1895
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The signal strength of the Huygens Probe Channel B transmission to the Cassini Orbiter was monitored during the Probe descent through Titan's atmosphere on 14 January 2005. A model of the Probe motion during the mission was constructed to include Probe spin, coning motion and tilt caused by varying

wind speeds. This simple model is sufficient to reproduce the most prominent features seen in the signal level measurements. It provides estimates of the coning and tilt angles as well as the direction of the Huygens coordinate axes over extended time intervals in the mission.

TI: DISR imaging and the geometry of the descent of the Huygens probe within Titan's atmosphere
AU: Erich Karkoschka, Martin G. Tomasko, Lyn R. Doose, Chuck See, Elisabeth A. McFarlane, Stefan E. Schröder and Bashar Rizk
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1896-1935
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The Descent Imager/Spectral Radiometer (DISR) provided 376 images during the descent to Titan and 224 images after landing. Images of the surface had scales between 150 m/pixel and 0.4 mm/pixel, all of which we assembled into a mosaic. The analysis of the surface and haze features in these images and of other data gave tight constraints on the geometry of the descent, particularly the trajectory, the tip and tilt, and the rotation of the Huygens probe...

TI: Descent motions of the Huygens probe as measured by the Surface Science Package (SSP): Turbulent evidence for a cloud layer
AU: Ralph D. Lorenz, John C. Zarnecki, Martin C. Towner, Mark R. Leese, Andrew J. Ball, Brijen Hathi, Axel Hagermann and Nadeem A.L. Ghafoor
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1936-1948
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The Huygens probe underwent vigorous short-period motions during its parachute descent through the atmosphere of Saturn's moon Titan in January 2005, at least some of which were excited by the Titan environment. Several sensors in the Huygens Surface Science Package (SSP) detect these motions, indicating the transition to the smaller stabilizer parachute, the changing probe spin rate, aerodynamic buffeting, and pendulum motions. Notably, in an altitude range of about 20–30 km where methane drops will freeze, the frequency content and statistical kurtosis of the tilt data indicate excitation by turbulent air motions like those observed in freezing clouds on Earth...

TI: Near-surface winds at the Huygens site on Titan: Interpretation by means of a general circulation model
AU: Tetsuya Tokano
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 1990-2009
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: This study aims at interpreting the zonal and meridional wind in Titan's troposphere measured by the Huygens probe by means of a general circulation model. The numerical simulation elucidates the relative importance of the seasonal variation in the Hadley circulation and Saturn's gravitational tide in affecting the actual wind profile. The observed reversal of the zonal wind at two altitudes in the lower troposphere can be reproduced with this model only if the near-surface temperature profile is asymmetric about the equator and substantial seasonal redistribution of angular momentum by the variable Hadley circulation takes place...

TI: Topography and geomorphology of the Huygens landing site on Titan
AU: Laurence A. Soderblom, Martin G. Tomasko, Brent A. Archinal, Tammy L. Becker, Michael W. Bushroe, Debbie A. Cook, Lyn R. Doose, Donna M. Galuszka, Trent M. Hare, Elpitha Howington-Kraus, Erich Karkoschka, Randolph L. Kirk,

Jonathan I. Lunine, Elisabeth A. McFarlane, Bonnie L. Redding, Bashar Rizk, Mark R. Rosiek, Charles See and Peter H. Smith
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 2015-2024
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The Descent Imager/Spectral Radiometer (DISR) aboard the Huygens Probe took several hundred visible-light images with its three cameras on approach to the surface of Titan. Several sets of stereo image pairs were collected during the descent. The digital terrain models constructed from those images show rugged topography, in places approaching the angle of repose, adjacent to flatter darker plains. Brighter regions north of the landing site display two styles of drainage patterns...

TI: Correlations between Cassini VIMS spectra and RADAR SAR images: Implications for Titan's surface composition and the character of the Huygens Probe Landing Site
AU: Laurence A. Soderblom, Randolph L. Kirk, Jonathan I. Lunine, Jeffrey A. Anderson, Kevin H. Baines, Jason W. Barnes, Janet M. Barrett, Robert H. Brown, Bonnie J. Buratti, Roger N. Clark, Dale P. Cruikshank, Charles Elachi, Michael A. Janssen, Ralf Jaumann, Erich Karkoschka, Stéphane Le Mouélic, Rosaly M. Lopes, Ralph D. Lorenz, Thomas B. McCord, Philip D. Nicholson, et al.
SO: Planetary and Space Science, November 2007, Volume 55, Issue 13, Pages 2025-2036
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: Titan's vast equatorial fields of RADAR-dark longitudinal dunes seen in Cassini RADAR synthetic aperture images correlate with one of two dark surface units discriminated as “brown” and “blue” in Visible and Infrared Mapping Spectrometer (VIMS) color composites...The dark dunes must be mobile on this very short timescale to prevent the accumulation of bright coatings. Huygens landed in a region of the VIMS bright and dark blue materials and about 30 km south of the nearest occurrence of dunes visible in the RADAR SAR images. Fluvial/pluvial processes, every few centuries or millennia, must be cleansing the dark floors of the incised channels and scouring the dark plains at the Huygens landing site both imaged by Descent Imager/Spectral Radiometer (DISR).

TI: Microphysical processes in Titan haze inferred from DISR/Huygens data
AU: A.V. Rodin, H.U. Keller, B. Grieger, Yu.V. Skorov, S. Schroeder, M.G Tomasko
SO: Icarus submitted 2007

TI: Latest news from Titan
AU: F. Raulin, M.-C. Gazeau and J.-P. Lebreton
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 571-572
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: Since the first publication of the Huygens in situ observations of Titan in Nature (Lebreton et al., 2005), many new results have been obtained, thanks to a more detailed analysis of the probe data, and by exploiting the synergy offered by complementary data sources allowing a multidisciplinary approach: data from the Cassini orbiter, from theoretical modelling, and from laboratory experimental studies...

TI: New laboratory measurements of CH4 in Titan's conditions and a reanalysis of the DISR near-surface spectra at the Huygens landing site
AU: D. Jacquemart, E. Lellouch, B. Bézard, C. de Bergh, A. Coustenis, N. Lacome, B. Schmitt and M. Tomasko
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 613-623
PB: Elsevier Ltd (http://www.elsevier.com)

Abstract: Laboratory spectra of methane-nitrogen mixtures have been recorded in the near-infrared range (1.0–1.65 μm) in conditions similar to Titan's near surface, to facilitate the interpretation of the DISR/DLIS (DISR—Descent Imager/Spectral Radiometer) spectra taken during the last phase of the descent of the Huygens Probe, when the surface was illuminated by a surface-science lamp...

TI: Measurements of Methane Absorption by the Descent Imager/Spectral Radiometer (DISR) During its Descent through Titan's Atmosphere
AU: M.G. Tomasko, B. Bézard, L. Doose, S. Engel, and E. Karkoschka
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 624-647
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: New low-temperature methane absorption coefficients pertinent to the Titan environment are presented as derived from the Huygens DISR spectral measurements combined with the in-situ measurements of the methane gas abundance profile measured by the Huygens Gas Chromatograph/Mass Spectrometer (GCMS)...

TI: Heat Balance in Titan's Atmosphere
AU: M.G. Tomasko, B. Bézard, L. Doose, S. Engel, E. Karkoschka and S.Vinatier
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 648-659
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The recent measurements of the vertical distribution and optical properties of haze aerosols as well as of the absorption coefficients for methane at long paths and cold temperatures by the Huygens entry probe of Titan permit the computation of the solar heating rate on Titan with greater certainty than heretofore...

TI: Optical properties of aerosols in Titan's atmosphere
AU: Yu.V. Skorov, H.U. Keller and A.V. Rodin
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 660-668
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: In the frame of fractal modeling of tholin aggregates we made a systematic analysis of their optical properties. Ballistic particle–cluster aggregation (BPCA) and diffusion-limited aggregation (DLA) of spherical primary particles (monomers) identical in material composition were considered...

TI: A Model of Titan's Aerosols Based on Measurements Made Inside the Atmosphere
AU: M.G. Tomasko, L. Doose, S. Engel, L.E. Dafoe, R.West, M. Lemmon, E. Karkoschka and C. See
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 669-707
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The descent imager/spectral radiometer (DISR) instrument aboard the Huygens probe into the atmosphere of Titan measured the brightness of sunlight using a complement of spectrometers, photometers, and cameras that covered the spectral range from 350 to 1600 nm, looked both upward and downward, and made measurements at altitudes from 150 km to the surface...

TI: Titan's aerosols; comparison between our model and DISR findings
AU: A. Bar-Nun, V. Dimitrov and M. Tomasko
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 708-714
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: Our model...describes the experimentally found polymerization of C2H2 and HCN to form aerosol embryos, their growth and adherence to form various aerosols objects...These loose fractal objects describe well the findings of DISR on the Huygens probe...

TI: The properties of Titan's surface at the Huygens landing site from DISR observations
AU: H.U. Keller, B Grieger, M Küppers, S.E. Schröder, Y.V. Skorov, M.G. Tomasko
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 728-752
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The descent imager/spectral radiometer (DISR) onboard the Huygens probe investigated the radiation balance inside Titan's atmosphere and took hundreds of images and spectra of the ground during the descent. The scattering of the aerosols in the atmosphere and the absorption by methane strongly influence the irradiation reaching the surface...

TI: The reflectance spectrum of Titan's surface at the Huygens landing site determined by the Descent Imager/Spectral Radiometer
AU: S.E. Schröder, H.U. Keller
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 753-769
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: The descent imager/spectral radiometer aboard the Huygens probe successfully acquired images and spectra of the surface of Titan. To counter the effects of haze and atmospheric methane absorption it carried a surface science lamp to illuminate the surface just before landing. We reconstruct the reflectance spectrum of the landing site...

TI: The Huygens scientific data archive: Technical overview
AU: O. Witasse, L Huber, J Zender, J-P Lebreton, etal
SO: Planetary and Space Science, April 2008, Volume 56, Issue 5, Pages 770-777
PB: Elsevier Ltd (http://www.elsevier.com)
Abstract: ...This paper presents an overview of the process the Huygens Data Archiving Working Group followed to develop and ingest the data set. A description of the data sets is also given.

Appendix 38 - DISR Temperatures

The following table reports the DISR temperatures in degrees Kelvin, as derived from all datasets.

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
144.3	258.8	266.1	269.6	143.2	270.0	282.0	259.0	264.2	275.7	274.0	287.2
148.8	258.8	266.1	269.6	283.8	271.2	433.2	259.5	264.3	275.9	273.4	287.8
149.0	258.7	266.1	269.6	436.4	272.0	523.2	259.6	264.4	276.0	273.1	288.4
182.7	259.0	266.9	269.5	528.1	272.3	700.6	259.1	264.4	276.0	272.4	289.0
208.1	259.2	267.0	269.4	715.3	272.7	808.0	258.9	264.3	275.9	271.8	289.4
236.5	259.5	267.0	269.4	781.6	272.7	957.9	258.1	264.2	275.8	271.2	290.1
242.9	259.5	267.0	269.4	789.9	272.7	1,047.9	257.5	264.2	275.7	270.8	290.8
282.0	259.6	261.8	263.8	822.2	272.7	1,137.9	256.8	263.9	275.7	270.3	290.8
283.1	259.7	261.8	263.8	832.4	272.7	1,227.9	255.8	263.7	275.4	269.7	290.9
283.3	259.7	261.8	263.8	958.8	272.7	1,317.9	254.7	263.5	275.0	269.0	291.7
291.7	259.7	261.8	263.7	1,049.5	272.5	1,407.9	253.1	263.1	275.0	268.1	292.0
298.6	259.7	261.8	263.7	1,139.4	272.3	1,531.2	250.8	262.6	274.5	266.8	292.4
331.2	259.9	262.0	263.5	1,229.1	272.0	1,621.2	248.8	262.2	274.1	265.5	292.8
353.9	260.0	262.2	263.4	1,318.5	271.6	1,711.2	246.7	261.5	273.7	264.6	293.2
380.1	260.1	262.2	263.3	1,408.9	271.1	1,801.2	244.3	260.8	273.0	263.2	293.4
433.2	260.2	262.3	263.1	1,532.8	270.2	1,891.2	241.9	260.2	272.5	261.8	293.7
436.3	260.2	262.3	263.1	1,622.1	269.4	1,979.0	239.2	259.1	271.8	260.3	293.8
436.8	260.2	262.3	263.1	1,711.7	268.5	2,094.8	235.3	258.1	271.0	258.2	294.1
446.3	260.2	262.3	263.0	1,802.5	267.4	2,228.2	230.4	256.5	269.8	255.6	294.8
448.8	260.2	262.3	263.0	1,897.7	266.2	2,318.2	227.0	255.5	268.7	253.6	295.2
448.9	260.2	262.3	263.0	1,955.9	265.4	2,408.2	223.7	254.1	268.0	251.7	295.2
459.9	260.2	262.3	263.0	1,959.4	265.3	2,498.2	220.2	252.7	266.7	249.6	295.6
520.0	260.5	262.3	262.6	1,989.7	264.9	2,579.9	217.0	251.4	265.5	247.8	295.5
523.2	260.5	262.3	262.6	2,006.4	264.6	2,703.1	212.5	249.2	264.2	244.9	296.0
523.3	260.5	262.3	262.6	2,095.5	263.1	2,793.1	209.2	247.6	263.4	242.9	296.2
523.9	260.5	262.3	262.7	2,229.0	260.6	2,883.1	206.1	245.9	263.4	240.8	296.2
537.8	260.5	262.3	262.6	2,320.6	258.8	2,973.1	203.0	244.1	263.1	239.0	296.5
542.0	260.5	262.3	262.5	2,410.0	256.8	3,113.2	198.6	241.2	263.5	236.0	296.6
542.0	260.5	262.3	262.6	2,509.2	254.6	3,203.2	195.9	239.4	263.3	234.1	296.7
558.3	260.5	262.3	262.3	2,561.9	253.4	3,293.2	193.5	237.5	263.4	232.4	297.2
699.6	260.6	262.3	261.8	2,566.7	253.2	3,383.2	191.0	235.5	263.2	230.5	296.9
700.6	260.6	262.3	261.7	2,588.3	252.8	3,473.2	188.7	233.5	263.1	228.9	297.0
719.5	260.8	262.7	261.5	2,615.4	252.0	3,563.2	186.7	231.6	263.1	227.3	297.3
719.6	260.8	262.7	261.5	2,705.7	249.9	3,653.2	184.6	229.4	263.0	225.9	297.3
785.0	260.7	262.4	261.2	2,794.3	247.6	3,794.2	181.7	226.2	263.0	223.9	297.3
785.2	260.8	262.6	261.2	2,885.4	245.4	3,884.2	180.0	224.3	263.0	222.5	297.2
808.0	260.5	262.1	261.1	2,975.5	243.1	3,974.2	178.5	222.3	262.3	221.3	297.3
824.8	260.5	262.1	260.9	3,115.4	239.6	4,064.2	177.0	220.3	262.0	220.2	297.3
825.4	260.5	262.1	261.0	3,205.0	237.3	4,154.3	175.6	218.3	261.5	219.1	297.3

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
834.2	260.4	262.0	261.0	3,295.3	235.1	4,244.3	174.2	216.3	260.7	218.1	297.3
836.8	260.2	261.9	260.9	3,383.8	232.9	4,335.6	173.0	214.3	259.9	217.1	297.3
850.0	260.4	262.0	260.8	3,475.4	230.8	4,495.4	172.4	211.0	258.7	215.5	297.2
850.2	260.4	262.0	260.8	3,566.2	228.8	4,856.4	172.2	204.1	255.7	212.5	297.0
860.1	260.5	261.9	260.7	3,656.0	226.8	5,194.9	172.4	198.2	252.8	210.3	296.5
870.9	260.3	261.9	260.7	3,796.3	223.8	5,534.9	172.5	193.0	250.1	208.3	296.0
906.0	260.3	261.9	260.5	3,885.1	221.9	5,726.2	172.2	190.3	248.8	207.6	295.6
957.9	260.2	261.6	260.2	3,976.2	220.1	6,067.4	172.4	185.7	246.4	206.4	294.8
960.8	260.2	261.6	260.2	4,065.4	218.4	6,405.7	172.0	181.7	244.5	205.6	294.0
961.2	260.2	261.6	260.2	4,155.7	216.7	6,736.6	172.3	178.2	242.7	205.0	293.2
969.2	260.2	261.5	260.1	4,245.3	215.0	7,063.1	172.4	175.3	241.1	204.6	292.4
974.6	260.2	261.5	260.0	4,337.1	213.4	7,384.4	172.2	172.6	239.6	204.2	291.6
992.0	260.2	261.5	259.9	4,861.1	206.9	7,717.7	172.1	170.4	238.1	204.0	290.8
999.7	260.2	261.4	259.9	5,199.2	204.0	8,046.4	172.1	168.5	236.7	204.1	289.9
1,028.9	260.0	261.4	259.8	5,538.2	201.5	8,222.7	171.9	167.7	235.9	203.9	289.5
1,047.9	260.0	261.4	259.5	5,538.9	201.5	8,320.4	172.2	167.3	235.6	204.2	289.2
1,051.5	260.0	261.2	259.5	5,539.6	201.5	8,417.3	172.1	166.9	235.1	204.1	289.1
1,051.7	260.0	261.2	259.5	5,543.0	201.5	8,516.3	172.0	166.6	234.8	204.2	288.8
1,056.8	260.0	261.2	259.4	5,545.0	201.5	8,614.2	172.1	166.4	234.4	204.2	288.7
1,065.8	259.9	261.1	259.4	5,545.7	201.5	8,711.9	172.3	166.0	234.1	204.2	288.3
1,066.9	260.0	261.2	259.4	5,547.1	201.5	8,810.5	172.4	165.8	234.1	204.4	288.2
1,070.8	260.0	261.1	259.3	5,547.8	201.5	8,891.2	172.0	165.7	234.0	204.8	288.0
1,100.6	259.7	261.0	259.0	5,549.8	201.5	8,975.3	171.9	165.8	233.9	204.9	287.6
1,137.9	259.7	260.7	258.7	5,551.9	201.5	9,370.3	172.2	168.0	234.4	207.4	287.1
1,138.4	259.7	260.7	258.6	5,552.6	201.5	9,690.7	172.1	170.7	235.9	209.8	286.7
1,139.3	259.6	260.7	258.6	5,554.6	201.5	10,001.4	172.2	173.9	237.6	211.9	286.4
1,142.4	259.7	260.7	258.6	5,556.7	201.4	10,311.4	172.4	177.0	239.3	213.6	285.9
1,143.3	259.7	260.7	258.6	5,557.4	201.4	10,609.5	172.1	179.7	240.9	214.5	285.7
1,143.5	259.7	260.7	258.6	5,558.7	201.4	10,904.5	172.7	182.1	242.2	215.7	285.6
1,147.4	259.7	260.7	258.6	5,559.4	201.4	11,182.0	173.5	184.2	243.5	216.5	285.7
1,175.8	259.5	260.5	258.2	5,560.8	201.4	11,462.6	174.4	185.9	244.4	217.2	285.4
1,227.9	259.2	260.1	257.5	5,561.5	201.4	11,744.2	175.3	187.6	245.4	217.7	285.2
1,229.8	259.2	260.1	257.5	5,563.5	201.4	12,307.2	176.9	190.6	247.0	218.9	285.0
1,232.9	259.2	260.1	257.5	5,564.2	201.4	12,588.4	177.6	191.8	247.8	219.3	285.0
1,235.2	259.2	260.0	257.5	5,566.3	201.4	12,864.9	178.1	192.9	248.4	219.7	284.9
1,235.8	259.2	260.0	257.5	5,568.3	201.4						
1,238.2	259.1	260.0	257.5	5,569.0	201.4						
1,239.0	259.2	260.0	257.5	5,570.4	201.4						
1,250.6	259.2	259.9	257.4	5,727.2	200.4						
1,317.9	258.7	259.1	256.6	6,069.5	198.5						
1,320.6	258.7	259.1	256.5	6,408.9	196.9						
1,323.2	258.7	259.1	256.4	6,737.6	195.5						
1,323.8	258.6	259.1	256.4	7,065.3	194.2						
1,326.6	258.7	259.1	256.4	7,385.6	193.1						

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
1,327.4	258.7	259.1	256.5	7,724.7	192.1						
1,332.8	258.6	259.1	256.4	8,046.9	191.2						
1,356.1	258.5	258.9	256.0	8,048.3	191.2						
1,407.9	258.0	258.3	255.5	8,049.0	191.2						
1,410.2	258.3	258.6	255.5	8,051.0	191.2						
1,413.8	258.0	258.1	255.4	8,053.1	191.2						
1,415.9	258.0	258.2	255.4	8,053.8	191.2						
1,422.2	257.9	258.1	255.2	8,055.8	191.2						
1,441.4	257.8	257.9	255.0	8,057.9	191.2						
1,503.0	257.3	257.1	254.1	8,058.6	191.2						
1,526.2	257.0	256.7	253.7	8,060.0	191.2						
1,531.2	257.0	256.7	253.7	8,060.6	191.2						
1,531.7	257.0	256.7	253.6	8,062.7	191.1						
1,536.1	257.0	256.7	253.6	8,064.8	191.1						
1,539.5	256.8	256.5	253.5	8,065.5	191.1						
1,553.3	256.8	256.3	253.3	8,066.8	191.1						
1,557.0	256.7	256.3	253.3	8,067.5	191.1						
1,572.9	256.5	255.9	253.0	8,069.6	191.1						
1,583.9	256.3	255.8	252.8	8,071.6	191.1						
1,621.2	255.9	255.5	252.3	8,072.3	191.1						
1,622.2	255.9	255.3	252.2	8,073.7	191.1						
1,623.1	255.9	255.2	252.3	8,074.4	191.1						
1,623.1	255.9	255.2	252.2	8,076.4	191.1						
1,626.4	255.9	255.1	252.2	8,078.5	191.1						
1,627.3	255.9	255.2	252.2	8,079.2	191.1						
1,627.5	255.9	255.2	252.2	8,080.5	191.1						
1,661.0	255.6	254.6	251.6	8,081.2	191.1						
1,711.2	254.8	253.9	250.8	8,083.3	191.1						
1,711.6	254.8	253.9	250.8	8,085.3	191.1						
1,711.7	254.8	253.9	250.8	8,232.2	190.7						
1,715.4	254.8	253.7	250.7	8,271.8	190.7						
1,716.4	254.8	253.7	250.7	8,320.9	190.6						
1,716.6	254.8	253.7	250.7	8,369.4	190.4						
1,729.4	254.6	253.5	250.4	8,417.8	190.3						
1,753.6	254.4	253.1	250.0	8,516.8	190.1						
1,801.2	253.6	252.2	249.1	8,566.1	190.1						
1,806.3	253.6	252.0	249.0	8,614.7	189.9						
1,806.5	253.6	252.0	249.1	8,664.5	189.8						
1,811.5	253.5	252.0	248.9	8,712.5	189.8						
1,820.7	253.4	251.8	248.7	8,762.8	189.7						
1,821.8	253.4	251.8	248.7	8,825.2	189.6						
1,826.0	253.2	251.7	248.6	8,832.0	189.6						
1,858.7	252.8	251.0	248.0	8,845.0	189.6						
1,891.2	252.3	250.4	247.3	8,850.2	189.6						

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
1,898.9	252.1	250.1	247.1	8,853.6	189.6						
1,899.2	252.1	250.1	247.1	8,857.0	189.6						
1,957.2	251.2	248.9	245.9	8,860.4	189.6						
1,957.5	251.2	248.9	245.8	8,863.9	189.6						
1,979.0	250.8	248.4	245.5	8,869.0	189.6						
1,981.2	251.9	248.4	245.4	8,879.2	189.6						
1,981.5	252.0	248.4	245.4	8,880.4	189.6						
2,006.2	250.3	247.7	244.8	8,882.2	189.6						
2,006.3	250.3	247.7	244.8	8,883.4	189.6						
2,011.8	250.2	247.5	244.7	8,888.4	189.6						
2,013.4	250.2	247.5	244.7	8,894.3	189.6						
2,013.7	250.2	247.5	244.7	8,895.4	189.6						
2,031.0	249.8	247.1	244.3	8,900.6	189.6						
2,050.1	249.5	246.6	243.8	8,903.5	189.6						
2,094.8	248.6	245.5	242.8	8,909.7	189.5						
2,095.4	248.5	245.3	242.8	8,914.6	189.5						
2,101.8	248.5	245.2	242.6	8,915.8	189.6						
2,102.1	248.5	245.2	242.7	8,918.0	189.5						
2,113.2	248.2	244.9	242.3	8,924.1	189.5						
2,120.3	248.1	244.8	242.2	8,932.1	189.5						
2,137.5	247.7	244.3	241.8	8,942.0	189.5						
2,155.9	247.4	243.8	241.4	8,950.3	189.5						
2,228.2	245.7	241.8	239.8	8,959.2	189.5						
2,229.2	245.8	241.7	239.7	8,967.5	189.5						
2,230.7	245.7	241.6	239.7	8,975.9	189.5						
2,237.7	245.5	241.4	239.6	8,984.1	189.5						
2,250.4	245.3	241.1	239.2	8,992.4	189.5						
2,252.3	245.2	241.1	239.2	9,000.7	189.5						
2,259.1	245.1	240.8	239.0	9,015.3	189.5						
2,304.6	244.1	239.5	237.9	9,373.3	190.2						
2,318.2	243.6	239.2	237.6	9,697.7	191.3						
2,318.6	244.1	239.2	237.6	10,002.3	192.5						
2,318.7	244.1	239.2	237.6	10,314.2	193.8						
2,324.7	243.5	238.9	237.4	10,610.8	195.0						
2,326.5	243.6	238.9	237.4	10,907.4	196.1						
2,326.8	243.6	238.9	237.4	11,183.5	197.2						
2,332.6	243.4	238.7	237.3	11,464.8	198.4						
2,374.2	242.4	237.4	236.3	11,746.0	199.6						
2,408.2	241.5	236.4	235.4	12,029.5	200.6						
2,409.9	241.4	236.4	235.4	12,308.5	201.6						
2,410.2	241.4	236.4	235.3	12,589.8	202.5						
2,416.6	241.3	236.1	235.2	12,865.9	203.2						
2,418.4	241.3	236.1	235.2								
2,418.5	241.3	236.1	235.2								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
2,425.4	241.1	235.9	235.0								
2,482.5	239.6	234.1	233.6								
2,498.2	239.2	233.6	233.3								
2,511.1	238.9	233.1	232.9								
2,511.3	239.0	233.3	232.9								
2,563.7	237.4	231.5	231.6								
2,564.2	237.7	231.6	231.5								
2,579.9	237.0	231.0	231.2								
2,580.9	237.6	231.0	231.2								
2,581.3	237.7	231.0	231.2								
2,619.9	236.0	229.7	230.2								
2,621.8	235.9	229.6	230.1								
2,622.1	235.9	229.6	230.1								
2,628.4	235.8	229.4	229.9								
2,630.2	235.7	229.4	229.9								
2,630.3	235.7	229.4	229.9								
2,672.4	234.6	228.0	228.8								
2,703.1	233.9	227.2	228.1								
2,705.9	233.7	227.0	228.0								
2,707.7	233.7	226.9	228.0								
2,707.9	233.7	226.9	228.0								
2,714.9	233.3	226.7	227.8								
2,717.0	233.2	226.6	227.8								
2,717.3	233.2	226.6	227.7								
2,775.5	231.8	224.8	226.2								
2,793.1	231.3	224.3	225.8								
2,794.3	231.3	224.2	225.8								
2,794.6	231.3	224.1	225.8								
2,800.8	231.1	224.1	225.6								
2,802.5	231.2	224.0	225.6								
2,802.8	231.2	224.0	225.6								
2,809.1	230.8	223.7	225.4								
2,866.7	229.3	222.1	224.1								
2,883.1	228.9	221.6	223.7								
2,885.1	228.8	221.4	223.6								
2,885.3	228.8	221.4	223.6								
2,894.0	228.5	221.1	223.4								
2,896.4	228.5	221.0	223.3								
2,896.9	228.5	221.0	223.3								
2,907.3	228.1	220.7	223.1								
2,954.0	226.9	219.3	221.9								
2,973.1	226.4	218.8	221.5								
2,973.3	226.3	218.8	221.4								
2,980.1	226.2	218.5	221.2								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
2,982.1	226.1	218.4	221.2								
3,006.9	225.5	217.7	220.6								
3,009.2	225.3	217.7	220.5								
3,020.1	225.1	217.4	220.2								
3,049.5	224.3	216.5	219.6								
3,113.2	222.6	214.6	217.9								
3,113.7	222.6	214.6	217.8								
3,115.4	222.5	214.5	218.0								
3,115.7	222.5	214.5	217.8								
3,123.5	222.4	214.2	217.7								
3,138.2	221.9	213.9	217.3								
3,139.9	221.9	213.8	217.3								
3,163.6	221.3	213.2	216.7								
3,203.2	220.2	212.1	215.8								
3,205.1	220.2	212.0	215.7								
3,207.0	220.2	211.9	215.7								
3,213.6	219.9	211.7	215.5								
3,215.5	219.8	211.7	215.5								
3,215.8	219.8	211.7	215.5								
3,241.0	219.2	211.0	214.9								
3,265.5	218.7	210.3	214.3								
3,293.2	218.0	209.7	213.7								
3,299.9	217.8	209.4	213.5								
3,301.8	217.8	209.4	213.4								
3,302.2	217.7	209.3	213.4								
3,308.6	217.5	209.2	213.3								
3,310.4	217.5	209.1	213.3								
3,310.6	217.5	209.1	213.3								
3,353.4	216.4	208.1	212.2								
3,383.2	215.6	207.3	211.4								
3,388.5	215.5	207.1	211.4								
3,390.4	215.4	207.1	211.3								
3,390.5	215.4	207.1	211.3								
3,397.6	215.3	206.9	211.2								
3,399.5	215.2	206.8	211.1								
3,399.9	215.2	206.8	211.1								
3,452.9	213.8	205.5	209.9								
3,473.2	213.4	205.0	209.5								
3,480.3	213.2	204.8	209.4								
3,482.2	213.1	204.8	209.3								
3,482.3	213.1	204.7	209.3								
3,489.6	213.0	204.6	209.1								
3,508.7	212.5	204.1	208.7								
3,509.1	212.5	204.1	208.7								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
3,549.2	211.5	203.1	207.8								
3,563.2	211.2	202.8	207.5								
3,567.7	211.1	202.7	207.4								
3,569.9	211.0	202.6	207.3								
3,570.2	211.0	202.6	207.3								
3,577.4	210.9	202.5	207.1								
3,579.3	210.9	202.4	207.1								
3,579.4	210.9	202.4	207.1								
3,626.4	209.7	201.3	206.0								
3,653.2	209.1	200.7	205.4								
3,653.4	209.1	200.7	205.4								
3,661.2	209.0	200.5	205.3								
3,663.2	208.9	200.4	205.1								
3,671.1	208.6	200.3	205.0								
3,692.9	208.2	199.8	204.5								
3,740.9	207.1	198.7	203.5								
3,763.3	206.5	198.2	203.1								
3,794.2	205.9	197.6	202.4								
3,801.7	205.8	197.4	202.2								
3,803.9	205.7	197.4	202.2								
3,812.0	205.5	197.2	201.9								
3,814.1	205.6	197.1	201.9								
3,814.3	205.6	197.1	201.9								
3,825.1	205.3	197.0	201.7								
3,864.8	204.4	196.2	201.0								
3,884.2	204.0	195.7	200.5								
3,885.3	203.9	195.4	200.4								
3,887.6	203.8	195.5	200.4								
3,888.1	203.8	195.5	200.4								
3,895.9	203.7	195.4	200.2								
3,898.1	203.7	195.4	200.2								
3,898.2	203.7	195.4	200.2								
3,950.0	202.6	194.4	199.2								
3,974.2	202.1	194.0	198.6								
3,981.8	201.9	193.8	198.4								
3,984.1	201.9	193.7	198.4								
3,984.2	201.9	193.7	198.4								
3,992.8	201.6	193.6	198.2								
4,015.5	201.2	193.2	197.8								
4,016.0	201.1	193.2	197.8								
4,057.9	200.4	192.4	196.9								
4,064.2	200.3	192.3	196.8								
4,068.4	200.2	192.2	196.7								
4,070.7	200.2	192.2	196.7								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
4,070.9	200.2	192.2	196.7								
4,079.6	199.9	192.0	196.5								
4,082.0	199.9	192.0	196.4								
4,082.5	199.9	192.0	196.4								
4,147.9	198.7	190.8	195.1								
4,154.3	198.5	190.7	195.1								
4,158.7	198.4	190.5	195.0								
4,161.1	198.3	190.5	195.0								
4,161.3	198.3	190.5	194.9								
4,170.2	198.2	190.3	194.8								
4,172.7	198.1	190.3	194.7								
4,173.2	198.1	190.3	194.7								
4,240.2	196.9	189.2	193.5								
4,244.3	196.8	189.1	193.3								
4,251.3	196.7	189.0	193.2								
4,253.8	196.6	188.9	193.1								
4,253.9	196.6	188.9	193.2								
4,263.1	196.5	188.8	193.0								
4,265.6	196.4	188.7	192.9								
4,266.2	196.4	188.7	192.9								
4,334.9	195.1	187.6	191.7								
4,335.6	195.1	187.6	191.7								
4,337.0	195.1	187.5	191.6								
4,337.4	195.1	187.5	191.6								
4,348.8	194.9	187.4	191.3								
4,348.9	194.9	187.4	191.4								
4,358.3	194.8	187.2	191.2								
4,394.6	194.0	186.6	190.5								
4,407.5	193.8	186.5	190.3								
4,495.4	192.6	185.7	188.7								
4,856.4	188.7	183.5	182.7								
4,869.0	188.5	183.3	182.4								
4,869.3	188.5	183.3	182.4								
4,882.3	188.3	183.3	182.2								
4,885.4	188.3	183.3	182.1								
4,899.3	188.2	183.2	181.9								
4,917.2	188.1	183.1	181.7								
4,954.7	187.7	182.8	181.1								
5,194.9	185.8	181.7	177.6								
5,195.0	185.7	181.7	177.6								
5,195.4	185.5	181.7	177.6								
5,208.2	185.5	181.6	177.3								
5,212.0	185.5	181.6	177.2								
5,246.7	185.3	181.5	176.8								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
5,295.5	184.9	181.2	176.2								
5,331.5	184.7	181.1	175.7								
5,534.9	183.1	180.3	173.1								
5,726.2	181.9	179.6	170.8								
5,739.7	181.8	179.5	170.6								
5,739.9	181.8	179.5	170.6								
5,752.6	181.7	179.5	170.4								
5,757.2	182.1	179.9	170.3								
5,769.1	181.6	179.5	170.2								
5,789.7	181.4	179.4	170.0								
5,850.3	181.1	179.2	169.3								
6,067.4	179.8	178.4	166.9								
6,077.8	179.7	178.4	166.8								
6,080.9	179.7	178.4	166.8								
6,093.0	179.7	178.4	166.8								
6,096.4	179.7	178.4	166.7								
6,125.0	179.4	178.3	166.4								
6,142.9	179.3	178.2	166.3								
6,159.5	179.3	178.2	166.1								
6,405.7	178.0	177.4	163.8								
6,411.5	178.0	177.4	163.8								
6,415.1	177.7	177.2	163.8								
6,427.9	178.0	177.4	163.7								
6,431.4	177.9	177.4	163.7								
6,448.5	177.7	177.3	163.6								
6,464.9	177.8	177.3	163.5								
6,511.1	177.5	177.2	163.1								
6,736.6	176.4	176.6	161.3								
6,750.2	176.4	176.6	161.2								
6,751.0	176.4	176.6	161.2								
6,767.1	176.3	176.6	161.1								
6,767.4	176.3	176.6	161.1								
6,780.9	176.2	176.6	161.0								
6,798.1	176.3	176.6	160.9								
6,816.3	176.0	176.5	160.7								
7,063.1	175.1	176.0	159.1								
7,065.1	175.1	175.8	159.1								
7,079.0	175.0	175.8	159.0								
7,082.9	174.7	175.6	158.9								
7,096.9	174.8	175.8	158.9								
7,101.6	174.8	175.8	158.9								
7,118.6	174.8	175.7	158.7								
7,134.1	174.8	175.7	158.7								
7,384.4	173.8	175.2	157.3								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
7,392.6	173.7	175.2	157.3								
7,393.4	173.7	175.2	157.3								
7,407.1	173.7	175.2	157.2								
7,411.1	173.6	175.1	157.1								
7,425.6	173.6	175.1	157.0								
7,448.0	173.6	175.1	157.0								
7,501.4	173.3	175.1	156.8								
7,717.7	172.6	174.6	155.7								
7,727.7	172.6	174.5	155.7								
7,731.9	172.6	174.6	155.7								
7,732.7	172.6	174.6	155.7								
7,746.8	172.6	174.5	155.7								
7,751.0	172.6	174.5	155.7								
7,767.1	172.5	174.5	155.5								
7,789.8	172.5	174.5	155.5								
8,046.4	171.8	174.0	154.7								
8,222.7	171.4	173.8	154.2								
8,222.8	171.4	173.9	154.2								
8,222.8	171.4	173.9	154.2								
8,271.4	171.3	173.8	154.1								
8,271.4	171.3	173.8	154.2								
8,280.6	171.3	173.8	154.2								
8,280.6	171.3	173.8	154.1								
8,320.4	171.1	173.8	154.1								
8,329.7	171.1	173.8	154.1								
8,329.7	171.1	173.8	154.1								
8,378.2	171.0	173.8	153.9								
8,378.2	171.0	173.8	153.9								
8,417.3	170.9	173.5	153.9								
8,417.4	170.9	173.6	153.9								
8,417.4	170.9	173.6	153.9								
8,426.5	170.9	173.6	153.9								
8,426.5	170.9	173.6	153.9								
8,516.3	170.9	173.6	153.7								
8,516.4	170.8	173.5	153.7								
8,516.4	170.8	173.5	153.7								
8,525.3	170.8	173.5	153.7								
8,525.3	170.8	173.5	153.7								
8,574.6	170.5	173.5	153.6								
8,574.6	170.5	173.5	153.7								
8,614.2	170.7	173.5	153.7								
8,623.3	170.7	173.4	153.6								
8,623.3	170.7	173.4	153.7								
8,673.2	170.5	173.5	153.5								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
8,673.2	170.5	173.5	153.5								
8,711.9	170.4	173.2	153.5								
8,712.0	170.4	173.4	153.5								
8,712.0	170.4	173.5	153.5								
8,721.3	170.4	173.4	153.5								
8,721.3	170.4	173.4	153.5								
8,771.7	170.4	173.2	153.4								
8,771.7	170.4	173.2	153.4								
8,810.5	170.3	173.3	153.4								
8,824.8	170.4	173.3	153.4								
8,824.8	170.4	173.3	153.4								
8,843.3	170.3	173.3	153.4								
8,843.3	170.3	173.3	153.4								
8,845.0	170.2	173.3	153.4								
8,845.1	170.2	173.3	153.4								
8,848.5	170.3	173.3	153.4								
8,848.5	170.3	173.3	153.4								
8,850.2	170.3	173.3	153.5								
8,850.2	170.3	173.3	153.5								
8,853.6	170.3	173.3	153.4								
8,853.6	170.3	173.3	153.4								
8,857.0	170.3	173.3	153.4								
8,857.0	170.3	173.3	153.4								
8,860.5	170.3	173.3	153.5								
8,860.5	170.3	173.3	153.5								
8,863.9	170.3	173.3	153.4								
8,863.9	170.3	173.3	153.4								
8,867.3	170.3	173.3	153.4								
8,867.3	170.3	173.3	153.4								
8,869.0	170.2	173.3	153.4								
8,869.0	170.2	173.3	153.4								
8,872.4	170.2	173.3	153.4								
8,872.5	170.2	173.3	153.4								
8,873.6	170.3	173.3	153.4								
8,873.6	170.3	173.3	153.4								
8,876.2	170.2	173.3	153.4								
8,876.3	170.2	173.3	153.4								
8,879.2	170.2	173.3	153.4								
8,879.3	170.2	173.3	153.4								
8,880.4	170.2	173.3	153.4								
8,883.4	170.1	173.3	153.5								
8,883.4	170.1	173.3	153.4								
8,888.4	170.3	173.3	153.4								
8,888.4	170.3	173.3	153.5								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
8,891.2	170.3	173.3	153.5								
8,891.3	170.3	173.3	153.4								
8,893.1	170.2	173.3	153.4								
8,893.1	170.2	173.3	153.4								
8,895.4	170.2	173.3	153.5								
8,895.4	170.2	173.3	153.5								
8,900.6	170.2	173.3	153.4								
8,900.6	170.2	173.3	153.5								
8,909.8	170.2	173.3	153.5								
8,909.8	170.2	173.3	153.5								
8,914.6	170.2	173.3	153.6								
8,914.6	170.2	173.3	153.6								
8,915.8	170.2	173.3	153.5								
8,915.8	170.2	173.3	153.5								
8,918.0	170.2	173.3	153.5								
8,918.0	170.2	173.3	153.6								
8,923.6	170.2	173.3	153.6								
8,923.7	170.2	173.3	153.6								
8,931.6	170.2	173.3	153.7								
8,931.6	170.2	173.3	153.7								
8,941.6	170.2	173.3	153.7								
8,941.6	170.2	173.3	153.7								
8,949.8	170.2	173.3	153.8								
8,949.8	170.2	173.3	153.8								
8,958.8	170.2	173.3	153.9								
8,958.8	170.2	173.3	153.9								
8,967.0	170.2	173.3	154.0								
8,967.0	170.2	173.3	154.1								
8,975.3	170.2	173.2	154.1								
8,975.4	170.2	173.2	154.2								
8,975.4	170.2	173.2	154.2								
8,983.7	170.2	173.2	154.2								
8,983.7	170.2	173.2	154.2								
8,992.0	170.2	173.2	154.3								
8,992.0	170.2	173.2	154.3								
9,000.3	170.0	173.2	154.5								
9,000.3	170.0	173.2	154.5								
9,030.1	170.1	173.2	154.9								
9,030.4	170.1	173.2	154.9								
9,050.9	170.2	173.3	155.3								
9,051.7	170.2	173.3	155.3								
9,066.8	170.2	173.3	155.6								
9,087.3	170.2	173.3	155.9								
9,129.4	170.2	173.4	156.7								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
9,370.3	170.9	173.8	161.1								
9,373.7	170.9	173.8	161.1								
9,378.2	170.7	173.5	161.2								
9,394.1	170.9	173.8	161.5								
9,398.6	170.7	173.6	161.5								
9,419.9	170.9	173.8	162.0								
9,439.2	171.0	173.9	162.3								
9,456.7	171.1	174.0	162.6								
9,690.7	172.1	174.6	166.4								
9,700.9	172.0	174.6	166.6								
9,705.5	172.1	174.8	166.6								
9,721.4	172.2	174.7	166.9								
9,725.6	172.3	174.7	166.9								
9,725.9	172.3	174.7	166.9								
9,783.9	172.5	174.9	167.8								
9,788.1	172.5	174.9	167.9								
10,001.4	173.5	175.6	170.7								
10,012.0	173.5	175.6	170.8								
10,012.3	173.5	175.6	170.9								
10,029.4	173.6	175.7	171.1								
10,032.7	173.4	175.5	171.1								
10,048.7	173.7	175.7	171.3								
10,069.1	173.8	175.8	171.6								
10,074.5	173.8	175.8	171.6								
10,311.4	175.1	176.4	174.3								
10,314.6	174.9	176.3	174.3								
10,319.1	175.5	176.8	174.3								
10,335.0	174.9	176.4	174.5								
10,339.5	175.0	176.5	174.5								
10,360.8	175.2	176.5	174.8								
10,397.6	175.3	176.7	175.2								
10,421.0	175.4	176.7	175.5								
10,609.5	176.3	177.1	177.1								
10,621.4	176.3	177.1	177.1								
10,625.9	176.3	177.1	177.2								
10,643.0	176.4	177.2	177.3								
10,646.3	176.5	177.2	177.4								
10,667.1	176.5	177.3	177.5								
10,688.1	176.5	177.3	177.7								
10,723.7	176.8	177.5	178.0								
10,904.5	177.5	177.9	179.3								
10,907.8	177.5	177.9	179.3								
10,912.3	177.8	178.3	179.4								
10,928.2	177.5	177.9	179.4								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
10,932.7	177.5	177.9	179.5								
10,952.9	177.6	178.0	179.5								
10,970.3	177.8	178.2	179.7								
10,974.5	177.9	178.1	179.8								
11,182.0	178.7	179.1	181.2								
11,194.1	178.7	179.2	181.3								
11,198.6	178.8	179.2	181.3								
11,215.8	178.8	179.2	181.5								
11,219.1	178.7	179.2	181.5								
11,239.8	179.0	179.3	181.6								
11,296.4	179.2	179.6	181.9								
11,301.7	179.3	179.6	182.0								
11,462.6	180.1	180.1	182.8								
11,464.6	180.2	180.5	182.8								
11,480.5	180.2	180.3	183.0								
11,485.0	180.1	180.2	183.0								
11,500.9	180.2	180.3	183.1								
11,506.3	180.2	180.3	183.1								
11,543.0	180.4	180.4	183.3								
11,566.5	180.4	180.6	183.5								
11,744.2	181.2	181.2	184.4								
11,746.4	181.4	181.2	184.4								
11,750.9	181.1	181.1	184.4								
11,771.0	181.4	181.4	184.5								
11,771.3	181.4	181.4	184.5								
11,788.5	181.4	181.4	184.7								
11,792.6	181.4	181.5	184.7								
11,807.8	181.5	181.5	184.7								
12,307.2	183.3	183.2	186.8								
12,319.1	183.4	183.2	186.8								
12,323.6	183.3	183.1	186.8								
12,339.6	183.6	183.3	186.8								
12,344.1	183.5	183.3	186.9								
12,361.2	183.5	183.3	187.0								
12,365.4	183.5	183.3	187.0								
12,384.7	183.6	183.4	187.0								
12,588.4	184.2	184.0	187.7								
12,589.6	184.7	184.0	187.6								
12,589.7	184.7	184.0	187.6								
12,605.5	184.3	184.1	187.7								
12,610.0	185.2	184.9	187.7								
12,625.9	184.3	184.1	187.8								
12,647.6	184.5	184.1	187.8								
12,651.7	184.4	184.1	187.8								

Time (sec)	CCD Chip (t15)	CCD Lug (t09)	Violet (t16)	Time (sec)	Ir Chip (t08)	Time (sec)	Strap (t10)	Optics (t11)	Aux Board	SH Box (t13)	EA Box (t14)
12,864.9	184.9	184.7	188.5								
12,875.6	185.1	184.7	188.5								
12,875.9	185.1	184.7	188.6								
12,893.0	185.1	184.7	188.6								
12,896.3	185.0	184.7	188.6								
12,912.3	185.1	184.7	188.7								
12,932.8	185.2	184.8	188.7								
12,938.1	185.2	184.8	188.7								

Appendix 39 - Column Headers for Visible Spectrometer Derived Data Products

The Visible Spectrometer data in the Derived Data Products directory of the PDS (hpdisr_0001\DATA\DERIVED_DATA_PRODUCTS) is somewhat difficult to use because the table columns (in the .TAB file) have no headers. To alliveate this problem we hereby supply the column headers for those two files (ULVS_DDP.TAB & DLVS_DDP.TAB)

Here is a brief description of the column abbreviations:
seq - Sequence number of the dataset, corresponds to ID number in PDS spectra file name.
cycle - Descent cycle corresponding to the measurement (see Appendix 6).
mtime - Mission time at the start of the measurement in seconds after parachute deploy (T0)
altitude - Altitude above Titan's surface in km
ccdtemp - Temperature of the CCD chip at the start of the measurement in deg K.
opttemp - Temperature of the optical bench at the start of the observation in deg K.
azact - The azimuth at start of observation relative to sun in degrees CCW, viewed from above.
exptime - exposure time of the measurement in seconds.
col - Number of columns in the dataset (DLVS).
ZA - Zenith angle of observation in degrees (DLVS).

ULVS Intensities				DLVS Intensities		
Column	Column Heading	Pixel		Column	Column Heading	Pixel
1	seq			1	col	
2	cycle			2	seq	
3	mtime			3	cycle	
4	altitude			4	mtime	
5	ccdtemp			5	altitude	
6	opttemp			6	ccdtemp	
7	azact			7	opttemp	
8	exptime			8	azact	
9	976.6593	0		9	ZA	
10	974.3501	1		10	exptime	
11	972.0389	2		11	976.6593	0
12	969.7256	3		12	974.3501	1
13	967.4104	4		13	972.0389	2
14	965.0931	5		14	969.7256	3
15	962.7738	6		15	967.4104	4
16	960.4525	7		16	965.0931	5
17	958.1292	8		17	962.7738	6
18	955.8038	9		18	960.4525	7
19	953.4764	10		19	958.1292	8
20	951.1470	11		20	955.8038	9
21	948.8156	12		21	953.4764	10
22	946.4822	13		22	951.1470	11
23	944.1467	14		23	948.8156	12
24	941.8092	15		24	946.4822	13
25	939.4697	16		25	944.1467	14

26	937.1282	17		26	941.8092	15
27	934.7847	18		27	939.4697	16
28	932.4390	19		28	937.1282	17
29	930.0915	20		29	934.7847	18
30	927.7419	21		30	932.4390	19
31	925.3903	22		31	930.0915	20
32	923.0366	23		32	927.7419	21
33	920.6810	24		33	925.3903	22
34	918.3232	25		34	923.0366	23
35	915.9636	26		35	920.6810	24
36	913.6019	27		36	918.3232	25
37	911.2380	28		37	915.9636	26
38	908.8723	29		38	913.6019	27
39	906.5046	30		39	911.2380	28
40	904.1347	31		40	908.8723	29
41	901.7629	32		41	906.5046	30
42	899.3891	33		42	904.1347	31
43	897.0132	34		43	901.7629	32
44	894.6353	35		44	899.3891	33
45	892.2554	36		45	897.0132	34
46	889.8734	37		46	894.6353	35
47	887.4895	38		47	892.2554	36
48	885.1036	39		48	889.8734	37
49	882.7155	40		49	887.4895	38
50	880.3256	41		50	885.1036	39
51	877.9335	42		51	882.7155	40
52	875.5394	43		52	880.3256	41
53	873.1434	44		53	877.9335	42
54	870.7453	45		54	875.5394	43
55	868.3452	46		55	873.1434	44
56	865.9431	47		56	870.7453	45
57	863.5389	48		57	868.3452	46
58	861.1327	49		58	865.9431	47
59	858.7245	50		59	863.5389	48
60	856.3143	51		60	861.1327	49
61	853.9021	52		61	858.7245	50
62	851.4879	53		62	856.3143	51
63	849.0716	54		63	853.9021	52
64	846.6533	55		64	851.4879	53
65	844.2330	56		65	849.0716	54
66	841.8106	57		66	846.6533	55
67	839.3862	58		67	844.2330	56
68	836.9599	59		68	841.8106	57
69	834.5315	60		69	839.3862	58
70	832.1011	61		70	836.9599	59
71	829.6686	62		71	834.5315	60
72	827.2341	63		72	832.1011	61

73	824.7977	64		73	829.6686	62
74	822.3592	65		74	827.2341	63
75	819.9186	66		75	824.7977	64
76	817.4761	67		76	822.3592	65
77	815.0316	68		77	819.9186	66
78	812.5850	69		78	817.4761	67
79	810.1364	70		79	815.0316	68
80	807.6857	71		80	812.5850	69
81	805.2331	72		81	810.1364	70
82	802.7784	73		82	807.6857	71
83	800.3218	74		83	805.2331	72
84	797.8631	75		84	802.7784	73
85	795.4023	76		85	800.3218	74
86	792.9396	77		86	797.8631	75
87	790.4749	78		87	795.4023	76
88	788.0081	79		88	792.9396	77
89	785.5392	80		89	790.4749	78
90	783.0684	81		90	788.0081	79
91	780.5956	82		91	785.5392	80
92	778.1207	83		92	783.0684	81
93	775.6439	84		93	780.5956	82
94	773.1650	85		94	778.1207	83
95	770.6840	86		95	775.6439	84
96	768.2010	87		96	773.1650	85
97	765.7161	88		97	770.6840	86
98	763.2291	89		98	768.2010	87
99	760.7401	90		99	765.7161	88
100	758.2491	91		100	763.2291	89
101	755.7560	92		101	760.7401	90
102	753.2610	93		102	758.2491	91
103	750.7639	94		103	755.7560	92
104	748.2648	95		104	753.2610	93
105	745.7637	96		105	750.7639	94
106	743.2606	97		106	748.2648	95
107	740.7553	98		107	745.7637	96
108	738.2482	99		108	743.2606	97
109	735.7390	100		109	740.7553	98
110	733.2277	101		110	738.2482	99
111	730.7145	102		111	735.7390	100
112	728.1992	103		112	733.2277	101
113	725.6819	104		113	730.7145	102
114	723.1626	105		114	728.1992	103
115	720.6413	106		115	725.6819	104
116	718.1179	107		116	723.1626	105
117	715.5925	108		117	720.6413	106
118	713.0652	109		118	718.1179	107
119	710.5357	110		119	715.5925	108

120	708.0043	111		120	713.0652	109
121	705.4709	112		121	710.5357	110
122	702.9354	113		122	708.0043	111
123	700.3979	114		123	705.4709	112
124	697.8584	115		124	702.9354	113
125	695.3168	116		125	700.3979	114
126	692.7733	117		126	697.8584	115
127	690.2277	118		127	695.3168	116
128	687.6801	119		128	692.7733	117
129	685.1305	120		129	690.2277	118
130	682.5789	121		130	687.6801	119
131	680.0252	122		131	685.1305	120
132	677.4695	123		132	682.5789	121
133	674.9119	124		133	680.0252	122
134	672.3521	125		134	677.4695	123
135	669.7903	126		135	674.9119	124
136	667.2266	127		136	672.3521	125
137	664.6608	128		137	669.7903	126
138	662.0930	129		138	667.2266	127
139	659.5233	130		139	664.6608	128
140	656.9514	131		140	662.0930	129
141	654.3774	132		141	659.5233	130
142	651.8017	133		142	656.9514	131
143	649.2238	134		143	654.3774	132
144	646.6438	135		144	651.8017	133
145	644.0618	136		145	649.2238	134
146	641.4779	137		146	646.6438	135
147	638.8919	138		147	644.0618	136
148	636.3039	139		148	641.4779	137
149	633.7139	140		149	638.8919	138
150	631.1218	141		150	636.3039	139
151	628.5278	142		151	633.7139	140
152	625.9317	143		152	631.1218	141
153	623.3336	144		153	628.5278	142
154	620.7335	145		154	625.9317	143
155	618.1313	146		155	623.3336	144
156	615.5272	147		156	620.7335	145
157	612.9210	148		157	618.1313	146
158	610.3128	149		158	615.5272	147
159	607.7025	150		159	612.9210	148
160	605.0903	151		160	610.3128	149
161	602.4761	152		161	607.7025	150
162	599.8597	153		162	605.0903	151
163	597.2415	154		163	602.4761	152
164	594.6212	155		164	599.8597	153
165	591.9988	156		165	597.2415	154
166	589.3744	157		166	594.6212	155

167	586.7480	158		167	591.9988	156
168	584.1196	159		168	589.3744	157
169	581.4892	160		169	586.7480	158
170	578.8568	161		170	584.1196	159
171	576.2222	162		171	581.4892	160
172	573.5858	163		172	578.8568	161
173	570.9473	164		173	576.2222	162
174	568.3067	165		174	573.5858	163
175	565.6642	166		175	570.9473	164
176	563.0197	167		176	568.3067	165
177	560.3730	168		177	565.6642	166
178	557.7244	169		178	563.0197	167
179	555.0738	170		179	560.3730	168
180	552.4211	171		180	557.7244	169
181	549.7665	172		181	555.0738	170
182	547.1098	173		182	552.4211	171
183	544.4510	174		183	549.7665	172
184	541.7903	175		184	547.1098	173
185	539.1276	176		185	544.4510	174
186	536.4628	177		186	541.7903	175
187	533.7960	178		187	539.1276	176
188	531.1272	179		188	536.4628	177
189	528.4563	180		189	533.7960	178
190	525.7835	181		190	531.1272	179
191	523.1086	182		191	528.4563	180
192	520.4317	183		192	525.7835	181
193	517.7528	184		193	523.1086	182
194	515.0719	185		194	520.4317	183
195	512.3889	186		195	517.7528	184
196	509.7039	187		196	515.0719	185
197	507.0170	188		197	512.3889	186
198	504.3279	189		198	509.7039	187
199	501.6368	190		199	507.0170	188
200	498.9438	191		200	504.3279	189
201	496.2487	192		201	501.6368	190
202	493.5516	193		202	498.9438	191
203	490.8525	194		203	496.2487	192
204	488.1514	195		204	493.5516	193
205	485.4482	196		205	490.8525	194
206	482.7431	197		206	488.1514	195
207	480.0358	198		207	485.4482	196
208	477.3266	199		208	482.7431	197
				209	480.0358	198
				210	477.3266	199

Appendix 40 - Visible Spectrometer Data Summary List

The following table presents information about the DISR Visible Spectrometer (ULVS & DLVS) datasets (hpdisr_0001\DATA\VISIBLE).
Red font data are the calibration cycles, and blue font data are Spectrophotometric & Near-Surface data.

Column:

1 Visible Spectrometer dataset number, corresponding to the number in the archive's dataset name (i.e. VISIBLE_**0001**...)
2 Mission time in seconds after parachute deploy (T0) that the exposure started.
3 Temperature of the CCD chip in degrees Kelvin.
4 Type of exposure, Upward Looking (ULVS) or Downward Looking (DLVS).
5 Exposure time of the measurement in milliseconds.
6 Number of columns (spatial elements) retuned in the dataset.
7 Mean value of the returned data in Data Numbers (DN), includes on-board summing, if applicable.
8 Maximum value in the returned in DN.
9 Mean value of the pixel array, after adjusting for summing in DN.
10 Maximum value of the pixel array in DN. If this value is 4095 some data is saturated. If near 4095 some pixels may be saturated.
11 Saturation Flag noting some pixels in the array are saturated.
12 Status of the calibration and surface lamps during the observation. The order is cal1, cal2, cal3, SSL.
13 Altitude at the start of the observation based on the DTWG's 2011 descent profile.
14 Vertical resolution of the pixel near 50° nadir angle (top of array) in kilometers (for DLVS).
15 Vertical resolution of the pixel near 10° nadir angle (bottom of array) in kilometers (for DLVS).
16 Horizontal Extent of the pixel near 50° nadir angle. Does not include exposure smearing or tipping (for DLVS).
17 Horizontal Extent of the pixel near 10° nadir angle. Does not include exposure smearing or tipping (for DLVS).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
													Vertical Resolution		Horizontal Extent	
Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
1	143.0	258.6	DLVS	298.5	10	957.8	2158	478.9	1079		0000	142.80	11.59	5.174	16.34	9.449
2	146.0	258.7	DLVS	298.5	10	959.7	2160	479.8	1080		0000	142.66	11.58	5.169	16.32	9.439
3	148.9	258.7	ULVS	137	2	418.1	722	104.5	180		0000	142.53				
4	156.9	258.7	DLVS	298.5	10	977.5	2217	488.7	1108		0000	142.14	11.53	5.150	16.26	9.405
5	168.9	258.9	DLVS	298.5	10	957.9	2179	478.9	1089		0000	141.49	11.48	5.126	16.19	9.362
6	179.7	258.9	DLVS	298.5	10	902.0	2024	451.0	1012		0000	140.90	11.43	5.105	16.12	9.323
7	182.4	259	ULVS	497.5	2	286.0	517	71.5	129		0000	140.75				
8	201.5	259.1	DLVS	298.5	10	938.8	2159	469.4	1079		0000	139.82	11.35	5.066	16.00	9.251

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
9	204.2	259.1	DLVS	298.5	10	922.0	2114	461.0	1057		0000	139.69	11.33	5.061	15.98	9.243
10	207.8	259.2	ULVS	497.5	2	314.3	568	78.6	142		0000	139.51				
11	216.1	259.2	DLVS	298.5	10	957.4	2228	478.7	1114		0000	139.11	11.29	5.040	15.91	9.205
12	229.4	259.3	DLVS	298.5	10	894.7	2011	447.3	1005		0000	138.44	11.23	5.016	15.84	9.160
13	236.3	259.5	ULVS	497.5	2	693.9	1250	173.5	312		0000	138.12				
14	242.7	259.5	ULVS	373	2	252.2	444	63.1	111		0000	137.82				
15	255.4	259.5	DLVS	298.5	10	901.3	2033	450.6	1016		0000	137.20	11.13	4.971	15.70	9.078
16	261.7	259.5	DLVS	298.5	10	893.8	2013	446.9	1006		0000	136.89	11.11	4.960	15.66	9.058
17	279.1	259.7	DLVS	425.5	10	1305.7	2960	652.9	1480		0000	136.07	11.04	4.930	15.57	9.003
18	283.1	259.7	ULVS	266.5	2	396.9	686	99.2	171		0000	135.88				
19	284.4	259.7	DLVS	582	10	1726.9	3964	863.4	1982		0000	135.82	11.02	4.921	15.54	8.987
20	298.1	259.7	ULVS	970	2	2073.5	3779	518.4	944		0000	135.19				
21	305.3	259.7	DLVS	650	10	1933.4	4402	966.7	2201		0000	134.86	10.94	4.886	15.43	8.923
22	308.8	259.7	DLVS	650	10	1995.0	4529	997.5	2264		0000	134.70	10.93	4.880	15.41	8.913
23	319.7	259.8	DLVS	650	10	2062.1	4873	1031.0	2436		0000	134.21	10.89	4.862	15.35	8.880
24	330.6	259.8	ULVS	1218	2	749.4	1417	187.4	354		0000	133.66				
25	332.3	260	DLVS	650	10	2018.0	4628	1009.0	2314		0000	133.57	10.84	4.839	15.28	8.838
26	342.9	260	DLVS	650	10	2041.3	4787	1020.6	2393		0000	133.09	10.80	4.822	15.23	8.806
27	353.5	260	ULVS	913.5	2	750.6	1405	187.6	351		0000	132.61				
28	355.4	260	DLVS	650	10	1952.3	4433	976.1	2216		0000	132.52	10.75	4.801	15.16	8.768
29	366.9	260.1	DLVS	650	10	1951.6	4477	975.8	2238		0000	131.97	10.71	4.781	15.10	8.732
30	379.5	260.1	ULVS	1218	2	4884.5	8928	1221.1	2232		0000	131.46				
31	382.2	260.1	DLVS	650	10	1887.0	4276	943.5	2138		0000	131.33	10.66	4.758	15.02	8.690
32	390.3	260.2	DLVS	650	10	1919.4	4386	959.7	2193		0000	130.95	10.63	4.744	14.98	8.665
33	400.5	260.2	DLVS	650	10	1915.6	4351	957.8	2175		0000	130.48	10.59	4.727	14.93	8.634
34	430.1	260.2	DLVS	650	10	2069.9	4761	1035.0	2380		0000	129.24	10.49	4.682	14.79	8.551
35	436.6	260.2	ULVS	382	2	266.9	468	66.7	117		0000	128.96				
36	437.5	260.2	DLVS	650	5	3988.2	9059	997.0	2264		0000	128.92	10.46	4.671	14.75	8.530
37	445.6	260.2	ULVS	1205.5	2	2356.9	4323	589.2	1080		0000	128.56				
38	448.2	260.2	ULVS	1389	2	3516.0	6414	879.0	1603		0000	128.45				
39	459.2	260.2	ULVS	1389	2	2164.8	3994	541.2	998		0000	127.98				
40	474.4	260.3	DLVS	650	5	3924.6	8937	981.2	2234		0000	127.36	10.33	4.614	14.57	8.427
41	479.4	260.3	DLVS	650	5	3832.0	8680	958.0	2170		0000	127.15	10.32	4.606	14.55	8.413
42	484.8	260.4	DLVS	650	5	3742.0	8468	935.5	2117		0000	126.92	10.30	4.598	14.52	8.398
43	495.7	260.4	DLVS	650	5	4115.1	9362	1028.8	2340		0000	126.44	10.26	4.581	14.47	8.366

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
44	501.3	260.4	DLVS	650	5	3957.8	9078	989.4	2269		0000	126.21	10.24	4.572	14.44	8.351
45	519.4	260.4	ULVS	1190.5	2	745.0	1411	186.3	352		0000	125.46				
46	523.6	260.4	ULVS	573	2	377.4	693	94.4	173		0000	125.28				
47	536.7	260.4	ULVS	2083.5	2	1210.5	2369	302.6	592		0000	124.76				
48	541.0	260.4	ULVS	1957	2	1131.9	2208	283.0	552		0000	124.60				
49	557.3	260.4	ULVS	2083.5	2	1244.5	2399	311.1	599		0000	123.95				
50	565.5	260.4	DLVS	627.5	5	3933.3	8993	983.3	2248		0000	123.62	10.03	4.479	14.14	8.179
51	572.6	260.4	DLVS	616	5	3830.7	8803	957.7	2200		0000	123.33	10.01	4.468	14.11	8.160
52	588.4	260.6	DLVS	639.5	5	3755.6	8581	938.9	2145		0000	122.72	9.958	4.446	14.04	8.120
53	596.0	260.6	DLVS	653.5	5	3907.4	8938	976.9	2234		0000	122.42	9.933	4.435	14.00	8.100
54	629.9	260.4	DLVS	631	5	3622.9	8190	905.7	2047		0000	121.06	9.823	4.386	13.85	8.010
55	652.0	260.4	DLVS	666.5	5	3921.1	9005	980.3	2251		0000	120.23	9.755	4.356	13.75	7.955
56	698.8	260.6	ULVS	1562.5	2	980.6	1916	245.1	479		0000	118.44				
57	714.4	260.6	ULVS	9.5	2	5356.9	12315	1339.2	3078		1110	117.87				
58	723.7	260.6	DLVS	23.5	10	2023.6	6110	1011.8	3055		1110	117.53	9.537	4.258	13.45	7.777
59	781.0	260.4	ULVS	9.5	2	69.5	85	17.4	21		0000	115.47				
60	804.7	260.4	DLVS	23.5	10	93.9	185	47.0	92		0000	114.59	9.298	4.151	13.11	7.582
61	805.0	260.2	ULVS	0	2	51.2	68	12.8	17		0000	114.58				
62	807.7	260.2	DLVS	0	10	25.9	37	13.0	18		0000	114.48	9.289	4.148	13.10	7.575
63	822.1	260.3	ULVS	9.5	2	5365.4	12356	1341.4	3089		1110	113.99				
64	828.2	260.4	DLVS	23.5	10	2026.8	6115	1013.4	3057		1110	113.79	9.233	4.123	13.02	7.529
65	830.3	260.4	DLVS	610.5	10	1816.4	4188	908.2	2094		0000	113.72	9.228	4.120	13.01	7.525
66	833.6	260.4	ULVS	1306.5	2	4626.0	8494	1156.5	2123		0000	113.60				
67	836.1	260.3	DLVS	644	10	1831.1	4304	915.6	2152		0000	113.52	9.211	4.113	12.99	7.511
68	845.5	260.4	DLVS	618	10	1717.5	3959	858.7	1979		0000	113.18	9.183	4.100	12.95	7.488
69	849.3	260.4	ULVS	1366	2	818.3	1587	204.6	396		0000	113.04				
70	859.6	260.4	ULVS	1024	2	1407.8	2613	352.0	653		0000	112.68				
71	867.0	260.4	DLVS	646.5	10	1778.9	4093	889.5	2046		0000	112.43	9.123	4.073	12.86	7.439
72	870.2	260.3	ULVS	1366	2	809.1	1595	202.3	398		0000	112.32				
73	872.7	260.3	DLVS	649.5	10	1911.5	4428	955.7	2214		0000	112.24	9.108	4.067	12.84	7.427
74	882.0	260.3	DLVS	603	10	1863.5	4517	931.7	2258		0000	111.94	9.083	4.056	12.81	7.407
75	892.8	260.3	DLVS	613	10	1825.1	4232	912.5	2116		0000	111.58	9.053	4.042	12.76	7.383
76	905.8	260.3	ULVS	375.5	2	813.0	1468	203.2	367		0000	111.07				
77	906.6	260.3	DLVS	632.5	10	2032.6	4746	1016.3	2373		0000	111.04	9.010	4.023	12.70	7.347
78	916.6	260.3	DLVS	628	10	1796.0	4175	898.0	2087		0000	110.64	8.977	4.008	12.66	7.321

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
79	927.9	260.2	DLVS	610.5	10	1830.0	4267	915.0	2133		0000	110.11	8.934	3.989	12.60	7.285
80	940.2	260.3	DLVS	649.5	10	1941.6	4665	970.8	2332		0000	109.42	8.879	3.964	12.52	7.240
81	954.8	260.2	DLVS	605.5	10	1792.8	4340	896.4	2170		0000	108.50	8.804	3.931	12.41	7.179
82	961.0	260.2	ULVS	254.5	2	199.4	345	49.9	86		0000	108.09				
83	964.3	260.1	DLVS	555.5	5	3131.0	7179	782.8	1794		0000	107.88	8.754	3.908	12.34	7.138
84	974.2	260.2	ULVS	877	2	557.2	1079	139.3	269		0000	107.16				
85	981.9	260.1	DLVS	411	5	2380.9	5580	595.2	1395		0000	106.59	8.649	3.862	12.19	7.053
86	989.9	260.1	DLVS	411	5	2329.8	5363	582.5	1340		0000	106.01	8.602	3.841	12.13	7.014
87	991.7	260.2	ULVS	685	2	1799.0	3280	449.8	820		0000	105.89				
88	998.3	260.1	DLVS	405.5	5	2345.8	5452	586.5	1363		0000	105.40	8.552	3.819	12.06	6.974
89	999.4	260.2	ULVS	676	2	450.1	854	112.5	213		0000	105.33				
90	1000.3	260.1	DLVS	405.5	5	2377.5	5482	594.4	1370		0000	105.26	8.541	3.813	12.04	6.964
91	1016.0	260	DLVS	351.5	5	2003.8	4667	500.9	1166		0000	104.10	8.447	3.772	11.91	6.888
92	1028.6	260	ULVS	439	2	371.3	693	92.8	173		0000	103.17				
93	1051.6	260	ULVS	163.5	2	147.0	244	36.7	61		0000	101.51				
94	1052.1	260	DLVS	357	5	2041.8	4725	510.4	1181		0000	101.47	8.234	3.676	11.61	6.714
95	1065.5	259.8	ULVS	595	2	1150.6	2111	287.6	527		0000	100.50				
96	1066.6	260	ULVS	595	2	1157.6	2126	289.4	531		0000	100.42				
97	1067.4	260	DLVS	357	5	1966.5	4551	491.6	1137		0000	100.36	8.143	3.636	11.48	6.640
98	1069.0	260	DLVS	357	5	2015.5	4711	503.9	1177		0000	100.24	8.134	3.632	11.47	6.633
99	1070.5	260	ULVS	595	2	399.2	762	99.8	190		0000	100.14				
100	1073.9	259.8	DLVS	357	5	1971.7	4593	492.9	1148		0000	99.90	8.106	3.619	11.43	6.610
101	1086.5	259.8	DLVS	276	5	1581.0	3664	395.2	916		0000	99.03	8.035	3.588	11.33	6.552
102	1091.2	260	DLVS	276	5	1612.0	3855	403.0	963		0000	98.71	8.009	3.576	11.29	6.531
103	1100.4	259.7	ULVS	345	2	732.4	1329	183.1	332		0000	98.08				
104	1138.2	259.7	ULVS	450.5	2	1101.7	2002	275.4	500		0000	95.56				
105	1142.2	259.7	ULVS	450.5	2	330.4	613	82.6	153		0000	95.30				
106	1143.4	259.7	ULVS	124	2	123.1	196	30.8	49		0000	95.22				
107	1147.1	259.7	ULVS	450.5	2	967.6	1760	241.9	440		0000	94.98				
108	1152.8	259.7	DLVS	270	5	1508.2	3528	377.0	882		0000	94.61	7.677	3.428	10.82	6.260
109	1157.1	259.6	DLVS	256.5	5	1383.2	3190	345.8	797		0000	94.34	7.655	3.418	10.79	6.242
110	1158.3	259.6	DLVS	256.5	5	1389.0	3239	347.2	809		0000	94.25	7.648	3.415	10.78	6.236
111	1159.6	259.6	DLVS	256.5	5	1382.2	3177	345.5	794		0000	94.17	7.641	3.412	10.77	6.231
112	1168.1	259.6	DLVS	249	5	1441.3	3502	360.3	875		0000	93.65	7.599	3.393	10.71	6.196
113	1175.7	259.5	ULVS	311.5	2	643.3	1164	160.8	291		0000	93.18				

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
114	1176.7	259.5	DLVS	249	5	1350.2	3114	337.5	778		0000	93.12	7.555	3.374	10.65	6.161
115	1234.1	259.2	DLVS	202.5	5	1104.5	2565	276.1	641		0000	89.58	7.269	3.245	10.25	5.927
116	1235.0	259.2	ULVS	337.5	2	250.8	458	62.7	114		0000	89.52				
117	1235.6	259.2	ULVS	337.5	2	248.7	450	62.2	112		0000	89.49				
118	1237.1	259.2	DLVS	202.5	5	1098.0	2560	274.5	640		0000	89.40	7.254	3.239	10.23	5.915
119	1238.0	259.1	ULVS	337.5	2	761.6	1393	190.4	348		0000	89.35				
120	1238.9	259.2	ULVS	91.5	2	175.1	294	43.8	73		0000	89.30				
121	1247.3	259.2	DLVS	199.5	5	1029.0	2380	257.2	595		0000	88.82	7.207	3.218	10.16	5.877
122	1250.5	259.2	ULVS	249.5	2	589.1	1063	147.3	265		0000	88.64				
123	1254.5	259.2	DLVS	199.5	5	1069.6	2496	267.4	624		0000	88.41	7.174	3.203	10.11	5.850
124	1262.5	259.1	DLVS	199.5	5	1127.3	2659	281.8	664		0000	87.95	7.136	3.186	10.06	5.819
125	1269.4	259.1	DLVS	199.5	5	1127.2	2742	281.8	685		0000	87.56	7.105	3.172	10.02	5.794
126	1323.0	258.7	ULVS	317.5	2	243.0	444	60.8	111		0000	84.65				
127	1323.6	258.6	ULVS	317.5	2	230.9	421	57.7	105		0000	84.62				
128	1327.3	258.7	ULVS	96	2	177.9	290	44.5	72		0000	84.42				
129	1331.7	258.7	DLVS	210	5	1093.4	2547	273.4	636		0000	84.18	6.831	3.050	9.630	5.570
130	1332.6	258.6	ULVS	350	2	917.5	1659	229.4	414		0000	84.13				
131	1334.0	258.6	DLVS	216	5	1185.2	2902	296.3	725		0000	84.06	6.821	3.045	9.616	5.562
132	1334.9	258.5	DLVS	216	5	1100.6	2557	275.2	639		0000	84.01	6.817	3.044	9.611	5.559
133	1341.6	258.5	DLVS	216	5	1100.2	2553	275.0	638		0000	83.66	6.788	3.031	9.570	5.535
134	1342.5	258.5	DLVS	216	5	1138.8	2672	284.7	668		0000	83.61	6.784	3.029	9.565	5.532
135	1350.2	258.5	DLVS	216	5	1121.4	2614	280.4	653		0000	83.22	6.753	3.015	9.521	5.506
136	1356.0	258.5	ULVS	269.5	2	206.1	370	51.5	92		0000	82.92				
137	1408.3	258	DLVS	254	10	644.4	1562	322.2	781		0000	80.28	6.514	2.909	9.185	5.312
138	1411.2	258	DLVS	244	10	591.2	1388	295.6	694		0000	80.14	6.503	2.904	9.168	5.303
139	1415.7	258	ULVS	407	2	517.7	975	129.4	243		0000	79.92				
140	1422.0	257.9	ULVS	305.5	2	223.3	411	55.8	102		0000	79.62				
141	1432.8	257.9	DLVS	244	10	659.9	1679	329.9	839		0000	79.11	6.419	2.866	9.050	5.234
142	1436.5	257.8	DLVS	244	10	620.1	1496	310.1	748		0000	78.93	6.405	2.860	9.030	5.223
143	1441.4	257.8	ULVS	112	2	226.2	387	56.6	96		0000	78.70				
144	1447.0	257.8	DLVS	244	10	634.8	1583	317.4	791		0000	78.44	6.365	2.842	8.973	5.190
145	1457.6	257.6	DLVS	244	10	607.2	1463	303.6	731		0000	77.93	6.324	2.823	8.916	5.156
146	1469.0	257.5	DLVS	244	10	600.4	1441	300.2	720		0000	77.42	6.282	2.805	8.857	5.123
147	1480.1	257.5	DLVS	254.5	10	627.6	1536	313.8	768		0000	76.93	6.242	2.787	8.801	5.090
148	1493.3	257.3	DLVS	254.5	10	615.2	1476	307.6	738		0000	76.34	6.195	2.766	8.734	5.051

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed		Per-Column		*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
						Mean	Max	Mean	Max.							
149	1502.8	257.3	ULVS	424	2	701.1	1289	175.3	322		0000	75.93				
150	1503.6	257.3	DLVS	254.5	10	631.1	1568	315.5	784		0000	75.89	6.158	2.750	8.682	5.021
151	1517.1	257	DLVS	254.5	10	661.7	1624	330.8	812		0000	75.30	6.110	2.728	8.615	4.982
152	1526.0	257	ULVS	397	2	302.9	555	75.7	138		0000	74.92				
153	1528.5	257	DLVS	238	10	582.9	1409	291.5	704		0000	74.81	6.070	2.710	8.558	4.950
154	1539.4	256.8	ULVS	136.5	2	331.8	575	82.9	143		0000	74.34				
155	1540.9	256.8	DLVS	298	5	1386.4	3273	346.6	818		0000	74.28	6.027	2.691	8.497	4.915
156	1553.1	256.8	ULVS	497	2	341.4	646	85.3	161		0000	73.76				
157	1556.8	256.7	ULVS	497	2	1089.5	1981	272.4	495		0000	73.61				
158	1558.1	256.7	DLVS	298	5	1395.1	3364	348.8	841		0000	73.55	5.968	2.665	8.414	4.866
159	1559.4	256.7	DLVS	298	5	1436.3	3504	359.1	876		0000	73.50	5.964	2.663	8.408	4.863
160	1572.0	256.5	DLVS	298	5	1490.1	3604	372.5	901		0000	72.98	5.922	2.644	8.349	4.829
161	1572.6	256.5	ULVS	497	2	336.9	637	84.2	159		0000	72.96				
162	1575.8	256.5	DLVS	298	5	1397.9	3353	349.5	838		0000	72.83	5.909	2.639	8.331	4.819
163	1577.1	256.5	DLVS	298	5	1365.8	3273	341.5	818		0000	72.78	5.905	2.637	8.326	4.815
164	1583.7	256.3	ULVS	372.5	2	270.9	496	67.7	124		0000	72.51				
165	1622.0	255.9	ULVS	463	2	408.7	770	102.2	192		0000	70.97				
166	1622.8	255.9	ULVS	463	2	347.9	654	87.0	163		0000	70.94				
167	1626.1	255.9	ULVS	463	2	430.9	825	107.7	206		0000	70.81				
168	1627.4	255.9	ULVS	127.5	2	296.8	513	74.2	128		0000	70.76				
169	1631.9	255.8	DLVS	277.5	5	1313.4	3158	328.4	789		0000	70.59	5.728	2.557	8.075	4.670
170	1636.2	255.7	DLVS	277.5	5	1287.6	3072	321.9	768		0000	70.42	5.714	2.551	8.056	4.660
171	1637.6	255.7	DLVS	277.5	5	1250.3	2966	312.6	741		0000	70.37	5.710	2.550	8.051	4.656
172	1641.9	255.7	DLVS	277.5	5	1299.3	3086	324.8	771		0000	70.21	5.697	2.544	8.032	4.646
173	1647.6	255.7	DLVS	277.5	5	1246.5	2970	311.6	742		0000	70.00	5.680	2.536	8.008	4.632
174	1651.9	255.6	DLVS	277.5	5	1280.1	3073	320.0	768		0000	69.84	5.667	2.530	7.990	4.621
175	1660.8	255.6	ULVS	347	2	557.4	1035	139.4	258		0000	69.52				
176	1711.4	254.8	ULVS	521	2	394.0	747	98.5	186		0000	67.74				
177	1715.1	254.8	ULVS	521	2	812.1	1545	203.0	386		0000	67.61				
178	1716.5	254.8	ULVS	143	2	296.1	520	74.0	130		0000	67.56				
179	1721.5	254.7	DLVS	312.5	5	1503.8	3706	375.9	926		0000	67.39	5.468	2.442	7.710	4.459
180	1726.3	254.6	DLVS	312.5	5	1342.3	3260	335.6	815		0000	67.23	5.455	2.436	7.691	4.448
181	1727.7	254.6	DLVS	312.5	5	1392.4	3284	348.1	821		0000	67.18	5.451	2.434	7.685	4.445
182	1729.2	254.6	ULVS	521	2	840.3	1546	210.1	386		0000	67.13				
183	1732.5	254.6	DLVS	312.5	5	1551.5	3831	387.9	957		0000	67.02	5.438	2.428	7.667	4.434

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
184	1743.6	254.5	DLVS	312.5	5	1543.4	3820	385.9	955		0000	66.66	5.408	2.415	7.625	4.410
185	1748.4	254.3	DLVS	312.5	5	1356.7	3268	339.2	817		0000	66.50	5.396	2.409	7.607	4.400
186	1753.4	254.3	ULVS	390.5	2	499.3	919	124.8	229		0000	66.33				
187	1806.4	253.6	ULVS	158	2	134.7	229	33.7	57		0000	64.67				
188	1806.9	253.5	DLVS	345	5	1588.1	3918	397.0	979		0000	64.66	5.247	2.343	7.397	4.278
189	1812.0	253.5	DLVS	345	5	1481.7	3656	370.4	914		0000	64.50	5.234	2.337	7.379	4.268
190	1820.4	253.4	ULVS	574.5	2	382.2	737	95.5	184		0000	64.25				
191	1821.5	253.4	ULVS	574.5	2	439.1	850	109.8	212		0000	64.22				
192	1824.1	253.4	DLVS	345	5	1465.5	3605	366.4	901		0000	64.14	5.204	2.324	7.337	4.244
193	1825.7	253.2	ULVS	574.5	2	772.3	1473	193.1	368		0000	64.09				
194	1829.4	253.2	DLVS	345	5	1517.6	3727	379.4	931		0000	63.98	5.192	2.318	7.320	4.234
195	1841.8	253.1	DLVS	345	5	1508.6	3707	377.2	926		0000	63.62	5.163	2.305	7.279	4.210
196	1847.3	252.9	DLVS	345	5	1506.4	3684	376.6	921		0000	63.47	5.150	2.299	7.261	4.199
197	1858.4	252.8	ULVS	431	2	289.3	538	72.3	134		0000	63.15				
198	1908.9	251.9	ULVS	9.5	2	5305.7	12264	1326.4	3066		1110	61.77				
199	1912.0	251.9	DLVS	23.5	10	1996.7	6069	998.3	3034		1110	61.69	5.006	2.235	7.057	4.082
200	1967.9	250.9	ULVS	9.5	2	50.5	60	12.6	15		0000	60.26				
201	1970.9	250.9	DLVS	23.5	10	68.2	146	34.1	73		0000	60.19	4.884	2.181	6.885	3.982
202	1971.2	250.7	ULVS	0	2	40.0	47	10.0	11		0000	60.18				
203	1978.7	250.6	DLVS	0	10	20.8	26	10.4	13		0000	59.99	4.868	2.173	6.863	3.969
204	1992.8	250.4	DLVS	23.5	10	1996.6	6078	998.3	3039		1110	59.64	4.840	2.161	6.823	3.946
205	2004.5	250.3	ULVS	9.5	2	5303.3	12302	1325.8	3075		1110	59.36				
206	2005.8	250.3	ULVS	786.5	2	476.4	911	119.1	227		0000	59.33				
207	2011.4	250.2	ULVS	786.5	2	1479.6	2804	369.9	701		0000	59.20				
208	2013.6	250.2	ULVS	216	2	321.6	588	80.4	147		0000	59.14				
209	2020.4	250.1	DLVS	478	5	2043.8	5128	511.0	1282		0000	58.98	4.786	2.137	6.747	3.902
210	2022.4	250	DLVS	478	5	1933.7	4817	483.4	1204		0000	58.93	4.782	2.135	6.742	3.899
211	2026.7	250	DLVS	478	5	1957.1	4961	489.3	1240		0000	58.83	4.773	2.131	6.730	3.892
212	2028.7	249.8	DLVS	478	5	1969.0	4976	492.3	1244		0000	58.78	4.769	2.130	6.724	3.889
213	2030.6	249.8	ULVS	796.5	2	731.2	1403	182.8	350		0000	58.73				
214	2037.0	249.7	DLVS	478	5	1948.4	4884	487.1	1221		0000	58.58	4.753	2.122	6.702	3.876
215	2049.8	249.5	ULVS	597.5	2	371.4	724	92.9	181		0000	58.28				
216	2055.8	249.3	DLVS	478	5	1930.3	4835	482.6	1208		0000	58.15	4.718	2.107	6.652	3.847
217	2094.9	248.6	DLVS	425.5	10	873.4	2208	436.7	1104		0000	57.26	4.646	2.074	6.550	3.788
218	2098.0	248.5	DLVS	425.5	10	837.2	2137	418.6	1068		0000	57.19	4.640	2.072	6.542	3.784

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed		Per-Column		*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
						Mean	Max	Mean	Max.							
219	2102.0	248.5	ULVS	195	2	310.3	558	77.6	139		0000	57.10				
220	2112.8	248.2	ULVS	709	2	1252.3	2396	313.1	599		0000	56.86				
221	2119.9	248.1	ULVS	709	2	469.1	907	117.3	226		0000	56.70				
222	2122.1	248	DLVS	425.5	10	901.6	2319	450.8	1159		0000	56.65	4.597	2.052	6.481	3.748
223	2125.3	248	DLVS	425.5	10	875.7	2228	437.8	1114		0000	56.58	4.591	2.050	6.473	3.744
224	2137.0	247.8	ULVS	884	2	512.9	1003	128.2	250		0000	56.33				
225	2147.7	247.5	DLVS	530.5	10	1061.8	2757	530.9	1378		0000	56.10	4.552	2.032	6.418	3.712
226	2152.1	247.5	DLVS	530.5	10	1094.0	2796	547.0	1398		0000	56.01	4.544	2.029	6.407	3.706
227	2155.6	247.4	ULVS	663	2	408.7	789	102.2	197		0000	55.93				
228	2161.8	247.3	DLVS	530.5	10	1052.0	2730	526.0	1365		0000	55.80	4.527	2.022	6.383	3.692
229	2172.7	247	DLVS	530.5	10	1106.0	2849	553.0	1424		0000	55.57	4.509	2.013	6.357	3.677
230	2183.9	246.8	DLVS	530.5	10	1082.6	2795	541.3	1397		0000	55.33	4.490	2.005	6.330	3.661
231	2195.0	246.5	DLVS	530.5	10	1038.4	2702	519.2	1351		0000	55.09	4.470	1.996	6.303	3.645
232	2209.3	246.2	DLVS	454.5	10	873.3	2223	436.6	1111		0000	54.80	4.447	1.985	6.269	3.626
233	2225.2	245.8	DLVS	454.5	10	915.0	2342	457.5	1171		0000	54.48	4.420	1.974	6.232	3.604
234	2228.8	245.8	ULVS	775	2	1098.9	2085	274.7	521		0000	54.41				
235	2245.5	245.4	DLVS	465	5	1845.0	4685	461.3	1171		0000	54.07	4.387	1.959	6.186	3.578
236	2250.0	245.3	ULVS	775	2	1290.7	2487	322.7	621		0000	53.98				
237	2252.2	245.2	ULVS	213	2	295.9	549	74.0	137		0000	53.94				
238	2255.0	245.2	DLVS	465	5	1845.8	4711	461.4	1177		0000	53.88	4.372	1.952	6.164	3.565
239	2257.4	245.1	DLVS	465	5	1905.5	4840	476.4	1210		0000	53.83	4.368	1.950	6.158	3.562
240	2258.7	245.1	ULVS	775	2	490.1	947	122.5	236		0000	53.81				
241	2262.3	245.1	DLVS	465	5	1900.1	4825	475.0	1206		0000	53.74	4.360	1.947	6.147	3.555
242	2267.2	244.8	DLVS	465	5	1773.2	4522	443.3	1130		0000	53.64	4.352	1.943	6.136	3.549
243	2279.6	244.6	DLVS	465	5	1902.6	4856	475.7	1214		0000	53.40	4.333	1.934	6.108	3.533
244	2304.3	244.1	ULVS	641	2	480.8	930	120.2	232		0000	52.91				
245	2318.2	243.7	ULVS	877	2	516.9	1005	129.2	251		0000	52.65				
246	2324.3	243.5	ULVS	877	2	615.8	1210	153.9	302		0000	52.53				
247	2326.7	243.6	ULVS	241	2	260.7	489	65.2	122		0000	52.48				
248	2332.2	243.4	ULVS	877	2	1191.3	2284	297.8	571		0000	52.38				
249	2335.1	243.4	DLVS	526.5	5	2019.1	5178	504.8	1294		0000	52.33	4.246	1.896	5.986	3.462
250	2337.8	243.2	DLVS	526.5	5	2078.0	5287	519.5	1321		0000	52.28	4.242	1.894	5.980	3.459
251	2343.2	243.1	DLVS	526.5	5	2093.3	5327	523.3	1331		0000	52.18	4.234	1.890	5.969	3.452
252	2345.9	243	DLVS	526.5	5	2005.4	5168	501.3	1292		0000	52.13	4.229	1.888	5.963	3.449
253	2356.7	242.8	DLVS	526.5	5	2035.2	5213	508.8	1303		0000	51.92	4.213	1.881	5.940	3.436

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
254	2365.1	242.6	DLVS	526.5	5	2068.8	5310	517.2	1327		0000	51.77	4.200	1.875	5.922	3.425
255	2373.8	242.4	ULVS	658	2	794.4	1568	198.6	392		0000	51.60				
256	2410.1	241.4	ULVS	262	2	169.8	303	42.4	75		0000	50.94				
257	2416.1	241.3	ULVS	952.5	2	1466.2	2866	366.6	716		0000	50.83				
258	2418.0	241.3	ULVS	952.5	2	1460.1	2825	365.0	706		0000	50.80				
259	2424.9	241	ULVS	952.5	2	888.6	1733	222.1	433		0000	50.67				
260	2428.1	240.9	DLVS	571.5	5	2258.5	5794	564.6	1448		0000	50.62	4.107	1.834	5.790	3.349
261	2431.1	240.9	DLVS	571.5	5	2272.3	5860	568.1	1465		0000	50.56	4.103	1.832	5.784	3.346
262	2437.0	240.8	DLVS	571.5	5	2112.6	5482	528.2	1370		0000	50.46	4.094	1.828	5.772	3.339
263	2439.9	240.7	DLVS	571.5	5	2138.9	5573	534.7	1393		0000	50.41	4.090	1.826	5.766	3.335
264	2451.7	240.4	DLVS	571.5	5	2280.4	5902	570.1	1475		0000	50.20	4.073	1.819	5.743	3.321
265	2460.5	240.2	DLVS	571.5	5	2113.5	5508	528.4	1377		0000	50.04	4.061	1.813	5.725	3.311
266	2482.1	239.6	ULVS	735	2	467.4	910	116.8	227		0000	49.67				
267	2509.0	238.9	ULVS	9.5	2	5234.3	12122	1308.6	3030		1110	49.20				
268	2513.3	238.7	DLVS	23.5	10	1976.0	6061	988.0	3030		1110	49.13	3.986	1.780	5.620	3.251
269	2561.8	237.5	ULVS	9.5	2	48.1	61	12.0	15		0000	48.31				
270	2566.2	237.4	DLVS	23.5	10	62.0	135	31.0	67		0000	48.24	3.914	1.748	5.518	3.192
271	2576.9	237.1	ULVS	0	2	36.0	40	9.0	10		0000	48.06				
272	2579.6	236.8	DLVS	0	10	18.1	21	9.1	10		0000	48.01	3.896	1.739	5.493	3.177
273	2592.5	236.8	DLVS	23.5	10	1978.9	6087	989.5	3043		1110	47.80	3.879	1.732	5.468	3.163
274	2612.8	236.2	ULVS	9.5	2	5225.3	12174	1306.3	3043		1110	47.47				
275	2619.4	236	ULVS	952.5	2	600.4	1189	150.1	297		0000	47.36				
276	2622.0	235.9	ULVS	262	2	263.4	496	65.8	124		0000	47.32				
277	2628.0	235.8	ULVS	952.5	2	1166.3	2315	291.6	578		0000	47.23				
278	2629.7	235.7	ULVS	952.5	2	1200.8	2374	300.2	593		0000	47.20				
279	2631.1	235.7	DLVS	571.5	5	2052.0	5402	513.0	1350		0000	47.18	3.828	1.709	5.397	3.121
280	2634.0	235.6	DLVS	571.5	5	2152.0	5613	538.0	1403		0000	47.13	3.824	1.707	5.392	3.118
281	2639.7	235.4	DLVS	571.5	5	2178.2	5692	544.6	1423		0000	47.04	3.817	1.704	5.381	3.112
282	2642.5	235.3	DLVS	571.5	5	2047.0	5378	511.8	1344		0000	46.99	3.813	1.703	5.376	3.109
283	2654.1	235.1	DLVS	571.5	5	2027.0	5297	506.7	1324		0000	46.81	3.798	1.696	5.355	3.097
284	2663.0	234.8	DLVS	571.5	5	2183.1	5717	545.8	1429		0000	46.67	3.787	1.691	5.339	3.088
285	2672.0	234.6	ULVS	714	2	1043.4	2070	260.9	517		0000	46.53				
286	2705.4	233.7	ULVS	1010	2	600.1	1196	150.0	299		0000	46.00				
287	2707.2	233.7	ULVS	1010	2	531.9	1055	133.0	263		0000	45.98				
288	2714.4	233.4	ULVS	1010	2	815.5	1648	203.9	412		0000	45.87				

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
289	2717.1	233.2	ULVS	277.5	2	426.1	833	106.5	208		0000	45.82				
290	2721.4	233.2	DLVS	693.5	5	2489.9	6695	622.5	1673		0000	45.76	3.713	1.658	5.235	3.028
291	2731.6	233	DLVS	693.5	5	2625.2	6920	656.3	1730		0000	45.60	3.700	1.652	5.217	3.017
292	2734.9	232.9	DLVS	693.5	5	2504.5	6618	626.1	1654		0000	45.55	3.696	1.650	5.211	3.014
293	2746.4	232.6	DLVS	709	5	2468.2	6486	617.0	1621		0000	45.38	3.682	1.644	5.192	3.003
294	2748.9	232.5	DLVS	709	5	2577.8	6817	644.5	1704		0000	45.34	3.679	1.643	5.187	3.000
295	2757.6	232.3	DLVS	709	5	2583.5	6874	645.9	1718		0000	45.21	3.669	1.638	5.172	2.992
296	2775.1	231.8	ULVS	886.5	2	455.1	900	113.8	225		0000	44.95				
297	2794.5	231.3	ULVS	262	2	171.2	313	42.8	78		0000	44.67				
298	2800.3	231	ULVS	952.5	2	566.8	1128	141.7	282		0000	44.58				
299	2802.0	231.2	ULVS	952.5	2	808.1	1633	202.0	408		0000	44.55				
300	2808.7	230.8	ULVS	952.5	2	1204.7	2420	301.2	605		0000	44.45				
301	2811.7	230.8	DLVS	571.5	5	2021.7	5370	505.4	1342		0000	44.41	3.603	1.609	5.080	2.938
302	2814.5	230.7	DLVS	571.5	5	2072.4	5463	518.1	1365		0000	44.37	3.600	1.607	5.076	2.936
303	2820.0	230.6	DLVS	571.5	5	2105.4	5598	526.3	1399		0000	44.29	3.594	1.605	5.066	2.930
304	2822.7	230.4	DLVS	571.5	5	2034.7	5414	508.7	1353		0000	44.25	3.590	1.603	5.062	2.928
305	2833.5	230.2	DLVS	571.5	5	1990.0	5255	497.5	1313		0000	44.09	3.578	1.597	5.044	2.917
306	2841.9	229.9	DLVS	571.5	5	2041.7	5400	510.4	1350		0000	43.97	3.568	1.593	5.030	2.909
307	2866.4	229.3	ULVS	675.5	2	414.6	817	103.7	204		0000	43.62				
308	2884.5	228.8	ULVS	1240	2	624.0	1248	156.0	312		0000	43.36				
309	2893.3	228.5	ULVS	1240	2	1670.9	3396	417.7	849		0000	43.24				
310	2896.7	228.5	ULVS	341	2	424.4	855	106.1	213		0000	43.19				
311	2906.6	228.1	ULVS	1352	2	686.5	1387	171.6	346		0000	43.05				
312	2911.2	228.1	DLVS	811.5	5	2851.4	7639	712.8	1909		0000	42.99	3.488	1.557	4.918	2.844
313	2915.4	228	DLVS	811.5	5	2736.5	7335	684.1	1833		0000	42.93	3.483	1.555	4.911	2.840
314	2924.2	227.8	DLVS	726	5	2491.3	6592	622.8	1648		0000	42.81	3.473	1.551	4.897	2.832
315	2936.0	227.4	DLVS	726	5	2476.5	6641	619.1	1660		0000	42.64	3.460	1.545	4.878	2.822
316	2938.9	227.3	DLVS	726	5	2414.3	6452	603.6	1613		0000	42.60	3.457	1.544	4.874	2.819
317	2944.6	227.3	DLVS	726	5	2437.9	6536	609.5	1634		0000	42.53	3.451	1.541	4.865	2.814
318	2953.6	226.9	ULVS	907.5	2	458.2	908	114.5	227		0000	42.40				
319	2973.3	226.3	DLVS	588	10	1029.4	2759	514.7	1379		0000	42.13	3.419	1.526	4.820	2.788
320	2976.3	226.3	DLVS	588	10	1075.6	2902	537.8	1451		0000	42.09	3.415	1.525	4.815	2.785
321	2979.6	226.2	ULVS	980.5	2	511.4	1024	127.9	256		0000	42.05				
322	2988.2	226	DLVS	588	10	975.0	2669	487.5	1334		0000	41.93	3.402	1.519	4.797	2.774
323	3006.4	225.6	ULVS	980.5	2	945.0	1926	236.2	481		0000	41.69				

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						Mean	Max	Mean	Max.							
324	3009.0	225.3	ULVS	269.5	2	393.3	779	98.3	194		0000	41.65				
325	3010.2	225.3	DLVS	588	10	978.3	2716	489.1	1358		0000	41.63	3.378	1.508	4.763	2.755
326	3016.0	225.3	DLVS	571.5	10	972.8	2625	486.4	1312		0000	41.56	3.372	1.506	4.754	2.750
327	3019.6	225.1	ULVS	952.5	2	512.5	1029	128.1	257		0000	41.51				
328	3024.5	225.1	DLVS	571.5	10	995.6	2711	497.8	1355		0000	41.44	3.363	1.501	4.741	2.742
329	3042.1	224.6	DLVS	746.5	10	1311.1	3530	655.6	1765		0000	41.21	3.344	1.493	4.714	2.726
330	3049.0	224.3	ULVS	985.5	2	590.4	1214	147.6	303		0000	41.12				
331	3058.8	224.1	DLVS	730.5	10	1225.6	3405	612.8	1702		0000	40.99	3.326	1.485	4.689	2.712
332	3065.4	223.8	DLVS	700.5	10	1226.3	3314	613.2	1657		0000	40.90	3.319	1.482	4.679	2.706
333	3073.5	223.7	DLVS	703	10	1157.4	3161	578.7	1580		0000	40.79	3.310	1.478	4.667	2.699
334	3092.3	223.1	DLVS	737.5	10	1282.7	3509	641.4	1754		0000	40.55	3.290	1.469	4.639	2.683
335	3110.1	222.7	DLVS	674	10	1156.3	3164	578.1	1582		0000	40.32	3.271	1.461	4.612	2.668
336	3113.3	222.6	ULVS	907.5	2	470.2	947	117.5	236		0000	40.28				
337	3115.6	222.5	ULVS	249.5	2	147.4	270	36.9	67		0000	40.25				
338	3132.5	222.1	DLVS	544.5	5	1786.3	4804	446.6	1201		0000	40.03	3.248	1.450	4.579	2.649
339	3137.8	221.9	ULVS	907.5	2	464.2	940	116.1	235		0000	39.96				
340	3139.5	221.9	ULVS	907.5	2	458.9	920	114.7	230		0000	39.94				
341	3140.8	221.9	DLVS	544.5	5	1909.0	5099	477.3	1274		0000	39.93	3.240	1.446	4.567	2.642
342	3143.5	221.8	DLVS	544.5	5	1818.5	4874	454.6	1218		0000	39.89	3.237	1.445	4.564	2.639
343	3146.3	221.6	DLVS	544.5	5	1768.6	4725	442.1	1181		0000	39.86	3.234	1.444	4.560	2.637
344	3151.8	221.6	DLVS	544.5	5	1772.6	4854	443.1	1213		0000	39.79	3.228	1.441	4.552	2.633
345	3163.3	221.3	ULVS	680.5	2	384.8	773	96.2	193		0000	39.64				
346	3171.3	221.2	DLVS	544.5	5	1834.6	4947	458.6	1236		0000	39.54	3.208	1.433	4.523	2.616
347	3204.7	220.2	ULVS	938	2	1102.0	2289	275.5	572		0000	39.12				
348	3213.1	219.9	ULVS	938	2	636.3	1326	159.1	331		0000	39.02				
349	3215.7	219.8	ULVS	258	2	164.0	308	41.0	77		0000	38.99				
350	3224.8	219.7	DLVS	563	5	1828.8	4918	457.2	1229		0000	38.88	3.154	1.408	4.447	2.572
351	3227.6	219.7	DLVS	563	5	1785.4	4813	446.3	1203		0000	38.84	3.152	1.407	4.443	2.570
352	3233.3	219.3	DLVS	563	5	1785.4	4836	446.4	1209		0000	38.77	3.146	1.405	4.435	2.565
353	3236.2	219.3	DLVS	563	5	1830.9	4972	457.7	1243		0000	38.73	3.143	1.403	4.431	2.563
354	3239.0	219.2	DLVS	563	5	1850.5	4969	462.6	1242		0000	38.70	3.140	1.402	4.427	2.561
355	3240.5	219.2	ULVS	938	2	528.7	1080	132.2	270		0000	38.68				
356	3247.6	219.1	DLVS	563	5	1871.0	5041	467.7	1260		0000	38.59	3.132	1.398	4.415	2.554
357	3265.1	218.7	ULVS	703.5	2	652.4	1350	163.1	337		0000	38.38				
358	3299.4	217.7	ULVS	969	2	490.1	1013	122.5	253		0000	37.97				

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359	3302.0	217.7	ULVS	266.5	2	174.4	337	43.6	84		0000	37.94				
360	3308.1	217.5	ULVS	969	2	1245.6	2589	311.4	647		0000	37.86				
361	3310.0	217.5	ULVS	969	2	1032.5	2205	258.1	551		0000	37.84				
362	3311.4	217.5	DLVS	581.5	5	1830.2	5012	457.6	1253		0000	37.83	3.069	1.370	4.327	2.503
363	3314.3	217.4	DLVS	581.5	5	1850.2	5056	462.6	1264		0000	37.79	3.066	1.369	4.323	2.501
364	3320.2	217.3	DLVS	581.5	5	1903.9	5130	476.0	1282		0000	37.72	3.061	1.367	4.315	2.496
365	3323.1	217.1	DLVS	581.5	5	2004.8	5445	501.2	1361		0000	37.69	3.058	1.365	4.311	2.494
366	3334.9	216.8	DLVS	581.5	5	1805.6	4913	451.4	1228		0000	37.55	3.047	1.360	4.295	2.484
367	3343.8	216.5	DLVS	581.5	5	1867.0	5075	466.8	1268		0000	37.44	3.038	1.357	4.283	2.477
368	3353.1	216.4	ULVS	726.5	2	368.6	757	92.2	189		0000	37.33				
369	3388.0	215.6	ULVS	999.5	2	1092.9	2308	273.2	577		0000	36.92				
370	3389.9	215.4	ULVS	999.5	2	1029.5	2142	257.4	535		0000	36.90				
371	3397.0	215.3	ULVS	999.5	2	482.4	990	120.6	247		0000	36.82				
372	3399.8	215.2	ULVS	275	2	161.0	307	40.2	76		0000	36.79				
373	3403.4	215.2	DLVS	599.5	5	1853.4	5011	463.4	1252		0000	36.75	2.982	1.331	4.204	2.431
374	3409.5	214.9	DLVS	599.5	5	1837.9	5080	459.5	1270		0000	36.68	2.976	1.329	4.196	2.427
375	3412.5	214.9	DLVS	599.5	5	1866.3	5157	466.6	1289		0000	36.64	2.973	1.328	4.192	2.425
376	3418.6	214.7	DLVS	599.5	5	1948.4	5287	487.1	1321		0000	36.57	2.968	1.325	4.184	2.420
377	3424.6	214.6	DLVS	599.5	5	1984.3	5411	496.1	1352		0000	36.51	2.962	1.323	4.176	2.415
378	3433.8	214.3	DLVS	599.5	5	1833.6	5060	458.4	1265		0000	36.40	2.954	1.319	4.164	2.408
379	3452.5	213.8	ULVS	749.5	2	370.9	766	92.7	191		0000	36.19				
380	3479.7	213.2	ULVS	1030.5	2	519.5	1088	129.9	272		0000	35.88				
381	3481.7	213.1	ULVS	1030.5	2	579.6	1230	144.9	307		0000	35.86				
382	3489.1	213	ULVS	1030.5	2	991.9	2157	248.0	539		0000	35.77				
383	3493.9	212.9	DLVS	622	5	1910.8	5207	477.7	1301		0000	35.72	2.898	1.294	4.086	2.363
384	3500.2	212.7	DLVS	622	5	2082.7	5665	520.7	1416		0000	35.65	2.893	1.292	4.078	2.359
385	3503.3	212.6	DLVS	622	5	2018.8	5527	504.7	1381		0000	35.62	2.890	1.290	4.074	2.357
386	3509.0	212.5	ULVS	285	2	347.6	698	86.9	174		0000	35.55				
387	3509.6	212.5	DLVS	622	5	1875.4	5146	468.9	1286		0000	35.55	2.884	1.288	4.067	2.352
388	3520.7	212.3	DLVS	723	5	2280.3	6222	570.1	1555		0000	35.42	2.874	1.283	4.052	2.344
389	3529.4	212.1	DLVS	723	5	2318.1	6378	579.5	1594		0000	35.33	2.867	1.280	4.042	2.338
390	3548.7	211.5	ULVS	903.5	2	578.6	1237	144.6	309		0000	35.12				
391	3567.2	211.2	ULVS	1061.5	2	1121.2	2417	280.3	604		0000	34.91				
392	3570.1	211	ULVS	292	2	332.5	686	83.1	171		0000	34.88				
393	3576.8	210.9	ULVS	1061.5	2	624.1	1358	156.0	339		0000	34.81				

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
394	3578.8	210.9	ULVS	1061.5	2	536.4	1139	134.1	284		0000	34.79				
395	3583.6	210.7	DLVS	637	5	2019.4	5500	504.8	1375		0000	34.74	2.819	1.259	3.974	2.298
396	3590.0	210.7	DLVS	637	5	1921.1	5273	480.3	1318		0000	34.67	2.813	1.256	3.966	2.294
397	3593.2	210.4	DLVS	637	5	1865.8	5121	466.4	1280		0000	34.64	2.810	1.255	3.962	2.292
398	3599.7	210.3	DLVS	637	5	1913.0	5273	478.2	1318		0000	34.57	2.805	1.252	3.954	2.287
399	3606.1	210.2	DLVS	637	5	2065.7	5690	516.4	1422		0000	34.50	2.799	1.250	3.946	2.282
400	3615.8	209.9	DLVS	637	5	1896.1	5258	474.0	1314		0000	34.39	2.791	1.246	3.935	2.276
401	3626.0	209.7	ULVS	796	2	627.8	1333	156.9	333		0000	34.29				
402	3654.3	209.1	DLVS	655.5	10	1030.7	2862	515.3	1431		0000	33.99	2.758	1.231	3.888	2.249
403	3657.6	209	DLVS	655.5	10	1038.2	2893	519.1	1446		0000	33.95	2.755	1.230	3.884	2.246
404	3660.7	209	ULVS	1092	2	589.1	1265	147.3	316		0000	33.92				
405	3670.5	208.6	ULVS	1092	2	1089.4	2357	272.4	589		0000	33.82				
406	3680.7	208.5	DLVS	655.5	10	1039.3	2895	519.6	1447		0000	33.71	2.735	1.221	3.856	2.230
407	3684.0	208.5	DLVS	655.5	10	1032.3	2891	516.2	1445		0000	33.68	2.732	1.220	3.853	2.228
408	3692.4	208.2	ULVS	1092	2	1291.4	2771	322.8	692		0000	33.59				
409	3695.6	208.1	DLVS	655.5	10	953.6	2704	476.8	1352		0000	33.56	2.723	1.216	3.839	2.220
410	3705.7	207.9	DLVS	655.5	10	1026.0	2865	513.0	1432		0000	33.45	2.714	1.212	3.826	2.213
411	3719.0	207.5	DLVS	655.5	10	928.4	2597	464.2	1298		0000	33.31	2.703	1.207	3.810	2.204
412	3728.3	207.4	DLVS	670	10	1016.1	2840	508.0	1420		0000	33.21	2.695	1.203	3.799	2.197
413	3740.5	207.1	ULVS	837.5	2	576.2	1254	144.0	313		0000	33.09				
414	3741.8	207.1	DLVS	670	10	974.6	2728	487.3	1364		0000	33.07	2.684	1.198	3.784	2.188
415	3751.9	206.8	DLVS	670	10	989.1	2757	494.6	1378		0000	32.97	2.675	1.194	3.772	2.181
416	3763.2	206.5	ULVS	307	2	188.9	383	47.2	95		0000	32.86				
417	3767.2	206.5	DLVS	670	10	966.4	2703	483.2	1351		0000	32.81	2.663	1.189	3.754	2.171
418	3791.1	206	DLVS	670	10	991.2	2779	495.6	1389		0000	32.57	2.643	1.180	3.726	2.155
419	3798.0	205.8	DLVS	685	5	1922.3	5400	480.6	1350		0000	32.50	2.637	1.178	3.718	2.151
420	3801.1	205.8	ULVS	1141.5	2	1141.4	2508	285.3	627		0000	32.47				
421	3811.4	205.5	ULVS	1141.5	2	562.2	1207	140.5	301		0000	32.37				
422	3813.6	205.5	ULVS	1141.5	2	540.3	1168	135.1	292		0000	32.35				
423	3815.2	205.5	DLVS	685	5	2135.0	5888	533.7	1472		0000	32.33	2.623	1.171	3.699	2.139
424	3824.9	205.3	ULVS	314	2	355.2	736	88.8	184		0000	32.23				
425	3825.6	205.3	DLVS	685	5	1966.6	5483	491.6	1370		0000	32.23	2.615	1.168	3.687	2.132
426	3829.1	205.2	DLVS	685	5	1919.4	5386	479.9	1346		0000	32.19	2.612	1.166	3.683	2.130
427	3843.0	204.8	DLVS	685	5	2105.8	5817	526.5	1454		0000	32.05	2.601	1.161	3.667	2.121
428	3853.4	204.6	DLVS	685	5	1961.6	5524	490.4	1381		0000	31.95	2.592	1.157	3.655	2.114

Vis #	Time	Temp	Type	Exp.	#	Summed		Per-Column		*	Lamp	Altitude	50º Nadir	10º Nadir	50º Nadir	10º Nadir
	(sec)	(K)		(ms)	Col's	Mean	Max	Mean	Max.			(km)	(km)	(km)	(km)	(km)
429	3864.4	204.4	ULVS	856	2	579.3	1268	144.8	317		0000	31.84				
430	3884.7	204	ULVS	1172.5	2	1132.1	2434	283.0	608		0000	31.64				
431	3887.9	203.8	ULVS	322.5	2	397.2	836	99.3	209		0000	31.61				
432	3895.3	203.7	ULVS	1172.5	2	1174.8	2567	293.7	641		0000	31.54				
433	3897.5	203.7	ULVS	1172.5	2	1117.1	2422	279.3	605		0000	31.51				
434	3909.8	203.4	DLVS	703.5	5	2121.0	5873	530.2	1468		0000	31.39	2.547	1.137	3.591	2.077
435	3913.4	203.4	DLVS	703.5	5	2031.9	5607	508.0	1401		0000	31.36	2.545	1.136	3.588	2.075
436	3920.5	203.1	DLVS	703.5	5	1937.0	5406	484.2	1351		0000	31.29	2.539	1.134	3.580	2.070
437	3924.1	203.1	DLVS	703.5	5	1971.4	5486	492.9	1371		0000	31.26	2.536	1.132	3.576	2.068
438	3927.6	203.1	DLVS	703.5	5	2077.1	5739	519.3	1434		0000	31.22	2.533	1.131	3.572	2.066
439	3938.3	202.7	DLVS	703.5	5	2005.9	5539	501.5	1384		0000	31.12	2.525	1.127	3.560	2.059
440	3949.5	202.6	ULVS	879	2	832.1	1819	208.0	454		0000	31.01				
441	3981.2	201.9	ULVS	1203.5	2	544.0	1191	136.0	297		0000	30.71				
442	3983.5	201.9	ULVS	1203.5	2	564.1	1240	141.0	310		0000	30.69				
443	3992.1	201.6	ULVS	1203.5	2	1148.9	2540	287.2	635		0000	30.60				
444	3994.6	201.6	DLVS	726	5	2014.8	5719	503.7	1429		0000	30.58	2.481	1.108	3.498	2.023
445	3998.3	201.6	DLVS	726	5	2076.5	5756	519.1	1439		0000	30.54	2.478	1.107	3.494	2.021
446	4005.6	201.4	DLVS	726	5	2103.4	5834	525.9	1458		0000	30.48	2.473	1.104	3.487	2.017
447	4009.2	201.4	DLVS	726	5	2011.2	5631	502.8	1407		0000	30.44	2.470	1.103	3.483	2.014
448	4015.8	201.2	ULVS	332.5	2	348.6	737	87.1	184		0000	30.38				
449	4023.8	201.2	DLVS	726	5	2180.9	6073	545.2	1518		0000	30.30	2.459	1.098	3.467	2.005
450	4034.9	200.9	DLVS	726	5	1959.7	5567	489.9	1391		0000	30.20	2.451	1.094	3.455	1.998
451	4057.4	200.4	ULVS	907.5	2	991.5	2177	247.9	544		0000	29.98				
452	4067.8	200.2	ULVS	1234	2	777.0	1737	194.2	434		0000	29.89				
453	4070.1	200.2	ULVS	1234	2	625.4	1391	156.4	347		0000	29.87				
454	4079.0	199.9	ULVS	1234	2	659.9	1484	165.0	371		0000	29.79				
455	4082.4	199.9	ULVS	339	2	305.0	647	76.2	161		0000	29.75				
456	4086.8	199.8	DLVS	740	5	1975.5	5620	493.9	1405		0000	29.71	2.411	1.076	3.399	1.966
457	4094.3	199.7	DLVS	740	5	2068.5	5778	517.1	1444		0000	29.64	2.405	1.074	3.391	1.961
458	4098.0	199.6	DLVS	740	5	2148.9	5988	537.2	1497		0000	29.61	2.403	1.073	3.387	1.959
459	4105.5	199.4	DLVS	740	5	2088.3	5835	522.1	1458		0000	29.54	2.397	1.070	3.379	1.955
460	4113.0	199.3	DLVS	740	5	1981.2	5670	495.3	1417		0000	29.47	2.391	1.068	3.371	1.950
461	4124.3	199.1	DLVS	740	5	2175.0	6119	543.8	1529		0000	29.36	2.383	1.064	3.359	1.943
462	4147.4	198.7	ULVS	925.5	2	876.6	1930	219.2	482		0000	29.15				
463	4158.1	198.5	ULVS	1265	2	601.1	1322	150.3	330		0000	29.06				

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
464	4160.5	198.3	ULVS	1265	2	563.7	1249	140.9	312		0000	29.03				
465	4169.6	198.2	ULVS	1265	2	736.7	1668	184.2	417		0000	28.95				
466	4173.0	198.1	ULVS	348	2	325.7	689	81.4	172		0000	28.92				
467	4177.6	198.1	DLVS	759	5	2004.6	5798	501.2	1449		0000	28.88	2.343	1.046	3.304	1.911
468	4185.3	198	DLVS	759	5	2040.9	5733	510.2	1433		0000	28.81	2.338	1.044	3.296	1.906
469	4189.1	197.9	DLVS	759	5	2161.1	6043	540.3	1510		0000	28.78	2.335	1.043	3.292	1.904
470	4196.8	197.7	DLVS	759	5	2165.0	6051	541.2	1512		0000	28.71	2.329	1.040	3.284	1.899
471	4204.5	197.6	DLVS	759	5	1989.8	5670	497.5	1417		0000	28.64	2.324	1.038	3.276	1.895
472	4216.1	197.4	DLVS	759	5	2117.1	5946	529.3	1486		0000	28.53	2.315	1.034	3.264	1.888
473	4239.8	196.9	ULVS	948.5	2	875.6	1928	218.9	482		0000	28.32				
474	4250.7	196.8	ULVS	1296	2	567.4	1284	141.8	321		0000	28.23				
475	4253.1	196.6	ULVS	1296	2	583.9	1307	146.0	326		0000	28.20				
476	4262.4	196.5	ULVS	1296	2	1373.7	3065	343.4	766		0000	28.12				
477	4266.0	196.4	ULVS	356.5	2	328.5	725	82.1	181		0000	28.09				
478	4270.7	196.3	DLVS	777.5	5	2042.2	5865	510.6	1466		0000	28.05	2.276	1.016	3.209	1.856
479	4278.5	196.2	DLVS	777.5	5	2195.8	6167	548.9	1541		0000	27.98	2.270	1.014	3.201	1.851
480	4282.5	196	DLVS	777.5	5	2213.1	6222	553.3	1555		0000	27.94	2.267	1.012	3.197	1.849
481	4290.4	196	DLVS	777.5	5	2039.6	5751	509.9	1437		0000	27.87	2.262	1.010	3.189	1.844
482	4298.3	195.8	DLVS	777.5	5	2006.3	5710	501.6	1427		0000	27.80	2.256	1.007	3.181	1.840
483	4310.1	195.5	DLVS	777.5	5	2201.0	6212	550.2	1553		0000	27.70	2.248	1.004	3.169	1.833
484	4334.4	195.1	ULVS	972	2	806.3	1851	201.6	462		0000	27.49				
485	4337.2	195.1	ULVS	365	2	348.5	754	87.1	188		0000	27.47				
486	4339.1	195.1	DLVS	796	10	1036.0	3017	518.0	1508		0000	27.45	2.227	0.995	3.140	1.816
487	4343.1	195.1	DLVS	796	10	1083.4	3122	541.7	1561		0000	27.42	2.225	0.993	3.136	1.814
488	4348.1	194.9	ULVS	1327	2	596.4	1350	149.1	337		0000	27.37				
489	4357.6	194.8	ULVS	1327	2	785.3	1809	196.3	452		0000	27.29				
490	4365.1	194.6	DLVS	796	10	990.5	2850	495.3	1425		0000	27.23	2.209	0.986	3.115	1.801
491	4369.2	194.6	DLVS	796	10	1002.8	2886	501.4	1443		0000	27.19	2.206	0.985	3.111	1.799
492	4381.3	194.3	DLVS	796	10	1099.4	3157	549.7	1578		0000	27.09	2.198	0.981	3.099	1.792
493	4394.0	194	ULVS	1327	2	915.4	2114	228.8	528		0000	26.98				
494	4395.6	194.1	DLVS	796	10	1025.8	2940	512.9	1470		0000	26.97	2.188	0.977	3.085	1.784
495	4401.6	194	DLVS	796	10	1005.5	2928	502.7	1464		0000	26.91	2.184	0.975	3.079	1.781
496	4407.0	193.8	ULVS	995.5	2	865.8	1945	216.4	486		0000	26.87				
497	4421.9	193.7	DLVS	796	10	1083.3	3074	541.7	1537		0000	26.74	2.170	0.969	3.059	1.769
498	4428.0	193.6	DLVS	796	10	1016.5	2899	508.3	1449		0000	26.68	2.165	0.967	3.053	1.766

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
499	4448.5	193.3	DLVS	796	10	1081.1	3087	540.6	1543		0000	26.51	2.151	0.960	3.033	1.754
500	4456.7	193.1	DLVS	796	10	1069.7	3047	534.9	1523		0000	26.44	2.145	0.958	3.025	1.749
501	4492.1	192.7	DLVS	796	10	1010.0	2859	505.0	1429		0000	26.14	2.121	0.947	2.990	1.729
502	4857.1	188.7	DLVS	1016	10	1292.2	3729	646.1	1864		0000	23.20	1.883	0.841	2.654	1.535
503	4862.6	188.6	DLVS	1051	10	1298.1	3775	649.1	1887		0000	23.16	1.879	0.839	2.649	1.532
504	4868.1	188.5	ULVS	1867.5	2	1414.1	3318	353.5	829		0000	23.11				
505	4881.3	188.3	ULVS	1867.5	2	1313.9	3088	328.5	772		0000	23.01				
506	4884.9	188.3	DLVS	1094.5	10	1323.2	3853	661.6	1926		0000	22.99	1.865	0.833	2.630	1.521
507	4893.4	188.3	DLVS	1101.5	10	1385.6	4020	692.8	2010		0000	22.92	1.860	0.830	2.622	1.517
508	4898.3	188.2	ULVS	1867.5	2	890.0	2135	222.5	533		0000	22.88				
509	4902.0	188.2	DLVS	1077.5	10	1258.6	3625	629.3	1812		0000	22.86	1.855	0.828	2.615	1.512
510	4910.5	188.1	DLVS	1010	10	1143.0	3350	571.5	1675		0000	22.79	1.849	0.826	2.607	1.508
511	4916.5	188.1	ULVS	1400.5	2	1048.2	2468	262.1	617		0000	22.74				
512	4933.1	187.9	DLVS	1074	10	1306.2	3789	653.1	1894		0000	22.62	1.835	0.819	2.587	1.497
513	4938.8	188	DLVS	1016	10	1185.1	3443	592.6	1721		0000	22.57	1.832	0.818	2.582	1.494
514	4947.2	187.7	DLVS	1120.5	10	1246.9	3719	623.5	1859		0000	22.51	1.827	0.816	2.575	1.489
515	4954.4	187.7	ULVS	513.5	2	445.8	1010	111.4	252		0000	22.46				
516	4975.5	187.6	DLVS	1088.5	10	1357.2	3938	678.6	1969		0000	22.30	1.809	0.808	2.551	1.475
517	4984.1	187.5	DLVS	1006.5	10	1214.1	3505	607.1	1752		0000	22.23	1.804	0.805	2.543	1.471
518	5023.9	187.1	DLVS	1013	10	1239.3	3604	619.6	1802		0000	21.93	1.780	0.795	2.509	1.451
519	5195.1	185.7	ULVS	528.5	2	434.9	999	108.7	249		0000	20.67				
520	5197.9	185.7	DLVS	1152.5	10	1247.0	3676	623.5	1838		0000	20.65	1.675	0.748	2.362	1.366
521	5203.7	185.7	DLVS	1140.5	10	1321.7	3851	660.8	1925		0000	20.61	1.672	0.747	2.357	1.363
522	5207.3	185.5	ULVS	1921	2	763.8	1839	190.9	459		0000	20.58				
523	5224.0	185.5	DLVS	1128	10	1191.2	3582	595.6	1791		0000	20.46	1.660	0.741	2.341	1.354
524	5235.6	185.3	DLVS	1152.5	10	1266.1	3750	633.0	1875		0000	20.38	1.654	0.738	2.332	1.348
525	5241.4	185.3	DLVS	1152.5	10	1329.7	3831	664.9	1915		0000	20.34	1.650	0.737	2.327	1.346
526	5245.7	185.3	ULVS	1921	2	757.6	1847	189.4	461		0000	20.31				
527	5250.3	185.3	DLVS	1143.5	10	1334.7	3876	667.3	1938		0000	20.28	1.645	0.735	2.320	1.342
528	5261.8	185.2	DLVS	1152.5	10	1206.8	3544	603.4	1772		0000	20.19	1.638	0.732	2.310	1.336
529	5279.3	185.1	DLVS	1152.5	10	1281.5	3790	640.7	1895		0000	20.07	1.628	0.727	2.296	1.328
530	5288.0	185.1	DLVS	1152.5	10	1348.8	3963	674.4	1981		0000	20.00	1.623	0.725	2.288	1.324
531	5294.5	184.9	ULVS	1921	2	1064.0	2623	266.0	655		0000	19.96				
532	5299.7	184.9	DLVS	1152.5	10	1195.2	3521	597.6	1760		0000	19.92	1.617	0.722	2.279	1.318
533	5317.2	184.8	DLVS	1147	10	1336.7	3906	668.4	1953		0000	19.80	1.606	0.717	2.265	1.310

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
534	5325.9	184.7	DLVS	1152.5	10	1287.2	3743	643.6	1871		0000	19.73	1.601	0.715	2.258	1.306
535	5330.8	184.7	ULVS	1441	2	997.7	2414	249.4	603		0000	19.70				
537	5536.1	183.1	DLVS	850	20	474.7	1434	474.7	1434		0000	18.28	1.483	0.662	2.091	1.209
540	5539.5	183.1	DLVS	850	20	480.0	1449	480.0	1449		0000	18.25	1.481	0.661	2.088	1.208
541	5540.7	183.1	DLVS	850	20	479.6	1456	479.6	1456		0000	18.25	1.480	0.661	2.087	1.207
543	5543.1	183.1	DLVS	850	20	466.4	1400	466.4	1400		0000	18.23	1.479	0.660	2.085	1.206
545	5545.4	183.1	DLVS	850	20	456.7	1336	456.7	1336		0000	18.21	1.478	0.660	2.084	1.205
547	5547.6	183.1	DLVS	850	20	449.6	1319	449.6	1319		0000	18.20	1.477	0.659	2.082	1.204
549	5549.9	183.1	DLVS	850	20	445.8	1310	445.8	1310		0000	18.18	1.475	0.659	2.080	1.203
551	5552.3	183.1	DLVS	850	20	430.4	1280	430.4	1280		0000	18.17	1.474	0.658	2.078	1.202
553	5554.6	183	DLVS	850	20	421.8	1262	421.8	1262		0000	18.15	1.473	0.658	2.076	1.201
555	5556.9	183	DLVS	850	20	417.8	1250	417.8	1250		0000	18.13	1.471	0.657	2.075	1.200
557	5559.2	183	DLVS	850	20	425.3	1269	425.3	1269		0000	18.12	1.470	0.656	2.073	1.199
559	5561.7	183	DLVS	850	20	434.9	1313	434.9	1313		0000	18.10	1.469	0.656	2.071	1.198
561	5564.0	183	DLVS	850	20	431.9	1302	431.9	1302		0000	18.09	1.467	0.655	2.069	1.197
563	5566.3	183	DLVS	850	20	433.3	1286	433.3	1286		0000	18.07	1.466	0.655	2.067	1.196
565	5568.5	183	DLVS	850	20	446.0	1330	446.0	1330		0000	18.05	1.465	0.654	2.065	1.195
567	5727.3	181.9	DLVS	1144	10	1200.4	3565	600.2	1782		0000	16.99	1.379	0.616	1.944	1.124
568	5733.0	181.8	DLVS	1144	10	1138.1	3394	569.0	1697		0000	16.95	1.375	0.614	1.939	1.122
569	5738.7	181.8	ULVS	1906.5	2	1464.8	3639	366.2	909		0000	16.91				
570	5751.6	181.8	ULVS	1906.5	2	956.6	2424	239.1	606		0000	16.83				
571	5755.2	181.6	DLVS	1144	10	1164.6	3472	582.3	1736		0000	16.81	1.364	0.609	1.923	1.112
572	5763.4	181.6	DLVS	1144	10	1221.4	3676	610.7	1838		0000	16.75	1.359	0.607	1.916	1.108
573	5768.1	181.6	ULVS	1906.5	2	820.9	2103	205.2	525		0000	16.72				
574	5771.5	181.6	DLVS	1144	10	1128.6	3315	564.3	1657		0000	16.70	1.355	0.605	1.910	1.105
575	5782.3	181.5	DLVS	1144	10	1091.6	3236	545.8	1618		0000	16.63	1.349	0.602	1.902	1.100
576	5789.4	181.4	ULVS	524.5	2	319.8	774	79.9	193		0000	16.58				
577	5801.8	181.4	DLVS	1144	10	1209.8	3604	604.9	1802		0000	16.50	1.339	0.598	1.888	1.092
578	5807.3	181.4	DLVS	1144	10	1140.7	3320	570.4	1660		0000	16.46	1.336	0.596	1.883	1.089
579	5818.3	181.3	DLVS	1144	10	1069.9	3163	535.0	1581		0000	16.39	1.330	0.594	1.875	1.085
580	5841.5	181	DLVS	1144	10	1152.3	3377	576.2	1688		0000	16.24	1.318	0.588	1.858	1.074
581	5849.5	181.1	ULVS	1430	2	1113.0	2796	278.3	699		0000	16.19				
582	5854.2	181	DLVS	1144	10	1059.9	3186	529.9	1593		0000	16.16	1.311	0.585	1.848	1.069
583	5874.4	180.9	DLVS	1144	10	1197.9	3612	599.0	1806		0000	16.02	1.300	0.581	1.833	1.060
584	6068.3	179.8	DLVS	1026.5	10	1005.1	3007	502.6	1503		0000	14.79	1.200	0.536	1.692	0.979

Vis #	Time	Temp	Type	Exp.	#	Summed		Per-Column		*	Lamp	Altitude	50º Nadir	10º Nadir	50º Nadir	10º Nadir
	(sec)	(K)		(ms)	Col's	Mean	Max	Mean	Max.			(km)	(km)	(km)	(km)	(km)
585	6073.5	179.7	DLVS	1026.5	10	975.3	2884	487.7	1442		0000	14.76	1.197	0.535	1.688	0.976
586	6077.0	179.7	ULVS	1711	2	1104.8	2837	276.2	709		0000	14.74				
587	6092.2	179.7	ULVS	1711	2	945.6	2462	236.4	615		0000	14.64				
588	6094.1	179.7	DLVS	1026.5	10	939.0	2807	469.5	1403		0000	14.63	1.187	0.530	1.673	0.968
589	6101.9	179.6	DLVS	1026.5	10	1014.6	3076	507.3	1538		0000	14.58	1.183	0.528	1.668	0.965
590	6109.6	179.6	DLVS	1026.5	10	980.9	2914	490.5	1457		0000	14.53	1.179	0.526	1.662	0.961
591	6120.0	179.4	DLVS	1026.5	10	887.2	2665	443.6	1332		0000	14.47	1.174	0.524	1.655	0.957
592	6124.4	179.4	ULVS	1283	2	848.7	2170	212.2	542		0000	14.44				
593	6138.2	179.3	DLVS	1026.5	10	1003.2	3065	501.6	1532		0000	14.35	1.165	0.520	1.642	0.950
594	6142.1	179.3	ULVS	1711	2	626.4	1608	156.6	402		0000	14.33				
595	6146.0	179.3	DLVS	1026.5	10	983.2	2949	491.6	1474		0000	14.30	1.161	0.518	1.636	0.946
596	6153.9	179.3	DLVS	1026.5	10	891.8	2637	445.9	1318		0000	14.25	1.157	0.516	1.631	0.943
597	6159.2	179.3	ULVS	470.5	2	320.2	794	80.0	198		0000	14.22				
598	6180.1	179.2	DLVS	1026.5	10	991.4	3012	495.7	1506		0000	14.09	1.144	0.511	1.612	0.932
599	6206.4	179.1	DLVS	1026.5	10	901.6	2655	450.8	1327		0000	13.93	1.130	0.505	1.594	0.922
600	6222.2	178.9	DLVS	1026.5	10	965.0	2903	482.5	1451		0000	13.84	1.123	0.501	1.583	0.915
601	6405.9	178	DLVS	1084	10	889.3	2648	444.7	1324		0000	12.73	1.033	0.461	1.456	0.842
602	6410.6	178	ULVS	1806.5	2	712.3	1897	178.1	474		0000	12.70				
603	6414.0	178	DLVS	1084	10	958.8	2946	479.4	1473		0000	12.68	1.029	0.459	1.451	0.839
604	6422.2	177.9	DLVS	1084	10	979.2	3016	489.6	1508		0000	12.63	1.025	0.458	1.445	0.836
605	6427.0	178	ULVS	1806.5	2	822.7	2214	205.7	553		0000	12.60				
606	6444.0	177.9	DLVS	1084	10	882.7	2643	441.3	1321		0000	12.50	1.014	0.453	1.430	0.827
607	6448.3	177.7	ULVS	497	2	256.0	638	64.0	159		0000	12.48				
608	6449.5	177.7	DLVS	1084	10	911.1	2705	455.6	1352		0000	12.47	1.012	0.452	1.426	0.825
609	6460.5	177.7	DLVS	1084	10	980.9	3016	490.5	1508		0000	12.41	1.007	0.449	1.419	0.821
610	6464.0	177.7	ULVS	1806.5	2	680.3	1809	170.1	452		0000	12.38				
611	6474.2	177.7	DLVS	1084	10	870.0	2566	435.0	1283		0000	12.33	1.000	0.447	1.410	0.816
612	6485.2	177.7	DLVS	1084	10	882.8	2675	441.4	1337		0000	12.26	0.995	0.444	1.403	0.811
613	6496.2	177.6	DLVS	1084	10	902.5	2664	451.2	1332		0000	12.20	0.990	0.442	1.395	0.807
614	6510.4	177.5	ULVS	1355	2	499.6	1326	124.9	331		0000	12.12				
615	6523.8	177.5	DLVS	1084	10	838.9	2464	419.5	1232		0000	12.04	0.977	0.436	1.377	0.796
616	6532.1	177.5	DLVS	1084	10	877.9	2682	438.9	1341		0000	11.99	0.973	0.434	1.371	0.793
617	6568.2	177.2	DLVS	1084	10	834.0	2473	417.0	1236		0000	11.78	0.956	0.427	1.347	0.779
618	6739.1	176.4	DLVS	1137.5	10	850.7	2573	425.4	1286		0000	10.79	0.876	0.391	1.235	0.714
619	6744.8	176.4	DLVS	1137.5	10	842.5	2538	421.3	1269		0000	10.76	0.873	0.390	1.231	0.712

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
620	6750.7	176.4	ULVS	521.5	2	323.6	823	80.9	205		0000	10.73				
621	6756.3	176.3	DLVS	1137.5	10	870.1	2608	435.0	1304		0000	10.69	0.868	0.387	1.223	0.708
622	6766.2	176.3	ULVS	1895.5	2	624.0	1677	156.0	419		0000	10.64				
623	6776.3	176.3	DLVS	1137.5	10	894.5	2784	447.3	1392		0000	10.58	0.859	0.383	1.210	0.700
624	6779.9	176.3	ULVS	1895.5	2	1111.6	3000	277.9	750		0000	10.56				
625	6782.1	176.1	DLVS	1137.5	10	845.3	2511	422.6	1255		0000	10.55	0.856	0.382	1.207	0.698
626	6793.5	176.1	DLVS	1137.5	10	852.9	2607	426.5	1303		0000	10.48	0.851	0.380	1.199	0.694
627	6797.1	176.3	ULVS	1895.5	2	965.1	2625	241.3	656		0000	10.46				
628	6802.4	176	DLVS	1137.5	10	872.9	2624	436.5	1312		0000	10.43	0.847	0.378	1.194	0.690
629	6815.6	176	ULVS	1422	2	485.5	1298	121.4	324		0000	10.36				
630	6831.0	176	DLVS	1137.5	10	826.6	2497	413.3	1248		0000	10.27	0.833	0.372	1.175	0.680
631	6839.7	176	DLVS	1137.5	10	833.0	2547	416.5	1273		0000	10.22	0.830	0.370	1.170	0.676
632	6854.1	176	DLVS	1137.5	10	896.1	2769	448.1	1384		0000	10.14	0.823	0.367	1.160	0.671
633	6868.6	175.9	DLVS	1137.5	10	872.5	2718	436.3	1359		0000	10.06	0.816	0.365	1.151	0.666
634	6891.8	175.8	DLVS	1137.5	10	827.8	2503	413.9	1251		0000	9.931	0.806	0.360	1.136	0.657
635	7063.9	175	DLVS	1183.5	10	818.5	2477	409.2	1238		0000	8.977	0.728	0.325	1.027	0.594
636	7069.9	175	DLVS	1183.5	10	850.2	2587	425.1	1293		0000	8.945	0.726	0.324	1.023	0.592
637	7078.0	175	ULVS	1972.5	2	625.2	1740	156.3	435		0000	8.900				
638	7081.8	174.9	DLVS	1183.5	10	894.2	2823	447.1	1411		0000	8.879	0.720	0.322	1.016	0.587
639	7095.9	174.8	ULVS	1972.5	2	1190.0	3414	297.5	853		0000	8.801				
640	7101.3	174.8	ULVS	542.5	2	313.7	847	78.4	211		0000	8.771				
641	7102.7	174.9	DLVS	1183.5	10	800.3	2460	400.2	1230		0000	8.763	0.711	0.317	1.002	0.580
642	7108.7	174.8	DLVS	1183.5	10	802.7	2462	401.3	1231		0000	8.730	0.708	0.316	0.999	0.578
643	7117.6	174.8	ULVS	1972.5	2	663.2	1881	165.8	470		0000	8.682				
644	7120.7	174.8	DLVS	1183.5	10	853.5	2642	426.7	1321		0000	8.666	0.703	0.314	0.991	0.573
645	7129.7	174.7	DLVS	1183.5	10	883.9	2798	441.9	1399		0000	8.618	0.699	0.312	0.986	0.570
646	7133.4	174.8	ULVS	1479	2	562.7	1582	140.7	395		0000	8.598				
647	7147.7	174.7	DLVS	1183.5	10	778.4	2377	389.2	1188		0000	8.519	0.691	0.309	0.975	0.564
648	7159.7	174.7	DLVS	1183.5	10	799.1	2457	399.5	1228		0000	8.453	0.686	0.306	0.967	0.559
649	7168.7	174.6	DLVS	1183.5	10	877.7	2848	438.8	1424		0000	8.406	0.682	0.305	0.962	0.556
650	7186.8	174.6	DLVS	1183.5	10	789.1	2413	394.6	1206		0000	8.310	0.674	0.301	0.951	0.550
651	7198.9	174.6	DLVS	1183.5	10	769.0	2370	384.5	1185		0000	8.244	0.669	0.299	0.943	0.545
652	7386.8	173.8	DLVS	1229.5	10	740.0	2250	370.0	1125		0000	7.237	0.587	0.262	0.828	0.479
653	7393.1	173.7	ULVS	563.5	2	308.9	845	77.2	211		0000	7.204				
654	7396.0	173.8	DLVS	1229.5	10	749.2	2321	374.6	1160		0000	7.188	0.583	0.260	0.822	0.476

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
655	7402.2	173.7	DLVS	1229.5	10	751.3	2296	375.6	1148		0000	7.156	0.581	0.259	0.819	0.473
656	7406.0	173.7	ULVS	2049	2	696.5	2012	174.1	503		0000	7.136				
657	7424.6	173.6	ULVS	2049	2	700.7	2025	175.2	506		0000	7.037				
658	7427.0	173.6	DLVS	1229.5	10	804.9	2566	402.4	1283		0000	7.024	0.570	0.254	0.804	0.465
659	7436.2	173.6	DLVS	1229.5	10	736.9	2234	368.4	1117		0000	6.976	0.566	0.253	0.798	0.462
660	7442.4	173.6	DLVS	1229.5	10	738.3	2318	369.2	1159		0000	6.943	0.563	0.252	0.794	0.459
661	7447.0	173.6	ULVS	2049	2	986.4	2867	246.6	716		0000	6.919				
662	7454.8	173.6	DLVS	1229.5	10	767.3	2390	383.6	1195		0000	6.879	0.558	0.249	0.787	0.455
663	7482.9	173.5	DLVS	1229.5	10	740.1	2362	370.0	1181		0000	6.731	0.546	0.244	0.770	0.445
664	7489.2	173.5	DLVS	1229.5	10	713.1	2133	356.5	1066		0000	6.698	0.543	0.243	0.766	0.443
665	7500.6	173.3	ULVS	1537	2	696.9	1984	174.2	496		0000	6.639				
666	7504.8	173.3	DLVS	1229.5	10	738.0	2277	369.0	1138		0000	6.617	0.537	0.240	0.757	0.438
667	7523.5	173.3	DLVS	1229.5	10	790.8	2575	395.4	1287		0000	6.519	0.529	0.236	0.746	0.431
668	7532.9	173.2	DLVS	1229.5	10	754.3	2420	377.1	1210		0000	6.470	0.525	0.234	0.740	0.428
669	7717.9	172.6	DLVS	1267	10	729.7	2352	364.8	1176		0000	5.517	0.448	0.200	0.631	0.365
670	7726.6	172.6	ULVS	2112	2	1080.9	3277	270.2	819		0000	5.474				
671	7732.4	172.6	ULVS	580.5	2	293.6	823	73.4	205		0000	5.444				
672	7733.9	172.6	DLVS	1267	10	674.8	2050	337.4	1025		0000	5.437	0.441	0.197	0.622	0.360
673	7740.3	172.5	DLVS	1267	10	686.3	2150	343.2	1075		0000	5.404	0.438	0.196	0.618	0.358
674	7745.8	172.6	ULVS	2112	2	708.7	2115	177.2	528		0000	5.376				
675	7749.8	172.6	DLVS	1267	10	727.0	2310	363.5	1155		0000	5.356	0.435	0.194	0.613	0.354
676	7759.4	172.6	DLVS	1267	10	762.9	2504	381.4	1252		0000	5.308	0.431	0.192	0.607	0.351
677	7766.3	172.5	ULVS	1584	2	509.4	1487	127.3	371		0000	5.273				
678	7775.4	172.5	DLVS	1267	10	694.4	2216	347.2	1108		0000	5.226	0.424	0.189	0.598	0.346
679	7785.0	172.5	DLVS	1267	10	661.6	1995	330.8	997		0000	5.177	0.420	0.188	0.592	0.343
680	7788.7	172.5	ULVS	2112	2	988.2	2956	247.1	739		0000	5.158				
681	7800.9	172.5	DLVS	1267	10	695.0	2169	347.5	1084		0000	5.096	0.414	0.185	0.583	0.337
682	7807.4	172.4	DLVS	1267	10	728.3	2301	364.2	1150		0000	5.064	0.411	0.183	0.579	0.335
683	7820.2	172.4	DLVS	1267	10	737.6	2454	368.8	1227		0000	5.000	0.406	0.181	0.572	0.331
684	7829.9	172.4	DLVS	1267	10	672.4	2099	336.2	1049		0000	4.952	0.402	0.179	0.567	0.328
685	7842.8	172.4	DLVS	1267	10	652.5	2006	326.2	1003		0000	4.888	0.397	0.177	0.559	0.323
686	8046.5	171.8	DLVS	850	20	203.4	652	203.4	652		0000	3.881	0.315	0.141	0.444	0.257
688	8048.7	171.8	DLVS	850	20	203.9	649	203.9	649		0000	3.870	0.314	0.140	0.443	0.256
690	8051.0	171.8	DLVS	850	20	204.1	649	204.1	649		0000	3.859	0.313	0.140	0.441	0.255
692	8053.5	171.8	DLVS	850	20	207.0	661	207.0	661		0000	3.847	0.312	0.139	0.440	0.255

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed		Per-Column		*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
						Mean	Max	Mean	Max.							
694	8055.8	171.8	DLVS	850	20	207.8	655	207.8	655		0000	3.835	0.311	0.139	0.439	0.254
696	8058.1	171.6	DLVS	850	20	209.1	660	209.1	660		0000	3.824	0.310	0.139	0.438	0.253
698	8060.4	171.6	DLVS	850	20	213.1	675	213.1	675		0000	3.813	0.309	0.138	0.436	0.252
700	8062.8	171.6	DLVS	850	20	216.1	692	216.1	692		0000	3.801	0.308	0.138	0.435	0.252
702	8065.0	171.6	DLVS	850	20	221.9	717	221.9	717		0000	3.790	0.308	0.137	0.434	0.251
704	8067.3	171.6	DLVS	850	20	222.0	716	222.0	716		0000	3.779	0.307	0.137	0.432	0.250
706	8069.6	171.8	DLVS	850	20	225.1	729	225.1	729		0000	3.768	0.306	0.137	0.431	0.249
708	8072.0	171.6	DLVS	850	20	229.0	761	229.0	761		0000	3.756	0.305	0.136	0.430	0.249
710	8074.2	171.6	DLVS	850	20	227.0	751	227.0	751		0000	3.745	0.304	0.136	0.428	0.248
712	8076.5	171.6	DLVS	850	20	223.7	740	223.7	740		0000	3.734	0.303	0.135	0.427	0.247
714	8078.7	171.6	DLVS	850	20	223.2	748	223.2	748		0000	3.723	0.302	0.135	0.426	0.246
716	8081.0	171.6	DLVS	850	20	224.1	756	224.1	756		0000	3.712	0.301	0.134	0.425	0.246
718	8083.4	171.6	DLVS	850	20	218.0	708	218.0	708		0000	3.700	0.300	0.134	0.423	0.245
720	8225.4	171.4	ULVS	2198	2	564.2	1715	141.1	428		0000	3.013				
721	8227.9	171.3	DLVS	1318.5	10	647.7	2110	323.8	1055		0000	3.001	0.243	0.109	0.343	0.199
722	8234.6	171.4	ULVS	2198	2	623.9	1919	156.0	479		0000	2.968				
723	8244.3	171.3	DLVS	1318.5	10	595.9	1894	297.9	947		0000	2.921	0.237	0.106	0.334	0.193
728	8323.3	171.1	ULVS	2210	2	770.5	2393	192.6	598		0000	2.543				
732	8371.8	171	ULVS	2217	2	875.3	2768	218.8	692		0000	2.311				
735	8390.6	171	DLVS	1330.5	10	614.9	2037	307.4	1018		0000	2.222	0.180	0.0805	0.254	0.147
741	8472.5	170.9	DLVS	1336.5	10	543.3	1816	271.6	908		0000	1.836	0.149	0.0665	0.210	0.121
743	8488.9	170.8	DLVS	1337.5	10	553.7	1808	276.8	904		0000	1.759	0.143	0.0637	0.201	0.116
748	8568.2	170.7	ULVS	2239.5	2	802.5	2542	200.6	635		0000	1.391				
759	8685.6	170.4	DLVS	1350	10	497.4	1627	248.7	813		0000	0.842	0.0683	0.0305	0.0963	0.0557
764	8765.2	170.3	ULVS	2257.5	2	560.0	1761	140.0	440		0001	0.474				
768	8824.7	170.4	DLVS	1359	2	523.2	1723	261.6	861		0001	0.205	0.0166	0.0074	0.0235	0.0136
769	8826.5	170.3	DLVS	1359	2	523.8	1708	261.9	854		0001	0.197	0.0160	0.0071	0.0226	0.0130
771	8841.6	170.3	DLVS	1359	2	487.9	1581	243.9	790		0001	0.127	0.0103	0.0046	0.0145	0.0084
772	8843.3	170.3	DLVS	1359	2	487.7	1584	243.9	792		0001	0.119	0.0097	0.0043	0.0137	0.0079
774	8846.8	170.2	DLVS	1359	2	484.5	1591	242.3	795		0001	0.104	0.0084	0.0038	0.0119	0.0069
775	8848.5	170.3	DLVS	1359	2	484.3	1567	242.2	783		0001	0.096	0.0078	0.0035	0.0110	0.0064
777	8851.9	170.3	DLVS	1359	2	484.4	1566	242.2	783		0001	0.081	0.0066	0.0029	0.0093	0.0054
779	8855.3	170.3	DLVS	1359	2	480.9	1549	240.5	774		0001	0.066	0.0053	0.0024	0.0075	0.0043
781	8858.7	170.3	DLVS	1360.5	2	492.4	1569	246.2	784		0001	0.050	0.0041	0.0018	0.0057	0.0033
785	8865.6	170.3	DLVS	1360.5	2	613.0	1911	306.5	955		0001	0.019	0.0015	0.0007	0.0022	0.0013

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
786	8867.3	170.3	DLVS	1360.5	2	995.0	3055	497.5	1527		0001	0.011	0.0009	0.0004	0.0013	0.0007
788	8870.7	170.2	DLVS	1360.5	2	4826.6	8190	2413.3	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
789	8872.4	170.2	DLVS	680.5	2	3879.5	8190	1939.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
790	8873.6	170.3	DLVS	340.5	2	1698.8	4220	849.4	2110		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
791	8876.2	170.2	DLVS	330.5	2	1785.4	4541	892.7	2270		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
792	8877.4	170.2	DLVS	295.5	2	1578.5	3995	789.2	1997		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
793	8879.2	170.2	DLVS	301	2	1614.0	4112	807.0	2056		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
798	8886.5	170.2	DLVS	301	2	1609.8	4085	804.9	2042		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
799	8888.4	170.3	DLVS	299	2	1607.7	4045	803.8	2022		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
801	8891.3	170.3	DLVS	297	2	1600.3	4050	800.2	2025		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
802	8893.1	170.2	DLVS	298.5	2	1600.3	4046	800.2	2023		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
803	8894.3	170.2	DLVS	299.5	2	1616.5	4093	808.2	2046		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
806	8898.9	170.2	DLVS	297.5	2	1606.7	4097	803.3	2048		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
807	8900.6	170.2	DLVS	296.5	2	1597.2	4048	798.6	2024		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
809	8903.5	170.3	DLVS	297	2	1601.6	4086	800.8	2043		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
811	8907.2	170.2	DLVS	299	2	1610.5	4085	805.3	2042		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
812	8908.3	170.2	DLVS	297.5	2	1601.4	4057	800.7	2028		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
813	8909.7	170.2	DLVS	299	2	1615.4	4106	807.7	2053		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
815	8912.8	170.2	DLVS	296	2	1602.8	4076	801.4	2038		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
816	8914.6	170.2	DLVS	296	2	1598.0	4056	799.0	2028		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
818	8918.0	170.2	ULVS	1000	2	577.5	1676	144.4	419		0001	0.00005				
819	8919.3	170.2	DLVS	4000	10	5359.8	8190	2679.9	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
820	8923.6	170.2	ULVS	7074.5	2	3772.2	11632	943.0	2908		0001	0.00005				
821	8931.0	170.2	DLVS	297	10	831.3	4088	415.7	2044		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
822	8931.6	170.2	ULVS	7326.5	2	3901.3	12008	975.3	3002		0001	0.00005				
823	8939.2	170.2	DLVS	2001	10	3836.7	8190	1918.4	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
824	8941.6	170.2	ULVS	7278.5	2	3871.7	11945	967.9	2986		0001	0.00005				
825	8949.1	170.2	DLVS	360	10	999.8	4942	499.9	2471		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
826	8949.8	170.2	ULVS	7316	2	3894.2	12000	973.5	3000		0001	0.00005				
827	8957.4	170.2	DLVS	1001	10	2518.9	8190	1259.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
828	8958.8	170.2	ULVS	7268	2	3865.9	11891	966.5	2972		0001	0.00005				
829	8966.3	170.2	DLVS	359.5	10	1000.4	4930	500.2	2465		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
830	8967.0	170.2	ULVS	7291	2	3876.2	11881	969.0	2970		0001	0.00005				
831	8974.6	170.2	DLVS	501	10	1381.5	6849	690.7	3424		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
832	8975.4	170.2	ULVS	7300	2	3881.6	11936	970.4	2984		0001	0.00005				

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833	8983.0	170.2	DLVS	358	10	997.7	4936	498.8	2468		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
834	8983.7	170.2	ULVS	7309	2	3885.1	11917	971.3	2979		0001	0.00005				
835	8991.3	170.2	DLVS	359	10	998.9	4913	499.5	2456		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
836	8992.0	170.2	ULVS	7303.5	2	3883.4	11947	970.8	2986		0001	0.00005				
837	8999.6	170.2	DLVS	357.5	10	997.3	4915	498.6	2457		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
838	9000.3	170	ULVS	7298	2	3881.2	11928	970.3	2982		0001	0.00005				
839	9007.8	170	DLVS	358.5	10	1000.5	4926	500.2	2463		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
840	9013.8	170.2	DLVS	1360.5	10	3085.6	8190	1542.8	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
841	9024.0	170.2	DLVS	1360.5	10	3090.2	8190	1545.1	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
842	9029.0	170.2	ULVS	2267.5	2	1238.8	3721	309.7	930		0001	0.00005				
843	9044.5	170.2	DLVS	1360.5	10	3088.6	8190	1544.3	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
844	9051.4	170.2	ULVS	623.5	2	378.7	1060	94.7	265		0001	0.00005				
845	9058.1	170.2	DLVS	1360.5	10	3092.9	8190	1546.4	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
846	9065.7	170.2	ULVS	2267.5	2	1239.8	3717	309.9	929		0001	0.00005				
847	9068.4	170.2	DLVS	1360.5	10	3092.8	8190	1546.4	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
848	9075.2	170.2	DLVS	1360.5	10	3091.2	8190	1545.6	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
849	9086.2	170.2	ULVS	2267.5	2	1239.9	3720	310.0	930		0001	0.00005				
850	9088.8	170.2	DLVS	1360.5	10	3093.0	8190	1546.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
851	9102.4	170.2	DLVS	1360.5	10	3087.5	8190	1543.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
852	9112.7	170.2	DLVS	1360.5	10	3095.3	8190	1547.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
853	9119.5	170.2	DLVS	1360.5	10	3090.4	8190	1545.2	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
854	9128.5	170.2	ULVS	1700.5	2	944.3	2813	236.1	703		0001	0.00005				
855	9163.8	170.3	DLVS	1360.5	10	3093.3	8190	1546.6	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
856	9174.0	170.4	DLVS	1360.5	10	3089.2	8190	1544.6	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
857	9372.5	170.9	ULVS	2267.5	2	1250.5	3827	312.6	956		0001	0.00005				
858	9376.9	170.8	DLVS	1360.5	10	3101.2	8190	1550.6	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
859	9383.7	170.8	DLVS	1360.5	10	3106.9	8190	1553.4	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
860	9393.0	170.9	ULVS	2267.5	2	1251.4	3821	312.9	955		0001	0.00005				
861	9397.3	170.9	DLVS	1360.5	10	3102.3	8190	1551.2	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
862	9414.4	170.9	DLVS	1360.5	10	3103.3	8190	1551.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
863	9419.6	170.9	ULVS	623.5	2	382.8	1094	95.7	273		0001	0.00005				
864	9421.2	170.9	DLVS	1360.5	10	3103.5	8190	1551.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
865	9431.4	170.9	DLVS	1360.5	10	3101.3	8190	1550.6	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
866	9438.1	171	ULVS	2267.5	2	1255.3	3871	313.8	967		0001	0.00005				
867	9441.6	171	DLVS	1360.5	10	3103.3	8190	1551.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06

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868	9451.9	171	DLVS	1360.5	10	3096.9	8190	1548.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
869	9455.8	171.1	ULVS	1700.5	2	954.6	2900	238.7	725		0001	0.00005				
870	9468.9	171.1	DLVS	1360.5	10	3097.8	8190	1548.9	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
871	9475.7	171.3	DLVS	1360.5	10	3101.4	8190	1550.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
872	9486.0	171.3	DLVS	1360.5	10	3105.3	8190	1552.6	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
873	9530.2	171.3	DLVS	1360.5	10	3104.4	8190	1552.2	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
874	9692.9	172.1	DLVS	680.5	10	1864.9	8190	932.4	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
875	9696.3	172.1	DLVS	680.5	10	1872.0	8190	936.0	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
876	9699.8	172	ULVS	2267.5	2	1270.3	3973	317.6	993		0001	0.00005				
877	9706.6	172.1	DLVS	680.5	10	1870.9	8190	935.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
878	9720.3	172.2	ULVS	2267.5	2	1271.2	3981	317.8	995		0001	0.00005				
879	9724.5	172.2	ULVS	2267.5	2	1272.1	3996	318.0	999		0001	0.00005				
880	9730.4	172.2	DLVS	680.5	10	1871.6	8190	935.8	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
881	9740.6	172.2	DLVS	680.5	10	1868.7	8190	934.3	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
882	9744.0	172.2	DLVS	680.5	10	1868.6	8190	934.3	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
883	9754.4	172.2	DLVS	680.5	10	1865.7	8190	932.8	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
884	9767.9	172.4	DLVS	680.5	10	1862.4	8190	931.2	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
885	9783.1	172.5	ULVS	1700.5	2	968.6	3020	242.2	755		0001	0.00005				
886	9787.8	172.5	ULVS	623.5	2	388.9	1140	97.2	285		0001	0.00005				
887	9791.8	172.6	DLVS	680.5	10	1871.6	8190	935.8	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
888	9798.6	172.6	DLVS	680.5	10	1870.4	8190	935.2	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
889	9805.4	172.6	DLVS	680.5	10	1866.7	8190	933.3	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
890	9842.9	172.9	DLVS	680.5	10	1869.7	8190	934.8	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
891	10001.5	173.6	DLVS	680.5	10	1867.6	8190	933.8	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
892	10004.8	173.5	DLVS	680.5	10	1868.9	8190	934.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
893	10010.8	173.5	ULVS	2267.5	2	1288.8	4109	322.2	1027		0001	0.00005				
894	10025.4	173.6	DLVS	680.5	10	1869.4	8190	934.7	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
895	10028.6	173.6	ULVS	1700.5	2	980.7	3093	245.2	773		0001	0.00005				
896	10032.1	173.6	DLVS	680.5	10	1873.8	8190	936.9	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
897	10039.1	173.6	DLVS	680.5	10	1865.8	8190	932.9	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
898	10047.5	173.7	ULVS	2267.5	2	1291.9	4134	323.0	1033		0001	0.00005				
899	10052.6	173.7	DLVS	680.5	10	1870.9	8190	935.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
900	10062.8	173.7	DLVS	680.5	10	1862.9	8190	931.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
901	10068.0	173.8	ULVS	2267.5	2	1293.1	4126	323.3	1031		0001	0.00005				
902	10074.1	173.8	ULVS	623.5	2	392.8	1169	98.2	292		0001	0.00005				

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
903	10090.1	173.9	DLVS	680.5	10	1871.1	8190	935.6	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
904	10096.9	173.9	DLVS	680.5	10	1870.5	8190	935.2	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
905	10110.5	174.1	DLVS	680.5	10	1862.9	8190	931.5	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
906	10117.3	174.1	DLVS	680.5	10	1866.1	8190	933.0	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
907	10141.2	174.2	DLVS	680.5	10	1862.9	8190	931.4	4095	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
908	10313.4	174.9	ULVS	2267.5	2	1307.4	4211	326.9	1052		0001	0.00005				
909	10317.1	174.9	DLVS	354.5	10	996.8	4881	498.4	2440		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
910	10320.5	175	DLVS	354.5	10	1000.0	4883	500.0	2441		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
911	10330.7	175	DLVS	354.5	10	993.5	4855	496.7	2427		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
912	10333.9	174.9	ULVS	2267.5	2	1310.7	4259	327.7	1064		0001	0.00005				
913	10354.6	175	DLVS	355	10	996.9	4880	498.5	2440		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
914	10360.5	175.2	ULVS	623.5	2	398.1	1194	99.5	298		0001	0.00005				
915	10364.8	175.2	DLVS	354.5	10	994.1	4875	497.0	2437		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
916	10368.2	175.2	DLVS	356	10	999.2	4906	499.6	2453		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
917	10378.5	175.3	DLVS	356	10	997.0	4887	498.5	2443		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
918	10392.1	175.3	DLVS	353	10	993.3	4873	496.6	2436		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
919	10396.7	175.3	ULVS	1700.5	2	999.7	3229	249.9	807		0001	0.00005				
920	10416.0	175.4	DLVS	355.5	10	1001.3	4939	500.6	2469		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
921	10419.9	175.4	ULVS	2267.5	2	1317.1	4292	329.3	1073		0001	0.00005				
922	10422.8	175.4	DLVS	357	10	998.7	4894	499.3	2447		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
923	10429.6	175.5	DLVS	354.5	10	996.9	4913	498.5	2456		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
924	10467.1	175.7	DLVS	352.5	10	994.2	4890	497.1	2445		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
925	10612.0	176.1	DLVS	356.5	10	1001.7	4914	500.9	2457		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
926	10615.4	176.1	DLVS	355.5	10	1001.0	4917	500.5	2458		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
927	10620.2	176.3	ULVS	2267.5	2	1328.1	4371	332.0	1092		0001	0.00005				
928	10635.9	176.4	DLVS	357.5	10	1004.2	4912	502.1	2456		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
929	10639.3	176.3	DLVS	355.5	10	999.6	4908	499.8	2454		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
930	10642.2	176.4	ULVS	1700.5	2	1007.7	3276	251.9	819		0001	0.00005				
931	10649.6	176.5	DLVS	354.5	10	997.9	4890	499.0	2445		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
932	10663.1	176.5	DLVS	354.5	10	997.9	4907	499.0	2453		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
933	10665.9	176.5	ULVS	2267.5	2	1330.4	4375	332.6	1093		0001	0.00005				
934	10673.3	176.5	DLVS	356	10	1005.3	4960	502.6	2480		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
935	10683.6	176.5	DLVS	357	10	1004.3	4911	502.2	2455		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
936	10687.8	176.5	ULVS	623.5	2	402.3	1225	100.6	306		0001	0.00005				
937	10700.6	176.6	DLVS	356	10	1000.0	4934	500.0	2467		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06

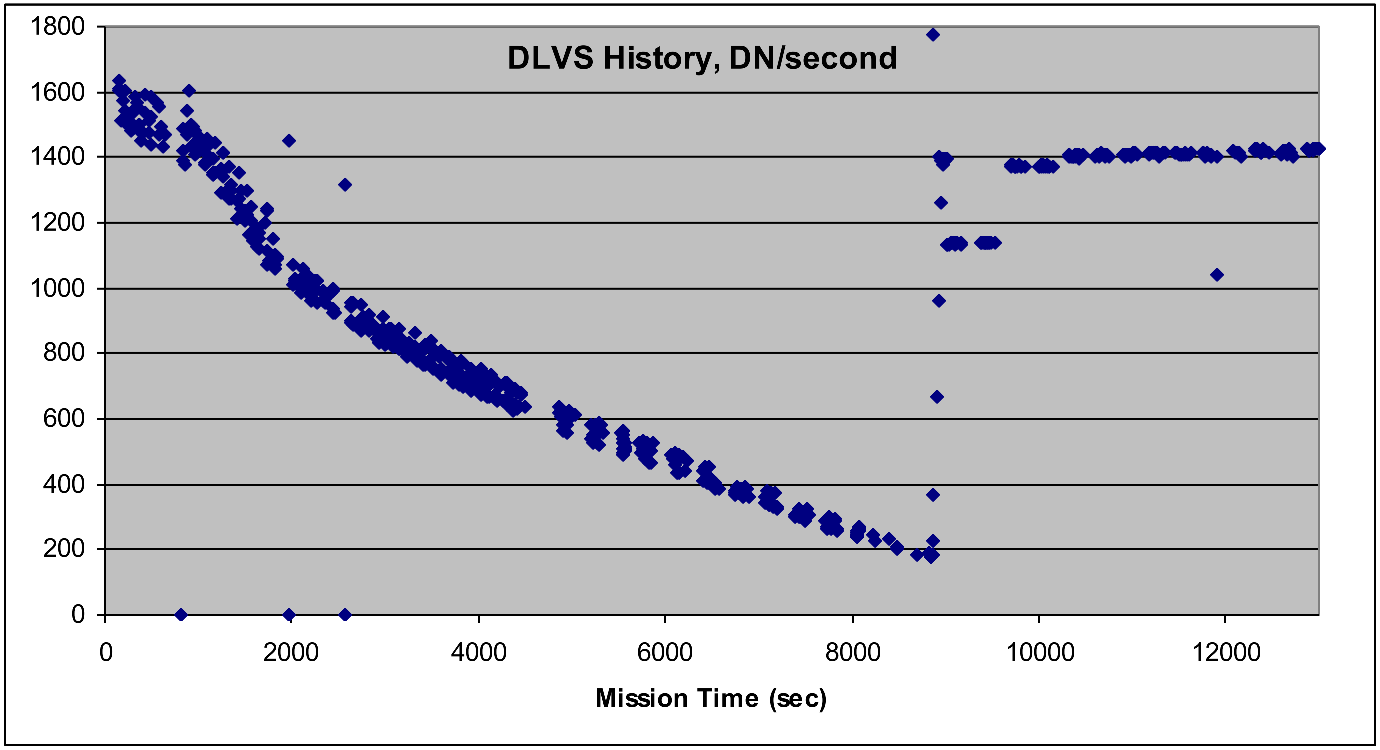
Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
938	10707.5	176.8	DLVS	355	10	998.1	4909	499.0	2454		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
939	10722.5	176.8	ULVS	2267.5	2	1332.0	4382	333.0	1095		0001	0.00005				
940	10727.9	176.8	DLVS	355	10	999.3	4910	499.7	2455		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
941	10751.7	176.8	DLVS	355.5	10	996.6	4899	498.3	2449		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
942	10906.6	177.5	ULVS	2267.5	2	1342.3	4445	335.6	1111		0001	0.00005				
943	10910.3	177.5	DLVS	359	10	1009.1	4916	504.5	2458		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
944	10913.7	177.5	DLVS	358	10	1008.2	4925	504.1	2462		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
945	10923.9	177.5	DLVS	355.5	10	995.4	4873	497.7	2436		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
946	10927.1	177.5	ULVS	2267.5	2	1344.9	4457	336.2	1114		0001	0.00005				
947	10937.6	177.5	DLVS	357.5	10	1006.1	4920	503.0	2460		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
948	10951.7	177.6	ULVS	2267.5	2	1346.0	4471	336.5	1117		0001	0.00005				
949	10958.0	177.6	DLVS	355	10	998.5	4899	499.2	2449		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
950	10961.4	177.7	DLVS	355.5	10	1000.8	4911	500.4	2455		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
951	10969.4	177.7	ULVS	1700.5	2	1022.6	3368	255.6	842		0001	0.00005				
952	10974.1	177.9	ULVS	623.5	2	407.2	1267	101.8	316		0001	0.00005				
953	10985.3	177.7	DLVS	357.5	10	1004.9	4953	502.4	2476		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
954	10988.7	177.9	DLVS	355	10	996.8	4892	498.4	2446		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
955	11009.1	177.9	DLVS	357.5	10	1008.8	4961	504.4	2480		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
956	11012.6	178	DLVS	356.5	10	1008.5	4987	504.3	2493		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
957	11022.8	178	DLVS	355.5	10	1006.7	4968	503.3	2484		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
958	11056.9	178.2	DLVS	356.5	10	1002.2	4930	501.1	2465		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
959	11184.7	178.7	DLVS	357	10	1006.8	4927	503.4	2463		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
960	11188.1	178.8	DLVS	355	10	1004.2	4925	502.1	2462		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
961	11193.0	178.7	ULVS	2267.5	2	1355.4	4496	338.8	1124		0001	0.00005				
962	11208.9	178.8	DLVS	356	10	1006.2	4917	503.1	2458		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
963	11212.0	178.8	DLVS	355	10	1003.3	4914	501.7	2457		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
964	11214.9	178.8	ULVS	1700.5	2	1030.9	3414	257.7	853		0001	0.00005				
965	11232.4	178.9	DLVS	356.5	10	1009.0	4936	504.5	2468		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
966	11235.9	178.9	DLVS	355.5	10	1005.7	4936	502.8	2468		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
967	11238.7	178.9	ULVS	2267.5	2	1359.7	4527	339.9	1131		0001	0.00005				
968	11246.4	179.1	DLVS	354.5	10	1002.3	4900	501.1	2450		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
969	11259.7	179.1	DLVS	356	10	1005.4	4920	502.7	2460		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
970	11280.2	179.1	DLVS	356	10	1002.2	4901	501.1	2450		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
971	11283.6	179.2	DLVS	357.5	10	1002.9	4893	501.4	2446		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
972	11295.2	179.2	ULVS	2267.5	2	1361.9	4551	340.5	1137		0001	0.00005				

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Summed Max	Per-Column Mean	Per-Column Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
973	11301.4	179.3	ULVS	623.5	2	409.9	1286	102.5	321		0001	0.00005				
974	11338.1	179.4	DLVS	355.5	10	1006.0	4948	503.0	2474		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
975	11344.9	179.4	DLVS	355.5	10	1006.0	4956	503.0	2478		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
976	11462.7	179.9	DLVS	355	10	1002.4	4927	501.2	2463		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
977	11466.0	179.9	DLVS	357	10	1009.0	4951	504.5	2475		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
978	11476.2	180	DLVS	356.5	10	1008.4	4949	504.2	2474		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
979	11479.3	180.2	ULVS	2267.5	2	1371.3	4582	342.8	1145		0001	0.00005				
980	11499.8	180.2	ULVS	2267.5	2	1370.6	4619	342.7	1154		0001	0.00005				
981	11506.0	180.2	ULVS	623.5	2	413.6	1301	103.4	325		0001	0.00005				
982	11510.3	180.2	DLVS	356.5	10	1006.3	4918	503.1	2459		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
983	11513.7	180.2	DLVS	353	10	993.9	4838	497.0	2419		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
984	11523.9	180.2	DLVS	356.5	10	1002.7	4893	501.3	2446		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
985	11534.2	180.3	DLVS	356	10	1004.4	4913	502.2	2456		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
986	11542.2	180.4	ULVS	1700.5	2	1043.7	3485	260.9	871		0001	0.00005				
987	11561.4	180.4	DLVS	357	10	1011.6	4960	505.8	2480		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
988	11565.4	180.4	ULVS	2267.5	2	1376.0	4607	344.0	1151		0001	0.00005				
989	11568.2	180.4	DLVS	357	10	1006.3	4924	503.2	2462		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
990	11578.5	180.4	DLVS	358	10	1007.0	4919	503.5	2459		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
991	11612.5	180.7	DLVS	357	10	1006.8	4928	503.4	2464		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
992	11622.8	180.7	DLVS	355	10	1002.7	4915	501.4	2457		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
993	11745.3	181.3	ULVS	2267.5	2	1386.8	4708	346.7	1177		0001	0.00005				
994	11750.6	181.3	DLVS	354.5	10	1003.0	4940	501.5	2470		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
995	11754.0	181.3	DLVS	354.5	10	1003.1	4942	501.5	2471		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
996	11764.3	181.3	DLVS	354	10	1000.4	4920	500.2	2460		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
997	11769.9	181.4	ULVS	2267.5	2	1390.0	4728	347.5	1182		0001	0.00005				
998	11784.7	181.4	DLVS	354.5	10	994.4	4856	497.2	2428		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
999	11787.6	181.4	ULVS	1700.5	2	1053.8	3554	263.5	888		0001	0.00005				
1000	11792.3	181.4	ULVS	623.5	2	418.2	1330	104.6	332		0001	0.00005				
1001	11798.4	181.4	DLVS	354	10	997.9	4882	499.0	2441		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1002	11801.8	181.4	DLVS	354	10	1000.4	4892	500.2	2446		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1003	11806.6	181.5	ULVS	2267.5	2	1390.6	4752	347.7	1188		0001	0.00005				
1004	11822.4	181.5	DLVS	355	10	1001.5	4921	500.7	2460		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1005	11829.0	181.5	DLVS	354	10	998.8	4873	499.4	2436		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1006	11849.5	181.6	DLVS	355	10	1001.1	4890	500.5	2445		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1007	11852.9	181.6	DLVS	357	10	1001.0	4857	500.5	2428		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
1008	11897.2	181.9	DLVS	358.5	10	1007.0	4891	503.5	2445		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1009	11900.6	181.9	DLVS	355	10	740.0	4866	370.0	2433		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1017	12074.0	182.5	ULVS	1700.5	2	1064.2	3613	266.1	903		0001	0.00005				
1018	12078.7	182.6	ULVS	623.5	2	421.5	1364	105.4	341		0001	0.00005				
1019	12086.4	182.6	DLVS	356	10	1013.5	10623	506.7	5311	*	0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1021	12097.2	182.6	ULVS	2267.5	2	1403.6	4801	350.9	1200		0001	0.00005				
1022	12100.1	182.6	DLVS	357.5	10	1011.5	4965	505.8	2482		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1023	12113.7	182.6	DLVS	355.5	10	1004.4	4928	502.2	2464		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1024	12134.2	182.7	DLVS	354.5	10	1002.7	4910	501.3	2455		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1025	12144.4	182.7	DLVS	354.5	10	996.8	4865	498.4	2432		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1026	12161.4	182.9	DLVS	354.5	10	995.4	4840	497.7	2420		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1027	12309.7	183.3	DLVS	358	10	1016.1	4958	508.1	2479		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1028	12313.1	183.2	DLVS	356	10	1009.2	4930	504.6	2465		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1029	12318.0	183.3	ULVS	2267.5	2	1412.9	4848	353.2	1212		0001	0.00005				
1030	12323.5	183.3	DLVS	354	10	1010.6	4951	505.3	2475		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1031	12333.8	183.3	DLVS	355	10	1013.2	4962	506.6	2481		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1032	12338.4	183.6	ULVS	2267.5	2	1414.0	4868	353.5	1217		0001	0.00005				
1033	12357.4	183.6	DLVS	359	10	1017.7	4953	508.9	2476		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1034	12360.4	183.5	ULVS	1700.5	2	1073.5	3680	268.4	920		0001	0.00005				
1035	12365.0	183.5	ULVS	623.5	2	423.9	1376	106.0	344		0001	0.00005				
1036	12371.1	183.6	DLVS	356.5	10	1010.4	4943	505.2	2471		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1037	12377.9	183.6	DLVS	355	10	1006.1	4902	503.0	2451		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1038	12383.5	183.6	ULVS	2267.5	2	1415.0	4842	353.7	1210		0001	0.00005				
1039	12388.1	183.6	DLVS	358	10	1013.8	4948	506.9	2474		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1040	12401.8	183.6	DLVS	355	10	1009.1	4929	504.6	2464		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1041	12408.6	183.7	DLVS	354	10	1009.4	4941	504.7	2470		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1042	12422.2	183.8	DLVS	357.5	10	1014.9	4971	507.5	2485		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1043	12466.5	184	DLVS	360.5	10	1020.7	4985	510.3	2492		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1044	12588.5	184.3	ULVS	2267.5	2	1426.1	4948	356.5	1237		0001	0.00005				
1045	12591.1	184.3	DLVS	356	10	1007.1	4923	503.5	2461		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1046	12594.4	184.3	DLVS	357.5	10	1007.6	4913	503.8	2456		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1047	12604.3	184.3	ULVS	2267.5	2	1427.3	4980	356.8	1245		0001	0.00005				
1048	12608.0	184.3	DLVS	355	10	1007.3	4936	503.7	2468		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1049	12615.1	184.3	DLVS	353.5	10	1000.8	4898	500.4	2449		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1050	12624.8	184.3	ULVS	2267.5	2	1427.2	4947	356.8	1236		0001	0.00005				

Vis #	Time (sec)	Temp (K)	Type	Exp. (ms)	# Col's	Summed Mean	Max	Per-Column Mean	Max.	*	Lamp	Altitude (km)	50º Nadir (km)	10º Nadir (km)	50º Nadir (km)	10º Nadir (km)
1051	12628.5	184.3	DLVS	356.5	10	1011.5	4952	505.8	2476		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1052	12646.7	184.4	ULVS	1700.5	2	1081.7	3725	270.4	931		0001	0.00005				
1053	12651.4	184.4	ULVS	623.5	2	427.7	1383	106.9	345		0001	0.00005				
1054	12652.3	184.3	DLVS	359	10	1018.9	4985	509.5	2492		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1055	12659.1	184.4	DLVS	354.5	10	1004.8	4876	502.4	2438		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1056	12666.0	184.4	DLVS	356.5	10	1005.8	4902	502.9	2451		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1057	12679.6	184.6	DLVS	357	10	1017.6	4999	508.8	2499		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1058	12686.5	184.6	DLVS	356	10	1010.8	4928	505.4	2464		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1059	12703.5	184.6	DLVS	354	10	1002.0	4872	501.0	2436		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1060	12723.9	184.6	DLVS	356	10	1000.3	4840	500.2	2420		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1061	12865.4	185.1	DLVS	352	10	1002.8	4881	501.4	2440		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1062	12868.8	184.9	DLVS	356	10	1015.8	4942	507.9	2471		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1063	12874.5	185.1	ULVS	2267.5	2	1435.7	4990	358.9	1247		0001	0.00005				
1064	12889.3	185.1	DLVS	354.5	10	1007.4	4918	503.7	2459		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1065	12892.2	185.1	ULVS	1700.5	2	1087.9	3744	272.0	936		0001	0.00005				
1066	12896.1	185.1	DLVS	351	10	997.1	4850	498.6	2425		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1067	12902.9	185.2	DLVS	355	10	1009.4	4908	504.7	2454		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1068	12911.1	185.1	ULVS	2267.5	2	1436.8	5027	359.2	1256		0001	0.00005				
1069	12926.8	185.2	DLVS	355.5	10	1011.6	4926	505.8	2463		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1070	12931.6	185.2	ULVS	2267.5	2	1436.5	5002	359.1	1250		0001	0.00005				
1071	12937.8	185.2	ULVS	623.5	2	430.1	1413	107.5	353		0001	0.00005				
1072	12940.4	185.2	DLVS	353	10	1006.9	4914	503.4	2457		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1073	12954.0	185.2	DLVS	354.5	10	1010.5	4936	505.2	2468		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1074	12957.4	185.2	DLVS	355.5	10	1013.6	4950	506.8	2475		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1075	12974.5	185.2	DLVS	354	10	1008.2	4900	504.1	2450		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1076	13001.7	185.3	DLVS	355	10	1012.9	4980	506.4	2490		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06
1077	13005.2	185.4	DLVS	353.5	10	1007.4	4924	503.7	2462		0001	0.00005	3.9E-06	1.7E-06	5.5E-06	3.2E-06

Below is presented a plot of the average per-column data rate history during the Titan descent for the Downward Looking Visible Spectrometer from the table above (in Data Number per second). The stray points at ~1000, 2000 & 2500 seconds are from the calibration cycles.



And the same data for the Upward Looking Visible Spectrometer..