Rings Observation Key

This is a brief guide to Cassini Mission Rings Science observation types. Most (but not necessarily all) observations with at least 10 instances are included. The describe observation are:

0PHASE
ANSASTARE
APOMOSAIC
AZSCN/AZSCAN/AZDKMRHPH
COMP
ExxPHASE
EGxxPHASE and EGPHASE
EQLBN/EQLBS/EQSB
FMONITOR
FMOVIE
FRSTRCHAN
GxxPHASE
HIPHASE
HIRESAFRG
HIRESFRNG
LATPHASE
NP
RPXING
RPXxxxPH
SHAD
SHADSCAN
SOLAROCC
SP
STELLAROCC
SUBM
TEMP
TMAP
URSTAR
VERT
VTMP

Observation Type: 0PHASE
Prime Instrument: VIMS
Usual Riders: ISS, CIRS, UVIS
Number of Observations: 13 (including CIRS riders on revs 26 and 180 and a ISS rider on rev 46)

“0PHASE” means “Zero Phase observation”. This was a limited set of observations scattered over the entire mission, executed at times when the zero-phase (or “opposition”) point as seen by Cassini moved across the main ring system. As such, there were no specific range or sub-spacecraft latitude restrictions, but in practice most such observations were made inside 15 Rs and at opening angles of 10^{o} or larger**.** Duration 0.5 – 5.5 hrs, but typically 2 - 4 hrs.

Pointing: VIMS 0PHASE observations had a common design, with the spacecraft +Y axis targeted to the Sun, thus ensuring that the ORS instrument boresights were all approximately pointed at the 0-phase location on the rings. For VIMS this meant that the 0-phase point was ~2 pixels from the center of the FOV. No restrictions were placed on the secondary axis, and the radial coverage of the rings was dictated by Cassini’s orbital trajectory. The spacecraft pointing remained fixed throughout the observation. In a few cases later in the mission the pointing was offset slightly to increase the range of phase angle sampled in each cube.

Instrument Parameters: Typically, continuous full 64x64 pixel LoRes cubes were obtained with an integration time of 40 or 50 msec, in order to avoid saturation on the brightest parts of the A and B rings while providing as large a range of phase angles per image as possible.

Observation	Start Time	Duration	Solar Opening Angle	Distance (Rs)
VIMS_008RI_0PHASE001_PRIME	2005-140T07:00:00	4:00:00	-21.65	12.08
VIMS_010RI_0PHASE001_PRIME	2005-177T03:00:00	2:40:00	-21.27	7.51
CIRS_026RI_ZEROPHASE001_PRIME	2006-204T19:25:00	2:05:00	-16.57	3.67
VIMS_027RI_0PHASE001_PRIME	2006-228T21:15:00	0:40:00	?	?
VIMS_034RI_0PHASE001_PRIME	2006-336T21:30:00	2:20:00	14.78	4.73
VIMS_044RI_0PHASE001_PRIME	2007-131T19:29:00	3:00:00	-12.51	13.57
ISS_046RI_0PHASE001_PRIME	2007-163T11:00:00	2:30:00	-12.05	6.61
VIMS_172RI_0PHASEB001_PRIME	2012-269T09:06:00	3:58:00	15.93	12.04
VIMS_179RI_0PHASEB001_PRIME	2013-020T11:20:00	4:30:00	17.28	14.95
CIRS_180RI_NP10L30012_PIE	2013-033T17:19:00	5:00:00	?	?
VIMS_237RI_0PHASEC001_PRIME	2016-177T23:35:00	5:25:00	26.29	24.98
VIMS_242RI_0PHASEC001_PIE	2016-255T17:14:00	3:08:00	26.47	9.1
VIMS_243RI_0PHASEC001_PRIME	2016-267T16:50:00	2:25:00	26.5	9.06

Observation Type: ANSASTARE
Prime Instrument: CIRS
Usual Riders: None
Number of Observations: 6

These observations were all designed to capture signal from F Ring with FP1. ANSASTARE observations were added in the Solstice mission in order to capture complete rotations of the ring in order to look for features. They are at higher emission angles than the CIRS prime FMOVIES because the team learned that the FMOVIE geometry was not optimal.

Pointing: The ANSASTAREs were designed to capture a complete rotation of the F ring. Because the team did not anticipate getting full 15 hour observations approved during Solstice Mission planning, they were designed in pairs of 8 hour long observations, arranged so that the two members of each pair were close together in time and captured complementary longitude ranges. There were some logistical issues scheduling these, where observations were shifted in the timeline to accomodate other teams, and also incorrect Ansae were targeted on at least one occasion, which compromised the longitudinal coverage of some of these observations. A thorough check on longitude ranges actually collected has not been done yet.

These observations focused FP1 off one Ansa and merely took data at the same pointing for the duration of the observation. The team determined that better signal results when the F ring is viewed from a high enough elevation that its filling factor across the FP1 FOV is significant (i.e., edge-on viewing is not optimal), so these are taken at emission angles of up to 10 degrees from the ring plane.

Instrument Parameters: All of these observations were taken at 15cm^-1 resolution, due to the expected low signal.

Observation	Start Time	Duration
CIRS_255RF_ANSASTARE001_PRIME	2017-004T02:09:00	0T09:51:00
CIRS_255RF_ANSASTARE002_PRIME	2017-005T06:59:00	0T09:52:00
CIRS_274RI_ANSASTARE001_PRIME	2017-137T03:09:00	0T14:00:00
CIRS_277RI_ANSASTARE001_PRIME	2017-157T18:07:00	0T18:10:00
CIRS_286RI_ANSASTARE001_PRIME	2017-215T16:55:00	0T09:44:00
CIRS_288RI_ANSASTARE001_PRIME	2017-227T19:00:00	0T06:53:00

Observation Type: APOMOSAIC
Prime Instrument: VIMS
Usual Riders: none
Number of Observations: 64

"APOMOSAIC" means "Apoapse mosaic". These were relatively large mosaics of Saturn and its main rings (D-F) intended to provide full spatial coverage of the unblocked rings at or near Cassini's orbital apoapses. Typical ranges were 30 - 40 R_S, but there were no specific limits. They spanned a wide range of sub-spacecraft latitude (B) and solar phase angle (alpha), and included mosaics of both the sunlit and dark sides of the rings. The plan was to obtain at least one APOMOSAIC per sequence in those periods when Cassini was on inclined orbits. Durations were highly variable, depending on the available observation time and mosaic size. Typical values were 4 – 12 hours (?). Intended more for public outreach than science, APOMOSAICs were used on many Cassini posters, book covers and similar products. They were also intended to provide regular monitoring of Saturn and the rings in the event of an unexpected "outburst" of any sort.

Pointing: The size of each APOMOSAIC was tailored to the specific range and sub-spacecraft latitude (B). Secondary axis was usually +/-Z to NSP or +/-X to NSP so as to place the major axis of the rings in the X or Z direction. Pointing designs were rectangular mosaics with offsets of ~30 mrad (1 VIMS FOV) in each direction. Sizes ranged from as small as 3x1 or 4x2 to as large as 9x4 (the LITMOSAIC on rev 234). In sequence S101, a second 9x4 APOMOSAIC was split into two segments, executed in similar geometries on revs 287 and 289. For such large mosaics, the blank corner fields were often omitted.

Instrument Parameters: Footprint stare times varied with the available observation time and mosaic size. Typical values were 15 - 30 min. Full 64x64 pixel Lo-Res cubes were taken at each pointing.

Observation type: AZSCN/AZSCAN/AZDKMRHPH
Prime Instrument: ISS
Usual Riders: CIRS
Number of Observations: 30

These three variations of observation name all mean “Azimuthal Scan”. The AZSCN observations have either LOPH or HIPH added to the end of the name which means “Low Phase” and “High Phase” respectively. AZSCANs may have LIT or DRK at the end of the name which means “Lit side“ or “Dark i.e. unlit side” of the rings respectively. The AZDKMRHPH is an azimuthal scan on the “Dark side of the rings at Medium Resolution and High Phase”. They were targeted to a single radius in the ring plane starting at a specified inertial longitude. The instrument boresight was then scanned azimuthally while keeping the radius of the ring plane intercept constant. The scanning/imaging rate was chosen to obtain complete overlapping (co-rotating) longitude coverage (at that radius). The scan wasn’t continuous: a co-rotating longitude was tracked at its local keplerian rate for a short time, allowing an un-smeared image to be shuttered by the narrow angle camera, before slewing at the maximum allowable rate to the next co-rotating longitude location. The individual longitude locations for imaging were chosen to provide a specified overlap in coverage of ring material in the images, usually 10-20%. The secondary axis orientation of the spacecraft was also constantly adjusted so as to place the radial direction along one of the axes of the image frame i.e., azimuthal ring features would always lie along either the line or sample direction in every image. This was done to maximize the compression efficiency of the image and thus reduce the total data volume required for the observation as well as ease subsequent stitching together of the images into a single mosaic. Scanning was usually chosen to be in the retrograde direction to take advantage of the motion of the ring material to reduce the time taken to slew from one imaging location to the next and thus the total time required for the observation to image the required full 360 degrees of co-rotating longitude. At the high resolutions used by these observations such coverage usually required several hundred “footprints” each of one image.

Not all observations have durations that allowed full 360 degree rotating longitude coverage. Some observations were targeted to the “wrong radius”, not imaging the feature intended, so that the image spacing was also incorrect leading to non-continuous longitude coverage.

Azimuthal scan observations were very demanding of spacecraft resources: data volume; CDS (Command data system) “words” and the reaction wheels. This was because each “footprint” of one image was essentially treated as a completely separate observation with a unique pointing and secondary orientation. Complete 360 degree co-rotating longitude coverage typically involved moving along the targeted radius for maybe 100-120 degrees in inertial longitude while also incrementally rotating the secondary axis through ~100-120 degs in several hundred smallish steps which was very demanding on the reaction wheels. After the end of the Prime Mission concern over the rate of wear of the reaction wheels and the possibility that more that one wheel could fail, requiring spacecraft attitude control be handled solely by the RCS, required mitigating action. One of the steps taken to limit wear and tear on the reaction wheels was to discontinue the use of azimuthal scan type observations. The last AZSCAN was in July 2009.

Observation	Start Time	Duration	Targeted Radius (km)
ISS_007RI_AZSCNLOPH001_PRIME	2005-122T05:35:00	9:00:00	136505
ISS_010RI_AZSCNLOPH001_PRIME	2005-176T05:00:00	8:00:00	120226
ISS_010RI_AZSCNLOPH002_PRIME	2005-176T13:00:00	2:30:00	133584
ISS_013RI_AZSCNLOPH001_PRIME	2005-231T14:40:00	8:30:00	133584
ISS_013RI_AZSCNHIPH001_PRIME	2005-232T14:37:00	2:25:00	140224
ISS_013RI_AZSCNHIPH002_PRIME	2005-232T21:00:00	1:19:00	140224
ISS_013RI_AZSCNHIPH003_PRIME	2005-232T22:19:00	4:41:00	140224
ISS_013RI_AZSCNHIPH004_PRIME	2005-233T03:00:00	3:00:00	117551
ISS_029RI_AZSCNLOPH001_PRIME	2006-268T11:00:00	10:30:00	139560
ISS_030RI_AZDKMRHPH001_PRIME	2006-289T21:10:00	10:00:00	140220.0 & 117970.0
ISS_032RI_AZSCNLOPH001_PRIME	2006-312T10:30:00	9:15:00	117970
ISS_033RI_AZDKMRHPH002_PRIME	2006-319T21:59:00	8:30:00	122120
ISS_033RI_AZSCNLOPH001_PRIME	2006-324T13:00:00	9:00:00	133584
ISS_033RI_AZDKMRHPH001_PRIME	2006-330T20:45:00	10:00:00	87500
ISS_035RI_AZSCNLOPH001_PRIME	2006-348T17:15:00	10:15:00	133584
ISS_036RI_AZSCNLOPH001_PRIME	2006-364T19:30:00	6:00:00	77871
ISS_043RI_AZSCAN001_PRIME	2007-115T06:30:00	10:00:00	137000
ISS_057RI_AZSCAN001_PRIME	2008-028T02:15:00	10:00:00	117970
ISS_060RI_AZSCAN001_PRIME	2008-062T09:30:00	10:00:00	87500
ISS_064RI_AZSCAN001_PRIME	2008-102T14:10:00	7:10:00	133580
ISS_067RI_AZSCAN001_PRIME	2008-131T06:20:00	10:00:00	140000
ISS_074RI_AZSCAN001_PRIME	2008-182T12:30:00	7:30:00	77825
ISS_079RI_AZSCANLIT001_PRIME	2008-217T16:00:00	10:35:00	90200
ISS_081RI_AZSCANDRK001_PRIME	2008-231T15:55:00	11:22:00	133584
ISS_085RI_AZSCANLIT001_PRIME	2008-261T17:45:00	2:55:00	88500
ISS_090RI_AZSCANLIT001_PRIME	2008-298T10:34:00	5:00:00	77800
ISS_092RI_AZSCANLIT001_PRIME	2008-314T04:30:00	4:43:00	87500
ISS_096RI_AZSCANLIT001_PRIME	2008-345T01:07:00	6:35:00	88200
ISS_114RI_AZSCANLIT001_PRIME	2009-191T11:35:00	8:00:00	120800
ISS_115RI_AZSCANLIT001_PRIME	2009-207T08:25:00	7:35:00	?

Observation Type: COMP
Prime Instrument: VIMS or ISS
Usual Riders: CIRS, UVIS
Number of Observations: 37. A total of 15 COMPLITs and 17 COMPDRKs were obtained between revs A and 247, four of which were ISS riders. Another five drift scans were made on the F/Prox orbits. Further VIMS radial composition scans were done as collaborative riders on ISS observations such as RDHRCOMP (six observations), RDHRESSCN (two), RDHRSSCHP (three) and RDHRESLPH (one).

"COMP" means "Radial compositional scan". These were of several different designs:

(1) 1D radial mosaics across the rings. These included most of the highest resolution VIMS and ISS radial scans of the rings, with the exception of the multi-instrument scans at SOI which were named RINGSCANG and RINGSCANA. Variants include six COMPLITs (scans across the sunlit side of the rings), two COMPLOLITs and seven COMPHILITs (low and high phase angle litside scans); four COMPDARKs (scans across the dark side of the rings), seven COMPLODRKs, and six COMPHIDRKs (low and high phase dark side scans). Range 5 – 10 Rs***.***

(2) Radial drift scans across the rings, done in LINE mode with an inertially-fixed pointing on the F-ring & Proximal orbits: three COMPLITBs and two COMPDRKs. Range 1.5 - 4 Rs. The two COMPDRKs were designed to form a single complete radial scan.

(3) More distant ISS scans with VIMS riders include ten multi-filter RDCOLSCNs.

Pointing: Each observation design was different, with some scans across one ring ansa, others across the rings near the sub-spacecraft longitude and others parallel to the edge of Saturn's shadow across the rings.

(1) Linear mosaics with 8-12 pointings, depending on range, offset by 30 or 15 mrad for VIMS-primes and ~5 mrad for ISS-primes. Duration 1.5 – 7.5 hrs, but typically ~3 hrs.

(2) Fixed pointing, optimized to provide full radial coverage from the F to C ring in the time available. The single darkside scan was split between revs 260 and 262.
Duration 2.5 – 3 hrs.

(3) Linear mosaics spaced for the ISS_NAC FOV (offsets ~5 mrad)?

Instrument Parameters: VIMS-prime: Each footprint was usually targeted for at least 10 min at low phase angles. Integration time 80+320 msec at low phase or 160+640 msec at high phase. Variable cube sizes used to accommodate varying range and geometry. Drift scans: Integration time 160 msec on both sunlit and dark sides. Line length 64 or 32 pixels, respectively, with 10 or 5 sec per line. ISS-prime: Dwell time ~2 min, 12x12 pixel cubes to match ISS FOV.

Observation Type: ExxPHASE
Prime Instrument: VIMS
Usual Riders: ISS, CIRS
Number of observations: 55

EXXPHASE means "Observation of the E ring at a phase angle of approximately XX degrees" These observations were obtained exclusively during the prime mission (2005-2008) and had durations ranging from 1.5 to over 20 hours. They were taken at low (<5 degrees, usually < 1 degree) ring opening angles and a range of phase angles from 10 to 150 degrees. The overall goal of these observations was to obtain data on the E-ring's spectral properties across a broad range of phase angles. Low ring elevation angles were used for these observations because it allowed the entire vertical extent of the ring to be captured in a single field of view, and also maximized the surface brightness of the ring.

Each observation spent most of its time staring at one ansa of the E ring core (240,000 km) that was selected to be largely free of bright satellites. Periodically, the spacecraft would briefly point off the ring to observe dark sky so that CIRS could obtain background measurements. Whenever looking at the E ring, the VIMS instrument would take cubes using the longest possible exposures (640 ms or 1000 ms per pixel for the IR channel) to maximize signal-to-noise. Whenever possible, the field of view was chosen to include regions above and below the E ring in order to determine the background signal levels in the instrument.

ISS rider observations typically consisted of repeated wide-angle-camera imaging through multiple filters. These covered a larger field of view and provide context information for the VIMS spectral data.

Observation Type: EGxxPHASE and EGPHASE
Prime Instrument: VIMS
Usual Riders: ISS, CIRS
Number of observations: 51

EGxxPHASE means "Observation of the E and/or G ring at a phase angle of approximately xx degrees". These were obtained during the Equinox and Solstice missions (2008-2016) and have
durations that range from 2 hours to a day. These were the successors to the ExxPHASE and GxxPHASE observations from the prime mission. Again, they were taken at low (<5 degrees, often < 1 degree) ring opening angles and a range of phase angles from 10 to 150 degrees. Since such geometries were useful for both E and G ring observations, the two types of observations were grouped together so that individual observations could be used to look at the E ring, G ring, or both, depending on the exact time allocated. The three most common observation types are as follows:

(1) G-ring ansa stare. These are long stares at one ansa of the G ring (167,500 km), and so are the continuation of the GxxPHASE observations. Since these observations were designed after the discovery of the bright arc in the G ring, many of these observations were targeted at the specific ansa that would contain the arc during the observation window. During each observation, the VIMS instrument would take cubes using the longest possible exposures (640 ms or 1000 ms per pixel for the IR channel) to maximize signal-to-noise. The field of view of the instrument was chosen to cover the G ring ansa and a sufficiently large region around it to determine the background levels in the instrument. ISS rider observations typically consisted of repeated narrow-angle-camera imaging, usually with a single filter in order to observe the structure of the ring and arc.

(2) E-ring ansa stare: These are long stares at one ansa of the E ring core (240,000 km), and so are the continuation of the ExxPHASE observations. Each observation consists of a single stare at one ansa of the E ring, which was selected to be largely free of bright satellites. Also, additional effort was made to observe both ansae because by now the asymmetries in the E-ring structures were known. During each observation, the VIMS instrument would take cubes using the longest possible exposures (640 ms or 1000 ms per pixel for the IR channel) to maximize signal-to-noise. Whenever possible, the field of view was chosen to include regions above and below the E ring in order to determine the background signal levels in the instrument. ISS rider observations typically consisted of repeated wide-angle-camera imaging through multiple filters. These covered a larger field of view and provide context information for the VIMS spectral data.

(3) E-ring double-ansa observation: Each of these observations has time spend

staring at both ansae of the E ring core, in order to better document the asymmetries in the E-ring structures. The time spent on each ansa were selected to avoid bright moons as much as possible. During each pointing , the VIMS instrument would take cubes using the longest possible exposures (640 ms or 1000 ms per pixel for the IR channel) to maximize signal-to-noise. Whenever possible, the field of view was chosen to include regions above and below the E ring in order to determine the background signal levels in the instrument. ISS rider observations typically consisted of repeated wide-angle-camera imaging through multiple filters. These covered a larger field of view and provide context information for the VIMS spectral data.

A few observations contained stares at both the E and G rings. Note also that these observations do not periodically point off the ring onto dark sky for CIRS. This was because it was deemed unlikely that CIRS would ever have sufficient signal-to-noise to detect these rings in most geometries, and also because it made for much simpler pointing designs.

Observation Type: EQLBN/EQLBS/EQSB
Prime Instrument: CIRS
Usual Riders: VIMS
Number of Observations: 28

All observations prefaced with "EQ" were designed to sample the changes in temperature of the rings as a function of radius, just before and after the Equinox event of August, 11, 2009.

The orbital plan for the end of extended mission offered very little opportunity for getting observations of the rings right before and after the equinox event. This fact was not appreciated until late in the planning. By this time in the mission the team had found that the seasonal variation of ring temperatures was important, and it was expected that the cooling of the lit side right before equinox and subsequent heating of the previously unlit side would help to constrain thermal properties of the ring particles and their vertical distribution.

The campaign of EQLB (long baseline) and EQSB (short baseline) observations was organized to try to get at least some temperature data at semi-regular intervals during the 100 or so days prior to and after Equinox event. The long baseline were designed to allow observation of cooling on the lit side as the Solar emission angle decreased, and heating on the previously unlit (North) side after the event. The latter required a baseline of observations on the unlit side before the event as well. In the end, the observations were highly limited by the fact that Cassini spent most of its time in the ring plane. Observations were placed by opportunity only, and only one opportunity for a short baseline observation was found.

Pointing: FP1 to rings. These were all conducted as radial scans.

Instrument Parameters: FP1 was the principle focal plane, FP3 and FP4 were used as data volume permitted.

Observation	Start Time	Duration
CIRS_112RI_EQLBN001_PRIME	2009-162T11:40:00	000T06:05:00
CIRS_113RI_EQLBN001_PRIME	2009-177T10:40:00	000T06:00:00
CIRS_114RI_EQLBN001_PRIME	2009-192T10:23:00	000T06:00:00
CIRS_115RI_EQLBN001_PRIME	2009-208T10:12:00	000T07:08:00
CIRS_116RI_EQLBN001_PRIME	2009-225T02:15:00	000T06:00:00
CIRS_117RI_EQLBN001_PRIME	2009-240T00:45:00	000T06:00:00
CIRS_118RI_EQLBN001_PRIME	2009-264T02:00:00	000T06:00:00
CIRS_123RI_EQLBN001_PRIME	2009-360T07:35:00	000T02:00:00
CIRS_125RI_EQLBN001_PRIME	2010-027T07:00:00	000T02:00:00

CIRS_132RI_EQLBN001_PRIME	2010-151T08:15:00	000T03:30:00
CIRS_132RI_EQLBN003_PRIME	2010-152T23:15:00	000T04:15:00
CIRS_132RI_EQLBN004_PRIME	2010-153T23:59:00	000T03:16:00
CIRS_137RI_EQLBN001_PRIME	2010-246T13:20:00	000T01:30:00
CIRS_137RI_EQLBN002_PRIME	2010-246T17:10:00	000T01:30:00
CIRS_112RI_EQLBS001_PRIME	2009-159T07:35:00	000T07:00:00
CIRS_113RI_EQLBS001_PRIME	2009-175T06:20:00	000T06:00:00
CIRS_114RI_EQLBS001_PRIME	2009-191T05:35:00	000T06:00:00
CIRS_115RI_EQLBS001_PRIME	2009-206T17:20:00	000T06:00:00
CIRS_116RI_EQLBS001_PRIME	2009-223T01:35:00	000T05:00:00
CIRS_123RI_EQLBS002_PRIME	2010-001T09:52:00	000T04:00:00
CIRS_123RI_EQLBS003_PRIME	2010-002T13:38:00	000T04:00:00
CIRS_124RI_EQLBS001_PRIME	2010-007T01:55:00	000T05:00:00
CIRS_124RI_EQLBS004_PRIME	2010-009T23:29:00	000T04:01:00
CIRS_124RI_EQLBS002_PRIME	2010-008T08:05:00	000T05:00:00
CIRS_133RI_EQLBS001_PRIME	2010-175T18:56:00	000T04:15:00
CIRS_133RI_EQLBS002_PRIME	2010-176T23:20:00	000T04:30:00
CIRS_137RI_EQLBS001_PRIME	2010-245T06:52:00	000T03:00:00
CIRS_116RI_EQSBS001_PRIME	2009-224T03:00:00	000T03:00:00

Observation Type: FMONITOR
Prime Instrument: CIRS
Usual Riders: ISS
Number of Observations: 73

These observations took place early in the prime mission, and were actually designed with the primary objective of facilitating ISS imagery of the F ring. The pointing was designed to return long integrations of the B and A rings by CIRS, while the ISS WAC took imagery of the F ring.

For CIRS, these function much like the COMP observations. Refer to notes on the CIRS_FMONITOR*_ISS observations for details on ISS imagery taken.

There are two types of FMONITOR: a) observations that are 6 to 10 hours long and occur in groups of 2 to 4 observations, where observations within the group are separated by 1 to 10 days; b) observations that are 30-90 minutes long, occur in groups of 5 up to 16, where observations within the group are separated by on the order of one hour.

There is no definitive way to associate groups of observations that were planned together, but there are 12 groups of type (a) observations, two of which are single observations, and there are 4 groups of type (b) observations.

Observations of type (a) typically take deep space off one Ansa, then an almost equal number of spectra are taken on the Ansa, with FP3/4 and FP1 on A and/or B ring. The observation then takes a short amount of data with FP3/4 and FP1 on the other Ansa, and this process repeats several times. The deep space are interspersed, specified by a pointing such that the projected radius in the ring plane is from 5 to 15 R_S.

Observations of type (b) proceed similarly to type (a), although they are much shorter in duration. In between the Ansae, they swing through Saturn.

Pointing: The pointing is either FP3/4 or FP1 to rings, with specific pointing set such that the footprints of the CIRS focal planes are near the outer edge of the main rings at the Ansae. They are taken from approximately 30R_S, with an emission angle of up to 20degrees.

Instrument Parameters: These appear to all have 0.5cm^-1 resolution, and FP3 takes spectra from all 10 detectors.

Observation	Start Time	Duration
CIRS_00ARI_FMONITOR001_PRIME	2004-311T22:48:00	000T06:30:00
CIRS_00BRI_FMONITOR001_PRIME	2004-335T10:20:00	000T06:50:00
CIRS_00CRI_FMONITOR001_PRIME	2005-020T12:30:00	000T08:00:00
CIRS_00CRI_FMONITOR002_PRIME	2005-021T12:15:00	000T04:00:00
CIRS_00CRI_FMONITOR003_PRIME	2005-024T12:00:00	000T04:00:00
CIRS_00CRI_FMONITOR004_PRIME	2005-026T12:00:00	000T04:00:00
CIRS_00CRI_FMONITOR005_PRIME	2005-027T12:00:00	000T04:00:00
CIRS_00CRI_FMONITOR006_PRIME	2005-028T12:00:00	000T04:00:00
CIRS_006RI_FMONITOR001_PRIME	2005-109T06:15:00	000T08:15:00
CIRS_006RI_FMONITOR002_PRIME	2005-111T07:28:00	000T10:00:00
CIRS_006RI_FMONITOR003_PRIME	2005-112T05:43:00	000T11:44:00
CIRS_008RI_FMONITOR001_PRIME	2005-145T03:06:00	000T08:17:00
CIRS_008RI_FMONITOR002_PRIME	2005-149T01:21:00	000T08:00:00
CIRS_009RI_FMONITOR001_PRIME	2005-153T02:13:00	000T08:00:00
CIRS_009RI_FMONITOR002_PRIME	2005-155T15:00:00	000T00:30:00
CIRS_009RI_FMONITOR003_PRIME	2005-163T02:35:00	000T00:30:00
CIRS_009RI_FMONITOR004_PRIME	2005-163T03:59:00	000T00:30:00
CIRS_009RI_FMONITOR005_PRIME	2005-163T05:55:00	000T00:30:00
CIRS_009RI_FMONITOR006_PRIME	2005-163T07:59:00	000T00:30:00
CIRS_009RI_FMONITOR007_PRIME	2005-166T02:47:00	000T01:28:00
CIRS_009RI_FMONITOR008_PRIME	2005-166T04:55:00	000T01:28:00
CIRS_009RI_FMONITOR009_PRIME	2005-166T07:03:00	000T01:28:00
CIRS_009RI_FMONITOR010_PRIME	2005-166T21:23:00	000T01:28:00
CIRS_009RI_FMONITOR011_PRIME	2005-166T23:31:00	000T01:28:00
CIRS_009RI_FMONITOR012_PRIME	2005-167T01:39:00	000T01:28:00
CIRS_009RI_FMONITOR013_PRIME	2005-167T03:47:00	000T01:28:00
CIRS_009RI_FMONITOR014_PRIME	2005-167T05:55:00	000T01:28:00
CIRS_009RI_FMONITOR015_PRIME	2005-168T05:24:00	000T01:28:00
CIRS_009RI_FMONITOR016_PRIME	2005-168T07:32:00	000T01:28:00
CIRS_009RI_FMONITOR017_PRIME	2005-168T09:40:00	000T01:28:00
CIRS_009RI_FMONITOR018_PRIME	2005-168T11:48:00	000T01:28:00
CIRS_010RI_FMONITOR001_PRIME	2005-181T03:37:00	000T08:00:00
CIRS_010RI_FMONITOR002_PRIME	2005-182T01:25:00	000T06:57:00
CIRS_010RI_FMONITOR003_PRIME	2005-169T02:44:00	000T01:28:00
CIRS_010RI_FMONITOR004_PRIME	2005-169T04:52:00	000T01:28:00
CIRS_010RI_FMONITOR005_PRIME	2005-169T07:00:00	000T01:28:00

Observation type:	FMOVIE
Prime Instrument:	2004-2008 mainly VIMS with a few CIRS. 2008-2017 mainly ISS with a handful of VIMS
Usual Riders:	VIMS, CIRS and ISS
Number of Observations:	ISS - 89 Primes 33 Riders, VIMS - 32 Primes 87 Riders, CIRS - 8 Primes 96 Riders

FMOVIE means "F ring movie". They usually occurred at ranges of 20-30 Rs (Rs-->Saturn radius-->60330 km) but occasionally as close as 10 Rs or as distant as 40 Rs. ISS observations were usually at elevation angles of 20 deg or greater while the few CIRS observations were at 1-5 deg. Durations varied between 2-20 hrs with ~15 hrs being optimal, corresponding to the orbital period of the F ring. In the Prime and Extended missions there were two basic types of observation design:

(1) Stares at a fixed inertial longitude (usually at or near an ansa), imaging as F ring material passed through the field of view. The longer the observation the greater the range of co-rotating(with the F ring) longitude observed - reaching full 360 degree coverage at 14hrs 51 mins. Longer observations provided some overlap in co-rotating longitude coverage.

(2) Split ansa stares. Spending ~7.5 hrs pointing at one inertial longitude and then switching to a different inertial longitude so as to catch the exact same F ring material again half a F ring orbital period later i.e. imaging the same range of co-rotating (with the F ring) longitudes twice but at orbital phases 180 degrees apart. Typically the first ansa stare would have a duration of just under 7.5 hrs with the second using all the remaining time in the observation (often somewhat less than 7.5 hrs). As such the second stare often didn't cover the complete range of co-rotating longitudes captured by the first. This type of observation particularly highlights eccentricities.

Towards the end of the mission a different type of design also started to occur:

(3) Drift scan. Instead of just staring at a fixed inertial longitude the pointing would track azimuthally along a fixed radius at a rate that was higher/lower than the local keplerian rate. Such scans provide inertial as well as co-rotating longitude coverage. They also provide greater or less co-rotating coverage than a stare at a fixed longitude depending on the exact tracking rate chosen. They were typically used when targeting features of interest --- whose longitude uncertainties were fairly large.

The CIRs prime observations used

(4) Place FP1 just off the main rings, typically with 144,000km < r_FP1 < 160,000km. Acquire data at one Ansa for a short period of time, on the order of 15 minutes, then swing through Saturn to the other Ansa. Some of them collect 15 minute segments of deep space during this cycle, whereas others acquire deep space only at the beginning and end of the observation. This strategy was designed to obtain a somewhat uniform longitudinal coverage of the F ring without observing for a full 14 hour rotational period. The emission angle is less than 1 degree, and they are taken from approximately 10 R_s.

For all ISS/VIMS observation designs images were taken at a fixed cadence designed to provide overlapping coverage in co-rotating longitude. The exact fraction of overlap varied from observation to observation depending on how much data volume had been allocated. For observations of equal duration more data volume allowed more images to be taken at a faster cadence leading to greater overlap.   Images were taken using the CL1/CL2 (clear/clear) filter combination with a typical exposure of 1200ms. Low phase observations would have exposures as low as 480 ms while high phase observation would be in the 1800-2000 ms range. In a typical 15 hr long FMOVIE observation there are usually ~200 images

When the resolution was low enough the targeted radius would usually be somewhere in the Roche Division to provide coverage of not only the F ring but the outer A ring in as far as the Encke Gap. At somewhat higher resolutions it wasn't possible to image both the Encke Gap and the F ring simultaneously so the targeted radius was chosen to place the F ring and the outer edge of the A ring in the NAC frame, many of these FMOVIEs thus provide valuable coverage of the Keeler Gap.

At the end of the mission there were a number of long, >18 hr, FMOVIES using the single stare at an inertial longitude design. These were to provide full 360 deg co-rotating (with the satellite Janus) coverage of resonant features in the outer A ring in addition to (more than) complete coverage of the F ring.

The CIRS prime observations were all designed to capture signal from the F Ring with FP1. They were designed to find temperature signal from the rings, and to see if there was a difference in brightness from one Ansa to the other. They were taken at low emission angle in order to maximize line of sight optical depth through the F ring, and flipped back and forth between Ansae.

Observation type: FRSTRCHAN
Prime Instrument: ISS
Usual Riders: CIRS
Number of Observations: 12

FRSTRCHAN means "F ring streamer-channel". These observations were designed to observe the local effects of the satellite Prometheus on the F ring, by using the ISS narrow angle camera (NAC) to follow a ~5 deg portion of the F ring around approximately one complete orbit. More specifically they are designed to monitor the formation and evolution of the streamer-channel features in the F ring created by gravitational interaction during the apoapse passage of the Prometheus.

Ideally they have a duration of a Prometheus orbital period so as to follow a streamer-channel feature through a complete evolutionary cycle. In practice the shortest one is 9.5 hrs while the longest is 15 hrs. During the first ~15 hrs following their creation a streamer-channel only drifts by ~3 degrees away from the longitude of Prometheus. FRSTRCHANs were designed to track Prometheus itself during the observation whilst also placing the ~3 degrees of the F ring leading and trailing Prometheus' position in the NAC field of view. This was easier operationally than trying to track the F ring at the longitude of the next Prometheus apoapse passage.

Images were taken every 157-298 seconds, the exact spacing dependent on the amount of data volume allocated to each observation. One outlier observation has an image spacing of 628 seconds. All images use the CL1/CL2 (clear/clear) filter combination with exposures chosen for the F ring (typically 1200-1500 ms).

Observation Type: GxxPHASE
Prime Instrument: VIMS
Usual Riders: ISS, CIRS
Number of observations: 22

GxxPHASE means "Observation of the G ring at a phase angle of approximately xx degrees" These observations were obtained exclusively during the prime mission (2005-2008) and had durations ranging from 1.5-10 hours. They were taken at low (<5 degrees, often < 1 degree) ring opening angles and a range of phase angles from 10 to 150 degrees. The overall goal of these observations was to obtain data on the G-ring's spectral properties across a broad range of phase angles. Low ring elevation angles were used for these observations because it maximized the surface brightness of the ring.

Each observation targeted one ansa of the G ring (167,500 km) that was selected to be largely free of bright satellites. Periodically, the spacecraft would briefly point off the ring to observe dark sky so that CIRS could obtain background measurements. During this time, the VIMS instrument would take cubes using the longest possible exposures (640 ms or 1000 ms per pixel for the IR channel) to maximize signal-to-noise. The field of view of the instrument was chosen to cover the G ring ansa and a sufficiently large region around it to determine the background levels in the instrument.

ISS rider observations typically consisted of repeated narrow-angle-camera imaging. These higher-resolution images also provided information about the structure of the ring or its embedded arc.

Observation Type: HIPHASE
Prime Instrument: ISS or VIMS
Usual Riders: VIMS or ISS, plus CIRS, UVIS
Number of Observations: 30

During the Prime thru IN-2 phases of the mission, VIMS obtained a total of 22 HIPHASE observations, including three ISS and one UVIS riders. A further three prime and five ISS rider observations were made in the F-ring/Proximal phases of the mission.

"HIPHASE" means "High Phase observation". This was a limited set of observations scattered over the entire mission, executed at times when the phase angle on the rings as seen by Cassini was especially high. Specifically this name was usually reserved for situations where the phase angle exceeded 165 deg, which was the maximum allowed under Cassini Flight Rules. Such observations were possible only during eclipse periods, i.e., when the full disk of the Sun was physically blocked by Saturn. Two of the ISS primes were named HIPHNAC and HIPHWAC. There were no specific range or sub-spacecraft latitude restrictions, but the observation start and stop times were carefully planned to avoid inadvertent exposure of the CIRS, VIMS or UVIS boresights to direct sunlight. The most distant HIPHASE observation was obtained on rev 28, at a range of ~35 Rs (1 Rs = 60,330 km), while the closest were at a range of ~10 Rs. Durations ranged from 0.5 - 6.5 hr, except for the very distant 14 hr observation on rev 28 that was split between ISS and VIMS.

Due to the unique geometry of each HIPHASE period, each observation design was different, the pointing being determined by which part of the rings could be observed to greatest advantage and/or at the highest phase angle. In most cases the diffuse rings were targeted, including the D, F, G or E rings, as well as gaps in the main rings with embedded tenuous ringlets. Some observations used single pointings, while others involved mosaics tuned to the size of the NAC, VIMS or WAC field of view. Note that since the sun was hidden behind the planet during these observations, the usual stray-light problems that affect the WAC at high phase angles are much reduced during these time periods, enabling large-scale WAC mosaics covering much of the E ring to be obtained on Revs 28, 173, 195, 260, 265 and 269.

For VIMS-prime mosaic observations, each footprint was usually targeted for at least 30 min, to provide time for a 320 msec full VIMS cube (or a partial cube at 640 msec). Shorter dwell times were used for ISS-prime WAC mosaics, due to the need to cover a wide area of sky in a limited time period. In the case of the large WAC mosaics, the VIMS frames do not overlap due to the smaller instrument FOV, but should provide samples of the E ring's spectrum at all longitudes.

Observation type: HIRESAFRG
Prime Instrument: ISS
Usual Riders: CIRS, VIMS, UVIS
Number of Observations: 14

HIRESAFRG means "high resolution A ring outer edge or F ring". These observations, which occurred during 2016 and 2017, were used to attempt to image features of interest at high resolution. Said features being "Peggy" on the outer edge of the A ring and clumps/objects in the F ring. The actual target was not determined at the time the observation was integrated, i.e. formally selected, but at the later date when it was implemented i.e. the actual spacecraft and camera commands built. At that point the most recently returned images of the A ring outer edge and F ring were used to locate any visible clumps/objects in the F ring and the "Peggy" feature at the outer edge of the A ring. These latest detections, along with any earlier ones, were used to generate up to date orbit fits and best guess predictions of where the objects would be in the future during the actual execution of the observation – which was typically 4-6 months after the observation was designed. These predictions were then used to select the object that would have the best observation geometry. Some observations had a single target while others had up to four. The most common number of targets was two. There were four objects that were candidates for observations. Two in the F ring, which had the internal names F16QA & F16QB, and two at the outer edge of the A ring, alternate candidates for the "Peggy" feature which we internally thought of as "Peggy A" and "Peggy B".

Since the observations were typically designed 4-6 months before the actual execution dates and the orbits of the targeted objects were not well know there was expected to be significant uncertainty in their actual locations. In an attempt to increase the probability of successfully imaging an object of interest a range of longitudes was usually targeted. Initially the designs used started at the F ring/ A ring outer edge at a longitude 2 deg "behind" the expected instantaneous longitude of the target object and slewed "forwards" along the ring, at greater than the local keplerian rate, before ending at a location 2 deg "ahead". As the results of earlier observations arrived on the ground this offset was increased from -2/+2 deg to -3/+3 deg and then later -5/+5 deg. With the final observation in rev 282 we reverted to simply staring at a fixed inertial longitude and watching ring material pass through the field of view.

Depending on the available time and data volume a single target could be observed more than once, performing multiple sweeps from behind its predicted location to ahead of it. In most observations a particular target object/feature was observed just once whilst in one observation "Peggy" was observed ten times.

All imaging was performed with the ISS narrow angle (NAC) camera using the CL1/CL2 (clear/clear) filter combination. Typically images were 12-bit with a 140-250 sec spacing although a minority were 8-bit and in some observations the spacing was as short as 45 sec. Exposures were typically 560-680 ms with a few in the 1200-2000 ms range. The exposure used depended on observation geometry and whether 8- or 12-bit images were being taken (since 12-bit images have more dynamic range shorter exposures were used to minimize smear while still obtaining useful detail). They occurred at ranges of 3-11 Rs (Rs-->Saturn radius-->60330 km) at elevation angles of 10-50 deg and at all phase angles. Durations varied between 1-8 hrs with ~1hr and 3-4 hrs being most common.

Observation type: HIRESFRNG
Prime Instrument: ISS
Usual Riders: CIRS, VIMS
Number of Observations: 10

HIRESFRNG means "high resolution F ring". These observations, which occurred in two groups during the periods 2007-2008 and 2012-2015, were used for high resolution imaging of the F ring. In this context high resolution means at distances of ~10Rs or less (Rs-->Saturn radius-->60330 km). The highest resolution observation was at ~4 Rs while most were at ~10Rs. All imaging was performed with the ISS narrow angle (NAC) camera using the CL1/CL2 (clear/clear) filter combination.

The 2007-2008 group were 1-1.5 hrs in duration and designed as a stare at a fixed inertial longitude (usually at or near an ansa), imaging as F ring material passed through the field of view. An observation consisted of 20-30 8-bit images with a spacing of 40-187 seconds with most using an exposure duration of 1200ms. The final observation in the group also took 13 12-bit images with exposures ranging from 220ms to 1200 ms.

The 2012-2015 group were either ~2.5 hrs or ~4.5 hrs in duration and designed as a drift scan. Instead of just staring at a fixed inertial longitude the pointing would track azimuthally along a fixed radius at a rate that was lower than the local keplerian rate. Such scans provide inertial as well as co-rotating longitude coverage. They also provide greater or less co-rotating coverage than a stare at a fixed longitude depending on the exact tracking rate chosen. An observation consisted of 60-100 12-bit images with a spacing of 130-160 seconds with exposure durations of 820-1800 ms. The first observation in the group was 8-bit rather than 12-bit images with a spacing of 80 seconds.

Observation Type: LATPHASE
Prime Instrument: VIMS
Usual Riders: CIRS, UVIS, ISS
Number of Observations: 57

"LATPHASE" means "Latitude & Phase angle". These were ring photometry observations, usually carried out in a standard format at a range of 15 – 25 R_S (1 R_S = 60,330 km). They spanned a wide range of sub-spacecraft latitude (B) and solar phase angle (alpha), including both sunlit and dark sides of the rings. Durations were typically 7 hours. ISS was a rider on the early LATPHASE observations, but on later orbits preferred to plan their own "PHOTLIT" and "PHOTDRK" requests. VIMS usually was a rider on these ISS observations. The goal was to provide medium-resolution maps of the rings I/F at all radii and at as wide a range of B and alpha as feasible, over the course of the mission.

Pointing: Each observation consisted of a 3x1 radial mosaic across each ring ansa, spaced by ~30 mrad (= 1 VIMS FOV), followed by a dark-sky stare for CIRS. Secondary axis was usually +/-Z to NSP or +/-X to NSP, so as to place the major axis of the rings in the X or Z direction, respectively. A variant of the standard design (for +/-Z to NSP only) used a 6x1 radial mosaic across each ansa with 15 mrad offsets, designed for VIMS HiRes mode. Some observations at ~90 deg phase, where much of one ansa was in shadow, were shortened to observe only the fully-lit ansa or had their pointing adjusted to avoid the shadowed region.

Instrument Parameters: Each footprint was observed for either 60 min (LoRes mode) or 30 min (HiRes mode), enough to include 64x64 cubes with both long (640 or 320 msec) and short (160 or 80 msec) integrations.

Observation Type:	NP (description also applies to SP)
Prime Instrument:	CIRS
Usual Riders:	None
Number of Observations:	32 NP + 1 P50 (rev134) & 14 SP

These observations were a solstice mission campaign designed to provide coverage in the parameter space of phase and latitude. During the main mission and extended mission, respectively, the TEMPS and TMAPS had been increasingly organized at trying to ensure that radial temperature scans were taken at a broad range of viewing geometries.

In planning the solstice mission observations, that objective was prioritized to the point where the radial scan observations were named according to the viewing geometry they were taken with. During the planning of the solstice mission, three bins in emission angle (latitude) were used, and five bins in phase angle were used. Further, the solar inclination angle was binned roughly into epochs in which the Sun was 18-20 degrees elevation, 20-24 degrees, and 25-27 degrees. CIRS attempted to negotiate to get at least one observation in each bin at each of the solar epochs.

It was impossible to meet those requirements because (1) the orbital structure, plotted in the phase-latitude plane, was such that some bins were almost never or never sampled, and (2) competition for observing time was intense, and these were not considered as high priority as various other observations.

The name of the observation specifies which bin it was in. The leading 'N' or 'S' according to whether the observation was of the North or South side of the rings (always lit and unlit, respectively, in this portion of the mission); the 'P' and numbers after it label the approximate phase (in degrees) of the observation, and the 'L' and numbers after it label the approximate latitude (emission angle).

During negotiations, there were originally an 'S' plus two numbers labeling the solar elevation (e.g., 19, 23, 25), but these were [mostly] dropped when observations were finalized and entered into CIMS, due to the 10 character constraint on observation name length. Some of these observations retained a vestigal 'S', sometimes followed by the solar elevation, sometimes not. This was an oversight in the naming process. The solar elevation can be easily figured out according to which rev the observation occurred in, so it was not thought necessary to keep it.

The P50L30S15 in rev 134 was naming accident. It should be 'NP50L30S15'.

Pointing: All of these observations are FP1 to rings, most use the R_RAD_LON module for pointing, but some used the P_SHAD_DUR module which built radial scans in which the points at all radii were the same number of minutes before or after shadow ingress or shadow egress.
As with the TEMPS and TMAPS but to a lesser degree, the radial scans were planned primarily for local times near one or both Ansae. But observations that were longer and/or at higher elevation often have additional scans not directly related to the phase/lat requirements.

Instrument Parameters: These observations were all taken at 15cm^-1 resolution, and FP3 and FP4 were used only as data volume permitted.

Observation	Start Time	Duration
CIRS_169RI_NP140L30001_PRIME	2012-204T19:25:00	000T00:55:00
CIRS_170RI_NP50L30S001_PRIME	2012-226T09:45:00	000T04:30:00
CIRS_172RI_NP20L30S001_PRIME	2012-269T06:06:00	000T03:00:00
CIRS_173RI_NP50L30N001_PRIME	2012-292T15:05:00	000T03:00:00
CIRS_174RI_NP50L30006_PIE	2012-316T21:30:00	000T05:00:00
CIRS_176RI_NP50L70004_PIE	2012-345T15:30:00	000T04:00:00
CIRS_176RI_NP20L70001_PIE	2012-346T02:30:00	000T04:00:00
CIRS_179RI_NP20L30S001_PRIME	2013-020T00:00:00	000T06:00:00
CIRS_179RI_NP10L30N001_PRIME	2013-020T15:50:00	000T07:00:00
CIRS_180RI_NP50L70S001_PRIME	2013-032T19:00:00	000T07:09:00
CIRS_181RI_NP20L70S001_PRIME	2013-046T13:28:00	000T03:52:00
CIRS_181RI_NP20L30S001_PRIME	2013-046T17:20:00	000T03:56:00
CIRS_185RI_NP20L70001_PRIME	2013-094T03:20:00	000T04:00:00
CIRS_185RI_NP10L30001_PRIME	2013-094T14:20:00	000T03:00:00
CIRS_186RI_NP20L70001_PRIME	2013-103T14:11:00	000T05:25:00
CIRS_189RI_NP10L30001_PRIME	2013-132T16:06:00	000T04:47:00
CIRS_180RI_NP10L30012_PIE	2013-033T17:19:00	000T05:00:00
CIRS_183RI_NP20L30029_PIE	2013-070T12:35:00	000T04:00:00
CIRS_191RI_NP50L70001_PRIME	2013-153T13:49:00	000T06:00:00
CIRS_194RI_NP20L70019_PIE	2013-189T22:00:00	000T04:00:00
CIRS_194RI_NP20L30019_PRIME	2013-190T02:00:00	000T06:00:00
CIRS_196RI_NP50L70024_PIE	2013-228T21:30:00	000T04:00:00
CIRS_196RI_NP10L30028_PIE	2013-239T10:11:00	000T04:00:00
CIRS_198RI_NP20L30054_PIE	2013-285T15:00:00	000T04:05:00
CIRS_234RI_NP20L10001_PRIME	2016-093T08:46:00	000T03:00:00
CIRS_237RI_NP20L30S2006_PRIME	2016-178T23:34:00	000T05:00:00
CIRS_239RI_NP50L30S2010_PRIME	2016-219T18:36:00	000T04:00:00

CIRS_243RI_NP50L30S2001_PRIME	2016-265T18:34:00	000T04:00:00
CIRS_243RI_NP50L30S2002_PRIME	2016-267T23:15:00	000T03:41:00
CIRS_243RI_NP20L30S2001_PRIME	2016-267T19:15:00	000T04:00:00
CIRS_246RI_NP50L30S2001_PRIME	2016-295T05:00:00	000T05:00:00
CIRS_265RI_NP140L50S001_PRIME	2017-073T01:20:00	000T03:00:00

CIRS_201RI_SP90L70S022_PRIME	2014-035T18:02:00	000T04:00:00
CIRS_202RI_SP90L30S022_PRIME	2014-066T22:21:00	000T04:00:00
CIRS_202RI_SP140L70S022_PRIME	2014-068T00:02:00	000T04:00:00
CIRS_202RI_SP140L30S023_PRIME	2014-069T01:32:00	000T04:00:00
CIRS_206RI_SP160L70001_PRIME	2014-199T21:16:00	000T04:00:00
CIRS_208RI_SP50L30001_PRIME	2014-261T08:58:00	000T06:00:00
CIRS_208RI_SP90L70001_PRIME	2014-262T13:21:00	000T04:00:00
CIRS_208RI_SP140L70001_PRIME	2014-263T09:13:00	000T04:00:00
CIRS_211RI_SP50L30001_PRIME	2015-009T09:07:00	000T03:00:00
CIRS_211RI_SP90L30001_PRIME	2015-009T12:07:00	000T04:00:00
CIRS_211RI_SP140L30001_PRIME	2015-010T07:40:00	000T04:00:00
CIRS_234RI_SP140L20001_PRIME	2016-094T01:46:00	000T02:00:00
CIRS_241RI_SP140L70S006_PRIME	2016-244T21:00:00	000T03:00:00
CIRS_245RI_SP140L30S001_PRIME	2016-289T08:56:00	000T02:31:00

Observation Type:	RPXING
Prime Instrument:	ANY (these are RPWS piggyback observations during ring plane crossings)
Usual Riders:	RPWS
Number of Observations:	Most Revs

Ring Plane Crossing "RPXING" observations were high rate RPWS WBR observations primarily designed to determine the equatorial dust flux and scale height as a function of radial distance from Saturn. These observations also obtained high resolution measurements of plasma waves detected near the magnetic equator. The majority of these observations used the 10 kHz WBR mode, attached to the Eu dipole antenna. The Ez monopole antenna was used on some Revs as it provided additional information on the properties of the dust. Later in the mission, the antenna was switched from the Ez to the Eu antenna at the ring plane crossing. Also, the 80 kHz WBR mode attached to the Eu antenna was used on some Revs to investigate higher frequency (>10 kHz) plasma and radio emissions near the equator.

Observation Type: RPXxxxPH
Prime Instrument: VIMS
Usual Riders: none
Number of Observations: 15(A total of eight RPXxxxPH observations were made between revs 4 and 241, at phase angles ranging from 10^o to 155^o. A further six "RPXMOVIE" observations were made by VIMS, plus one RPXHIPH (rev 48))

"RPXxxxPH" means "Ring Plane Crossing observation, phase angle xxx". A series of observations made on (mostly) near-equatorial orbits as Cassini slowly crossed the ring plane. Typical range was 20 – 30 Rs and the observation repeated a small radial mosaic along one ring ansa with the sub-spacecraft latitude below 0.01 deg. (In more distant cases a single fixed pointing was used.) RPXMOVIEs were similar, but used a single ansa pointing. The goal was to determine the vertical structure of the F ring by modeling the edge-on radial brightness profile of the rings when the I/F was dominated by the F ring. Duration variable between 6 and 24 hrs. There are also CDA (RPXING) and ISS (RPXRIDER) riders on revs 43 and 214, respectively.

Pointing: Stare at one ring ansa, including the F ring, for the duration of the observation. For closer observations, a small radial mosaic was used. Which ansa was selected was based on trying to avoid bright satellites crossing the field of view.
Secondary axis was generally +/-Z to NSP but +/-X to NSP on later orbits to maximize resolution perpendicular to the ring plane.

Instrument Parameters: Usually 640 msec integrations were used, with a cube size of 32x64 or 16*64 pixels.

Observation Type:	SHAD
Prime Instrument:	CIRS
Usual Riders:	None
Number of Observations:	18 SHADL, 6 SHADU, 4 SHAD*CAS, 1 SHADA & 2 SHADC*

These were all main mission campaigns intended to investigate heating and cooling of particles at representative radii in the main rings as they went through the shadow region. These were originally designed for purposes of fitting cooling curves under the assumption that CIRS was seeing emission from rotating particle models. The intention was to constrain particle thermal inertia and size distribution.

The naming convention for most of these observations has a 'U' (or sometimes 'UL') for unlit or 'L' for lit following the 'SHAD' predicate. During the prime mission 'U' is always the North side of the rings and 'L' the South side. Following that is a rough classification of whether the data were at low, medium, or high phase angle ('LP', 'MP', or 'HP').

In the early revs, before naming convention was established and observation design templates elaborated, there were several observations labeled as 'SHADA', 'SHADC', and 'SHADCOUT'. These were all unlit side observations containing a large number of footprints aimed at finding radial variation near shadow ingress, in order to see whether temperature effects could be seen in the unlit A and C rings.

There are additionally several 'SHADCAS' observations that were placed when Cassini was at close enough range that the FP1 footprint fit entirely within the Cassini division.

Pointing: These were FP1 to rings, and were mostly azimuthal scans at fixed radius.

Instrument Parameters: These were all specifically designed for FP1, and mostly taken at 15cm^-1 resolution.

Observation	Start Time	Duration
CIRS_00ARC_SHADA001_PRIME	2004-302T09:00:00	000T03:00:00
CIRS_00ARC_SHADCIN001_PRIME	2004-302T07:15:00	000T01:45:00
CIRS_00ARC_SHADCOUT001_PRIME	2004-302T12:00:00	000T02:00:00
CIRS_000RI_SHADLMP001_PRIME	2004-184T22:00:00	000T02:45:00
CIRS_007RB_SHADLLP001_PRIME	2005-122T14:35:00	000T02:00:00
CIRS_011RC_SHADLLP001_PRIME	2005-194T00:00:00	000T04:00:00
CIRS_011RA_SHADLLP001_PRIME	2005-194T04:00:00	000T04:00:00
CIRS_031RC_SHADLMP001_PRIME	2006-300T00:30:00	000T08:30:00
CIRS_037RC_SHADLLP001_PRIME	2007-016T09:30:00	000T04:00:00
CIRS_037RB_SHADLLP001_PRIME	2007-016T13:30:00	000T05:00:00
CIRS_037RA_SHADLLP001_PRIME	2007-016T18:30:00	000T04:00:00
CIRS_039RI_SHADLMP004_PRIME	2007-048T15:50:00	000T08:25:00
CIRS_039RI_SHADLMP005_PRIME	2007-049T15:55:00	000T01:35:00
CIRS_039RI_SHADLMP006_PRIME	2007-049T21:20:00	000T03:45:00
CIRS_041RI_SHADLMP001_PRIME	2007-082T01:20:00	000T10:20:00
CIRS_041RI_SHADLMP002_PRIME	2007-082T14:40:00	000T01:40:00
CIRS_062RB_SHADLLP001_PRIME	2008-083T18:20:00	000T05:30:00
CIRS_063RB_SHADLLP001_PRIME	2008-093T09:05:00	000T06:30:00
CIRS_074RI_SHADLMP001_PRIME	2008-182T20:00:00	000T04:00:00
CIRS_077RI_SHADLMP001_PRIME	2008-204T02:50:00	000T04:00:00
CIRS_098RI_SHADLMP001_PRIME	2008-362T09:09:00	000T21:11:00
CIRS_010RC_SHADULHP001_PRIME	2005-178T00:44:00	000T02:52:00
CIRS_010RA_SHADULHP001_PRIME	2005-178T03:36:00	000T04:00:00
CIRS_031RC_SHADULMP001_PRIME	2006-301T22:00:00	000T02:00:00
CIRS_033RB_SHADULHP001_PRIME	2006-326T22:00:00	000T03:00:00
CIRS_034RC_SHADULMP001_PRIME	2006-337T17:00:00	000T04:00:00
CIRS_064RI_SHADULMP001_PRIME	2008-101T16:00:00	000T02:45:00
CIRS_042RI_SHADLCAS001_PRIME	2007-098T17:10:00	000T00:55:00
CIRS_042RI_SHADLCAS002_PRIME	2007-098T19:40:00	000T02:05:00
CIRS_044RI_SHADCAS001_PRIME	2007-130T08:44:00	000T04:26:00
CIRS_066RI_SHADULCAS001_PRIME	2008-120T23:30:00	000T09:40:00

Observation Type:	SHADSCAN
Prime Instrument:	VIMS or ISS
Usual Riders:	ISS or VIMS + CIRS, UVIS
Number of Observations:	14. During the F-ring/Proximal phase of the mission high-resolution SHADSCAN observations were made on revs 276 and 283.

"SHADSCAN" means "A radial scan along Saturn's shadow edge on the rings". These were usually done at a phase angle near 90^o, so that the shadow passed across one ring ansa. The goal was to obtain IR spectra with as little contamination by saturnshine as possible, since these locations on the rings "see" only a thin lit crescent on Saturn.

Pointing: Each observation design was different, depending on the shadow geometry. Not all scans spanned the full extent of the main rings, especially later in the mission when the shadow terminated near the Cassini Division.

Instrument Parameters: Each footprint was usually targeted for at least 10 min, with a 160 or 320 msec integration time. Cube sizes variable.

Observation Type: SOLAROCC
Prime Instrument: VIMS or UVIS
Usual Riders: UVIS or VIMS
Number of Observations: 31 (including two UVIS riders. Twelve of these were done during the F-ring/Proximal phases of the mission)

“SOLAROCC” means “Ring solar occultation” and denotes any observation when the Sun was observed through the main rings. In a few cases the name “SOLOCC” was used instead. Ideally the path traversed by the Sun went from the D ring to the F ring (or vice versa) but many of the SOLAROCC observations covered only a part of this range, due to competing requests for observations by RSS, UVIS or ISS in these highly-sought-after periods. Ingress, egress and chord occultations were observed. Durations ranged from under 1 hr to over 11 hrs (rev 28), but were typically 2 - 4 hrs. SOLAROCC observations frequently preceded or followed HIPHASE observations, as mission Flight Rules often prohibited observing any other target at these times.

Pointing: For each observation either the UVIS or VIMS solar port was initially targeted at the Sun, and this pointing then remained fixed as the image of the Sun passed behind the ring system. Because of VIMS’ pointing flexibility, in most cases the UVIS solarport was used as the primary boresight so that both instruments could obtain data. On revs 9, 172, and 181, however, the VIMS solarport boresight was used. On revs 11, 85 and 90 various experimental non-standard boresights were used.

Instrument Parameters: In order to avoid saturation at some wavelengths, the VIMS integration time was set at 40 or (after rev 181) 60 msec. Since the Sun subtends a diameter of 1.0 mrad at Saturn, or 2 VIMS pixels, IMAGE mode was used rather than OCCULTATION mode, with cube sizes of 8x8 or 12x12 pixels for most observations. In a few cases, a much larger field of 24x24 or even 32x32 pixels was used, with the goal of mapping out the scattered light halo around the solar image. Most observations after rev 241 were recorded with spectral-summing turned ON, in order to reduce data volume, since the ring’s transmission spectrum was found to be featureless.

Observation Type: SP

See entry for observation type NP

Observation Type: STELLAROCC
Prime Instrument: VIMS
Usual Riders: ISS, plus occasionally CIRS or UVIS
Number of Observations: Approx 180 stellar occultations were observed by VIMS during the entire mission, all but ~10 returning useful data. Over 40 different stars were used, several many times. Particularly notable are sets of 5 or more occultations by gamma Crucis, alpha Orionis, alpha Scorpii, omicron Ceti, CW Leo, R Leo, R Cas, R Lyr, mu Cephei and W Hydrae.

“STELLAROCC” means “Ring stellar occultation”. Observation names are of the form “xxxxOCC”, where “xxxx” is the standard 4-to-6-letter abbreviated star name (e.g., GAMCRU or RLEO). VIMS monitored the brightness of a star as it passed behind the rings, as seen by Cassini, using its single-pixel OCCULTATION mode. Observations were timed to begin 10 - 15 min before the star entered the rings, to permit prior acquisition of the target when it was well-separated from the rings. Spectra were then obtained in a continuous series for the duration of the ring occultation, or until several minutes after the star had passed behind Saturn. Ring occultations are classified as Ingress, Egress or Chord occultations, depending on whether the star’s motion is radially inward, outward or reaches a minimum value during the observation. VIMS primarily observed Ingress and Chord events, due to the necessity to acquire the star prior to the observation. Durations ranged from 1 hr to 24 hr (longest was lamVel on rev 203), being determined for each observation by the occultation duration and/or other mission constraints such as scheduled downlinks.

Pointing: Each observation design followed a standard design. An initial “star-finding cube” of 16x4 pixels was taken to identify the position of the star in the VIMS FOV. Data from this cube were then used to set the IR scan mirror to the corresponding position (denoted by “star tracking ON” in the cube labels) and a continuous series of single-pixel spectra was then initiated. In only one instance (etaCar, rev 70) did the star drift out of the pixel during the observation due to spacecraft pointing variations. In approx. 10% of these observations the star fell between two pixels and the resulting data quality is poor to useless.

Instrument Parameters: VIMS integration times were adjusted according to (1) the stellar magnitude and (2) the speed of the occultation; values ranged from 20 msec for the brightest stars to 100 msec for the fainter ones and/or slower occs. In almost all cases VIMS was operated with spectral summing turned ON, resulting in the 256 spectral channels being co-added in contiguous sets of 8. This was to reduce overall data volume to manageable levels.

Observation Type:	SUBM
Prime Instrument:	CIRS
Usual Riders:	None
Number of Observations:	28 SUBML, 54 SUBMU, 7 SUBMS, 1 SUBMML & 1 SUBMLVEN

These were originally planned as a campaign to collect radial scans slowly at high spectral resolution in order to detect any variation in the sub-millimeter wavelength region in the form of "rolloff" or spectral features. Given that the radial scans were to be slow, it was anticipated that most of these observations would only have one or maybe two scans, and during negotiations they were preferentially placed in the timeline at low spacecraft elevations, where high signal to noise could be obtained by looking at the Ansae.

Analysis showed that the S/N of FP1 is not good enough to see spectral features without averaging together many spectra, and after rev 60 the observations were conducted at lower resolution with faster radial scans, in order to supplement the TEMP campaign.

The naming convention is that 'L' or 'U' follows the 'SUBM' designation, either for 'Lit' or 'Unlit' (which map to North and South, as all of these took place in Prime Mission before the equinox). The characters after this indicate the approximate latitude (sub-spacecraft elevation) and whether it was at low, medium or high phase (LP, MP, HP).

Pointing: Originally these were taken with FP1 to rings, and planned with R_RAD_LON adjusted to a slow scan across either Ansa.
Several of them have "COMP"-like portions where they take many footprints at a particular location in the rings.
After rev 60 the scans are faster

Instrument Parameters: The initial observations were at 0.5 or 1cm^-1 resolution, with 15cm^-1 appearing late in the prime mission.

Observation	Start Time	Duration
CIRS_00ARI_SUBMU07LP001_PRIME	2004-301T11:10:00	000T06:05:00
CIRS_00ARI_SUBML06HP001_PRIME	2004-303T12:15:00	000T04:45:00
CIRS_006RI_SUBML07LP001_PRIME	2005-104T06:25:00	000T03:55:00
CIRS_006RI_SUBMU04HP001_PRIME	2005-105T11:25:00	000T02:30:00
CIRS_007RI_SUBMU14HP001_PRIME	2005-123T10:49:00	000T07:27:00
CIRS_008RI_SUBML20LP001_PRIME	2005-140T11:00:00	000T07:00:00

CIRS_008RI_SUBMU10HP001_PRIME	2005-142T01:30:00	000T06:30:00
CIRS_009RI_SUBML20LP001_PRIME	2005-157T03:00:00	000T06:30:00
CIRS_009RI_SUBML20LP002_PRIME	2005-158T13:00:00	000T07:00:00
CIRS_009RI_SUBMU15HP003_PRIME	2005-159T19:37:00	000T06:40:00
CIRS_026RI_SUBML07MP001_PRIME	2006-204T00:45:00	000T06:15:00
CIRS_026RI_SUBMU15HP001_PRIME	2006-206T06:00:00	000T08:00:00
CIRS_028RI_SUBMU24MP001_PRIME	2006-253T06:00:00	000T05:30:00
CIRS_029RI_SUBML16MP001_PRIME	2006-267T20:30:00	000T06:30:00
CIRS_029RI_SUBML16MP001_PRIME	2006-267T20:30:00	000T06:30:00
CIRS_029RI_SUBMU36HP001_PRIME	2006-270T03:45:00	000T07:15:00
CIRS_031RI_SUBML20MP001_PRIME	2006-299T15:15:00	000T09:15:00
CIRS_031RI_SUBMU50MP001_PRIME	2006-301T14:00:00	000T08:00:00
CIRS_032RI_SUBMU07HP001_PRIME	2006-309T18:10:00	000T08:05:00
CIRS_032RI_SUBML07HP001_PRIME	2006-311T00:00:00	000T08:00:00
CIRS_033RI_SUBML07HP001_PRIME	2006-323T03:15:00	000T04:00:00
CIRS_034RI_SUBMU07HP001_PRIME	2006-333T16:45:00	000T08:00:00
CIRS_035RI_SUBML52MP001_PRIME	2006-348T08:15:00	000T08:00:00
CIRS_035RI_SUBMU20MP001_PRIME	2006-349T17:15:00	000T08:00:00
CIRS_036RI_SUBML27HP002_PRIME	2006-363T13:00:00	000T08:00:00
CIRS_036RI_SUBML17LP001_PRIME	2006-365T15:00:00	000T05:30:00
CIRS_036RI_SUBMU35MP001_PRIME	2007-001T21:00:00	000T07:20:00
CIRS_037RI_SUBMU45MP001_PRIME	2007-019T21:20:00	000T06:00:00
CIRS_038RI_SUBMMLP001_PRIME	2007-035T14:07:00	000T05:15:00
CIRS_039RI_SUBML10HP001_PRIME	2007-047T19:50:00	000T05:30:00
CIRS_039RI_SUBML59MP001_PRIME	2007-050T12:00:00	000T08:40:00
CIRS_039RI_SUBML40LP001_PRIME	2007-051T11:00:00	000T09:30:00
CIRS_041RI_SUBMU25HP001_PRIME	2007-080T23:00:00	000T07:55:00
CIRS_041RI_SUBMU10HP001_PRIME	2007-081T08:55:00	000T04:00:00
CIRS_042RI_SUBMU40HP001_PRIME	2007-097T07:48:00	000T06:19:00
CIRS_042RI_SUBMU10HP001_PRIME	2007-098T00:20:00	000T03:40:00
CIRS_043RI_SUBMU45MP001_PRIME	2007-113T04:45:00	000T05:00:00
CIRS_050RI_SUBMU04LP001_PRIME	2007-273T23:20:00	000T04:00:00
CIRS_053RI_SUBMU10MP001_PRIME	2007-335T23:30:00	000T07:45:00
CIRS_053RI_SUBML07LP001_PRIME	2007-337T18:40:00	000T06:33:00
CIRS_054RI_SUBML08LP001_PRIME	2007-353T20:16:00	000T05:30:00
CIRS_056RI_SUBMU05LP001_PRIME	2008-018T18:50:00	000T06:30:00
CIRS_057RI_SUBML20LP001_PRIME	2008-028T13:45:00	000T06:20:00
CIRS_058RI_SUBMU35LP001_PRIME	2008-037T18:36:00	000T08:00:00
CIRS_060RI_SUBMU30LP001_PRIME	2008-058T11:31:00	000T08:35:00
CIRS_060RI_SUBMU45MP001_PRIME	2008-059T19:20:00	000T08:00:00
CIRS_060RI_SUBMU47MP001_PRIME	2008-060T11:20:00	000T04:40:00
CIRS_060RI_SUBMU50MP001_PRIME	2008-060T21:00:00	000T03:20:00
CIRS_060RI_SUBML10LP001_PRIME	2008-063T11:15:00	000T03:30:00
CIRS_060RI_SUBML10LP101_PRIME	2008-063T17:45:00	000T01:45:00

CIRS_060RI_SUBML10LP102_PRIME	2008-063T20:00:00	000T05:00:00
CIRS_061RI_SUBMU45MP001_PRIME	2008-070T11:06:00	000T08:00:00
CIRS_061RI_SUBMU50MP001_PRIME	2008-071T10:35:00	000T07:00:00
CIRS_062RI_SUBMU30MP001_PRIME	2008-079T10:05:00	000T08:00:00
CIRS_062RI_SUBMU39MP001_PRIME	2008-080T14:20:00	000T08:00:00
CIRS_063RI_SUBMU28LP001_PRIME	2008-088T14:35:00	000T08:00:00
CIRS_063RI_SUBMU55MP001_PRIME	2008-091T09:05:00	000T08:00:00
CIRS_063RI_SUBMLVENC001_PRIME	2008-092T23:07:00	000T06:58:00
CIRS_065RI_SUBMU55MP001_PRIME	2008-110T07:50:00	000T01:50:00
CIRS_065RI_SUBMU55MP002_PRIME	2008-110T14:50:00	000T04:40:00
CIRS_065RI_SUBMU60MP001_PRIME	2008-111T07:32:00	000T04:48:00
CIRS_065RI_SUBML39LP001_PRIME	2008-112T14:30:00	000T07:00:00
CIRS_065RI_SUBMU10LP001_PRIME	2008-115T08:02:00	000T08:00:00
CIRS_066RI_SUBMU40MP001_PRIME	2008-118T14:17:00	000T07:00:00
CIRS_066RI_SUBMU40MP001_PRIME	2008-118T14:17:00	000T07:00:00
CIRS_066RI_SUBMU50MP001_PRIME	2008-119T07:16:00	000T08:54:00
CIRS_067RI_SUBMU35LP001_PRIME	2008-127T07:15:00	000T08:15:00
CIRS_067RI_SUBMU35LP001_PRIME	2008-127T07:15:00	000T08:15:00
CIRS_068RI_SUBMU20LP001_PRIME	2008-135T06:44:00	000T08:00:00
CIRS_068RI_SUBMU33LP001_PRIME	2008-136T05:59:00	000T06:00:00
CIRS_068RI_SUBMU33LP001_PRIME	2008-136T05:59:00	000T06:00:00
CIRS_070RI_SUBMU35LP001_PRIME	2008-152T09:00:00	000T08:00:00
CIRS_070RI_SUBML32LP001_PRIME	2008-154T22:27:00	000T08:00:00
CIRS_070RI_SUBMU08LP001_PRIME	2008-157T04:41:00	000T07:00:00
CIRS_071RI_SUBMU17LP001_PRIME	2008-158T04:41:00	00T08:00:000
CIRS_072RI_SUBMU12LP001_PRIME	2008-164T21:10:00	000T07:00:00
CIRS_073RI_SUBMU25LP001_PRIME	2008-173T05:19:00	000T02:30:00
CIRS_073RI_SUBMU17LP001_PRIME	2008-172T10:09:00	000T07:00:00
CIRS_073RI_SUBMU25LP002_PRIME	2008-173T09:29:00	000T02:30:00
CIRS_073RI_SUBML25LP001_PRIME	2008-176T03:39:00	000T09:00:00
CIRS_074RI_SUBML25LP002_PRIME	2008-183T00:00:00	000T08:38:00
CIRS_075RI_SUBMU14LP001_PRIME	2008-186T02:55:00	000T08:00:00
CIRS_075RI_SUBMU40MP001_PRIME	2008-188T02:23:00	000T07:29:00
CIRS_076RI_SUBMU45MP001_PRIME	2008-195T12:22:00	000T03:00:00
CIRS_077RI_SUBML24MP001_PRIME	2008-204T11:50:00	000T04:00:00
CIRS_078RI_SUBMU27LP001_PRIME	2008-208T07:36:00	000T09:00:00
CIRS_084RI_SUBMS10LP001_PRIME	2008-256T15:29:00	000T05:16:00
CIRS_086RI_SUBMS45LP001_PRIME	2008-269T23:20:00	000T08:45:00
CIRS_089RI_SUBMS45LP001_PRIME	2008-291T18:00:00	000T07:00:00
CIRS_090RI_SUBMS10LP001_PRIME	2008-300T13:45:00	000T09:00:00
CIRS_093RI_SUBMS30LP001_PRIME	2008-322T19:04:00	000T08:40:00
CIRS_096RI_SUBMS10LP001_PRIME	2008-347T18:52:00	000T08:00:00
CIRS_100RI_SUBMS20LP001_PRIME	2009-017T16:00:00	000T12:02:00
CIRS_100RI_SUBMS20LP001_PRIME	2009-017T16:00:00	000T12:02:00

Observation Type:	TEMP
Prime Instrument:	CIRS
Usual Riders:	None
Number of Observations:	31 TEMPL, 45 TEMPU, 4 TEMPN & 4 TEMPS

This campaign was aimed at observing radial variation in ring temperature to constrain differences in structure across the rings. While both the 'SUBM' campaigns and 'TEMP' campaigns used radial scans, the 'TEMP' campaign was designed to use faster scans and obtain a larger variety of observation geometries. Approximately mid-way through the prime mission the TEMPs started to be placed in the timeline during negotiations at phases and latitudes that had not been previously observed.

The naming convention is that 'L' or 'U' following 'TEMP' indicates whether it observed the lit or unlit side of the rings (corresponding to South or North, as these were all taken during the prime mission prior to Saturn equinox). Following that is an approximate sub-spacecraft latitude and 'LP', 'MP', or 'HP' to indicate whether it was at low, medium or high phase angle.

Toward the end of prime mission the 'L' and 'U' were replaced with 'S' and 'N', for observing the South or North side of the rings, in anticipation of directions reversing after Saturn Equinox. There are 8 such observations.

There are more TEMP observations of the unlit side of the rings than the lit side simply because observing time on the unlit side was not as heavily subscribed as on the lit side.

Pointing: These use FP1 to rings, and were nearly all performed with radial scans programmed via the R_RAD_LON module. The initial observations had at most a couple of radial scans, but toward the end of main mission, after approximately rev 60, more scans were used, when possible, and at faster rates.

Instrument Parameters: These were all taken at 15cm^-1 resolution and primarily with FP1; FP3 and FP4 were always included, but were omitted when data volume constraints required it.

Observation	Start Time	Duration
CIRS_00BRI_TEMPL06MP001_PRIME	2004-350T19:30:00	000T04:00:00
CIRS_00BRI_TEMPL06MP001_PRIME	2004-350T19:30:00	000T04:00:00
CIRS_007RI_TEMPL20LP001_PRIME	2005-122T03:35:00	000T02:00:00
CIRS_009RI_TEMPL20LP001_PRIME	2005-156T22:00:00	000T05:00:00
CIRS_014RI_TEMPL15LP001_PRIME	2005-247T04:00:00	000T06:00:00

CIRS_028RI_TEMPL10MP001_PRIME	2006-252T00:30:00	000T02:00:00
CIRS_029RI_TEMPL10HP001_PRIME	2006-267T07:30:00	000T02:40:00
CIRS_029RI_TEMPL10HP001_PRIME	2006-267T07:30:00	000T02:40:00
CIRS_033RI_TEMPL20HP001_PRIME	2006-323T17:15:00	000T02:00:00
CIRS_035RI_TEMPL25LP001_PRIME	2006-349T03:30:00	000T02:00:00
CIRS_036RI_TEMPL57LP001_PRIME	2006-364T18:30:00	000T01:00:00
CIRS_037RI_TEMPL35LP001_PRIME	2007-016T22:30:00	000T02:00:00
CIRS_040RI_TEMPL55MP001_PRIME	2007-066T21:51:00	000T02:00:00
CIRS_040RI_TEMPL40LP001_PRIME	2007-067T09:41:00	000T02:40:00
CIRS_042RI_TEMPL43LP001_PRIME	2007-099T10:15:00	000T02:00:00
CIRS_043RI_TEMPL25MP001_PRIME	2007-115T16:30:00	000T02:00:00
CIRS_055RI_TEMPL37MP001_PRIME	2008-004T04:45:00	000T02:03:00
CIRS_056RI_TEMPL05MP001_PRIME	2008-017T11:20:00	000T03:00:00
CIRS_057RI_TEMPL10LP001_PRIME	2008-029T06:05:00	000T02:00:00
CIRS_058RI_TEMPL16LP001_PRIME	2008-040T16:00:00	000T02:00:00
CIRS_061RI_TEMPL30MP001_PRIME	2008-073T11:50:00	000T05:01:00
CIRS_061RI_TEMPL15LP001_PRIME	2008-074T02:50:00	000T03:35:00
CIRS_065RI_TEMPL55MP001_PRIME	2008-112T02:05:00	000T05:00:00
CIRS_068RI_TEMPL48LP001_PRIME	2008-139T10:05:00	000T02:09:00
CIRS_069RI_TEMPL25LP001_PRIME	2008-148T05:19:32	000T02:25:00
CIRS_070RI_TEMPL42LP001_PRIME	2008-154T10:00:00	000T01:27:00
CIRS_071RI_TEMPL20LP001_PRIME	2008-162T03:50:00	000T03:10:00
CIRS_072RI_TEMPL53MP001_PRIME	2008-168T11:45:00	000T03:00:00
CIRS_074RI_TEMPL10LP001_PRIME	2008-184T04:00:00	000T03:00:00
CIRS_074RI_TEMPL13LP001_PRIME	2008-183T20:30:00	000T03:15:00
CIRS_075RI_TEMPL17LP001_PRIME	2008-191T02:40:00	000T01:05:00
CIRS_075RI_TEMPL17LP002_PRIME	2008-191T07:30:00	000T01:15:00

CIRS_079RI_TEMPN20LP001_PRIME	2008-214T07:35:00	000T06:15:00
CIRS_079RI_TEMPN45HP001_PRIME	2008-217T06:45:00	000T01:15:00
CIRS_080RI_TEMPN45LP001_PRIME	2008-223T08:50:00	000T06:00:00
CIRS_079RI_TEMPN60HP001_PRIME	2008-217T01:45:00	000T01:00:00

CIRS_00BRI_TEMPU05LP001_PRIME	2004-349T17:52:00	000T04:00:00
CIRS_00BRI_TEMPU05LP001_PRIME	2004-349T17:52:00	000T04:00:00
CIRS_007RI_TEMPU11HP001_PRIME	2005-123T18:16:00	000T03:30:00
CIRS_008RI_TEMPU17HP001_PRIME	2005-141T15:08:00	000T02:28:00
CIRS_009RI_TEMPU12HP002_PRIME	2005-160T02:17:00	000T01:43:00
CIRS_010RI_TEMPU08HP002_PRIME	2005-178T11:00:00	000T02:00:00
CIRS_012RI_TEMPU05HP001_PRIME	2005-215T01:30:00	000T03:50:00
CIRS_013RI_TEMPU09HP001_PRIME	2005-233T06:00:00	000T04:45:00
CIRS_026RI_TEMPU15HP002_PRIME	2006-206T02:00:00	000T04:00:00

CIRS_028RI_TEMPU22HP001_PRIME	2006-253T21:30:00	000T04:00:00
CIRS_029RI_TEMPU30MP001_PRIME	2006-269T02:30:00	000T03:30:00
CIRS_029RI_TEMPU35HP001_PRIME	2006-271T01:00:00	000T03:00:00
CIRS_030RI_TEMPU20MP001_PRIME	2006-285T08:35:00	000T01:10:00
CIRS_030RI_TEMPU10MP001_PRIME	2006-285T05:00:00	000T01:35:00
CIRS_030RI_TEMPU40MP001_PRIME	2006-285T20:30:00	000T03:00:00
CIRS_030RI_TEMPU45MP001_PRIME	2006-286T07:00:00	000T02:30:00
CIRS_032RI_TEMPU05HP002_PRIME	2006-310T02:15:00	000T05:00:00
CIRS_033RI_TEMPU50HP001_PRIME	2006-325T15:30:00	000T03:15:00
CIRS_034RI_TEMPU05HP001_PRIME	2006-334T00:45:00	000T05:00:00
CIRS_036RI_TEMPU05LP001_PRIME	2007-001T02:00:00	000T02:30:00
CIRS_037RI_TEMPU28MP001_PRIME	2007-018T21:50:00	000T04:00:00
CIRS_037RI_TEMPU55MP001_PRIME	2007-021T00:30:00	000T01:15:00
CIRS_041RI_TEMPU45HP001_PRIME	2007-079T19:40:00	000T03:20:00
CIRS_041RI_TEMPU15HP001_PRIME	2007-081T06:55:00	000T02:00:00
CIRS_055RI_TEMPU33MP001_PRIME	2008-001T15:33:00	000T02:45:00
CIRS_056RI_TEMPU45MP001_PRIME	2008-015T07:05:00	000T02:55:00
CIRS_057RI_TEMPU05LP001_PRIME	2008-030T14:30:00	000T04:00:00
CIRS_060RI_TEMPU57MP001_PRIME	2008-061T12:00:00	000T01:15:00
CIRS_060RI_TEMPU20LP001_PRIME	2008-067T11:51:00	000T05:00:00
CIRS_062RI_TEMPU47MP001_PRIME	2008-080T09:50:00	000T04:00:00
CIRS_062RI_TEMPU28HP001_PRIME	2008-083T02:20:00	000T03:00:00
CIRS_063RI_TEMPU49MP001_PRIME	2008-090T18:34:00	000T04:30:00
CIRS_063RI_TEMPU16LP001_PRIME	2008-096T17:49:00	000T04:00:00
CIRS_064RI_TEMPU30LP001_PRIME	2008-098T17:34:00	000T04:00:00
CIRS_064RI_TEMPU15MP001_PRIME	2008-106T07:33:00	000T04:00:00
CIRS_065RI_TEMPU60MP001_PRIME	2008-110T19:30:00	000T04:15:00
CIRS_065RI_TEMPU26HP001_PRIME	2008-111T16:00:00	000T04:05:00
CIRS_065RI_TEMPU06LP001_PRIME	2008-114T17:32:00	000T04:00:00
CIRS_065RI_TEMPU15LP001_PRIME	2008-115T16:32:00	000T04:00:00
CIRS_066RI_TEMPU20LP001_PRIME	2008-125T06:46:00	000T04:00:00
CIRS_067RI_TEMPU58MP001_PRIME	2008-129T16:30:00	000T04:00:00
CIRS_068RI_TEMPU20LP001_PRIME	2008-135T14:44:00	000T04:00:00
CIRS_068RI_TEMPU35LP001_PRIME	2008-136T12:29:00	000T04:00:00
CIRS_070RI_TEMPU16LP001_PRIME	2008-150T22:42:00	000T04:00:00
CIRS_074RI_TEMPU16LP001_PRIME	2008-180T03:23:00	000T03:30:00
CIRS_074RI_TEMPU06LP001_PRIME	2008-185T11:50:00	000T04:00:00

CIRS_079RI_TEMPS60MP001_PRIME	2008-218T02:35:00	000T05:00:00
CIRS_079RI_TEMPS20LP001_PRIME	2008-218T20:35:00	000T05:00:00
CIRS_080RI_TEMPS10LP001_PRIME	2008-227T00:44:00	000T06:00:00
CIRS_082RI_TEMPS20LP001_PRIME	2008-240T23:59:00	000T08:50:00

Observation Type: TMAP
Prime Instrument: CIRS
Usual Riders: None
Number of Observations: 28 TMAPN*, 16 TMAPS* & 2 TMAPS

The TMAP campaign was a continuation of the TEMP campaign designed for the extended mission. During the presentation of CIRS strategies to the Rings TWT prior to XM, the TWT argued that azimuthal observations did not represent good use of time, given the few points needed to constrain cooling curves (at this point in time, the subtle variation in azimuthal signal due to wake structures was not appreciated). Consequently the TMAP observations were updated to include a large number of radial scans, taken faster than during the TEMP observations.

These were subsequently discovered to strain the spacecraft's ability to dissipate angular momentum (they were "not RBOT friendly"), and other instrument teams, particularly VIMS, complained that they could not ride along on observations that slewed as fast as the TMAPS. They were discontinued in the solstice mission.

The naming convention is that 'N' or 'S' following 'TMAP' indicates whether it observed the North or South of the rings. Following that is an approximate sub-spacecraft latitude and 'LP', 'MP', or 'HP' to indicate whether it was at low, medium or high phase angle.

Pointing: These use FP1 to rings, and were nearly all performed with radial scans programmed via the R_RAD_LON module. The initial observations had at most a couple of radial scans, but toward the end of main mission, after approximately rev 60, more scans were added at faster rates.

Instrument Parameters: These were all taken at 15cm^-1 resolution and primarily with FP1; FP3 and FP4 were always included, but were omitted when data volume constraints required it.

Observation	Start Time	Duration
CIRS_081RI_TMAPN30LP001_PRIME	2008-230T00:30:00	000T07:40:00
CIRS_085RI_TMAPN20LP001_PRIME	2008-258T22:54:00	000T03:15:00
CIRS_085RI_TMAPN30LP001_PRIME	2008-259T02:09:00	000T08:00:00
CIRS_088RI_TMAPN20LP001_PRIME	2008-281T07:10:00	000T04:05:00
CIRS_088RI_TMAPN45LP001_PRIME	2008-282T06:00:00	000T05:15:00
CIRS_089RI_TMAPN20LP001_PRIME	2008-287T23:40:00	000T09:55:00

CIRS_092RI_TMAPN20LP001_PRIME	2008-310T00:00:00	000T09:00:00
CIRS_092RI_TMAPN30LP001_PRIME	2008-310T19:48:00	000T06:10:00
CIRS_092RI_TMAPN45LP001_PRIME	2008-311T18:00:00	000T09:00:00
CIRS_092RI_TMAPN10LP001_PRIME	2008-317T06:45:00	000T08:00:00
CIRS_096RI_TMAPN20LP001_PRIME	2008-341T22:07:00	000T06:55:00
CIRS_096RI_TMAPN45LP001_PRIME	2008-342T17:52:00	000T05:20:00
CIRS_098RI_TMAPN30LP001_PRIME	2008-357T22:54:00	000T07:40:00
CIRS_098RI_TMAPN45LP001_PRIME	2008-358T18:30:00	000T04:00:00
CIRS_105RI_TMAPN45LP001_PRIME	2009-064T08:00:00	000T08:00:00
CIRS_107RI_TMAPN45MP001_PRIME	2009-091T10:15:00	000T06:20:00
CIRS_108RI_TMAPN30LP001_PRIME	2009-102T15:44:00	000T07:00:00
CIRS_109RI_TMAPN45LP001_PRIME	2009-118T22:52:00	000T04:00:00
CIRS_111RI_TMAPN45LP001_PRIME	2009-148T07:38:00	000T09:30:00
CIRS_114RI_TMAPN30MP001_PRIME	2009-186T23:33:00	000T02:25:00
CIRS_114RI_TMAPN45MP001_PRIME	2009-193T21:00:00	000T09:07:00
CIRS_114RI_TMAPN30MP002_PRIME	2009-196T07:39:00	000T09:41:00
CIRS_106RI_TMAPN20LP001_PRIME	2009-075T07:45:00	000T10:00:00
CIRS_115RI_TMAPN25MP001_PRIME	2009-212T01:55:00	000T04:25:00
CIRS_116RI_TMAPN20MP001_PRIME	2009-225T08:45:00	000T06:30:00
CIRS_116RI_TMAPN20MP002_PRIME	2009-227T19:20:00	000T12:10:00
CIRS_117RI_TMAPN10LP002_PRIME	2009-240T20:40:00	000T06:00:00
CIRS_118RI_TMAPN10LP002_PRIME	2009-264T22:55:00	000T08:00:00

CIRS_080RI_TMAPS20LP001_PRIME	2008-226T09:05:00	000T05:15:00
CIRS_085RI_TMAPS10LP001_PRIME	2008-263T15:05:00	000T04:10:00
CIRS_087RI_TMAPS10LP001_PRIME	2008-278T14:15:00	000T04:00:00
CIRS_088RI_TMAPS30LP001_PRIME	2008-285T01:40:00	000T04:00:00
CIRS_090RI_TMAPS45LP001_PRIME	2008-299T03:04:00	000T07:08:00
CIRS_092RI_TMAPS10LP001_PRIME	2008-315T20:00:00	000T08:44:00
CIRS_094RI_TMAPS45LP001_PRIME	2008-330T01:05:00	000T07:10:00
CIRS_100RI_TMAPS45LP001_PRIME	2009-016T14:35:00	000T08:00:00
CIRS_102RI_TMAPS45MP001_PRIME	2009-035T15:29:00	000T04:00:00
CIRS_103RI_TMAPS45MP001_PRIME	2009-047T17:25:00	000T09:30:00
CIRS_103RI_TMAPS30LP001_PRIME	2009-048T18:15:00	000T08:40:00
CIRS_104RI_TMAPS45MP001_PRIME	2009-059T12:30:00	000T08:30:00
CIRS_104RI_TMAPS30LP001_PRIME	2009-060T12:20:00	000T06:30:00
CIRS_108RI_TMAPS45MP001_PRIME	2009-099T10:59:00	000T08:00:00
CIRS_109RI_TMAPS20LP001_PRIME	2009-115T08:40:00	000T06:15:00
CIRS_111RI_TMAPS45MP001_PRIME	2009-145T07:54:00	000T04:00:00
CIRS_134RI_TMAPS001_PRIME	2010-183T04:29:00	000T05:00:00
CIRS_134RI_TMAPS002_PRIME	2010-184T13:29:00	000T05:00:00

Observation Type: URSTAR
Prime Instrument: UVIS
Usual Riders: Occasionally CIRS, ISS, VIMS
Number of Observations: 197 stellar occultations were observed by UVIS, where ingress and egress portions of an occultation are counted together as a single observations, even if the two portions were not observed continuously. Counting ingress and egress separately (even if the two portions were observed continuously) the total number of observed scans is 280. The sensitivity of the UVIS High Speed Photometer declined over the course of the mission, and several observed occultations have very low stellar signals. The brightest stars at high and low elevation angle (*B*) with multiple full radial scans are Beta Centauri (*B*=66.7°) and Alpha Virginis (*B*=17.3°). Some occultations were joint with VIMS for stars such as Alpha Lyrae which can be observed by both instruments.

Observation Naming: Observation names are typically of the form “URXXXYYY” where “XXX” are the first three letters of the star’s Greek letter designation, and “YYY” are the first three letters of the constellation. URBETCEN thus refers to a UVIS Ring occultation of the star Beta Centauri. Late in the tour an alternate naming scheme was required for some observations. In these, the “UR” was dropped, and a descriptive string “ZZZ” was appended: “XXXYYYZZZ” where “ZZZ” would indicate if the occultation was a radial scan (“RD” or a particle-tracking occultation (“TKA”, “TKB”, or “TKC” representing a minimum sampled radius in the A, B, or C ring, respectively).

Observation Mode: UVIS had a High Speed Photometer (HSP) channel for observing occultations. The integration period was 2 msec for most of the occultations in the first part of the nominal mission and then was 1 msec for the remainder of the mission. For some faint stars or when data volume was constrained integration periods of 4 or 8 msec were used. Ring occultations are classified as Ingress, Egress or Chord occultations, depending on whether the star’s motion is radially inward, outward or reaches a minimum value during the observation. The HSP exhibited an anomalous “ramp-up” behavior in which the measured signal increased in a non-linear fashion for the first several minutes of the observation, and nearly linearly thereafter. Some observations included extended periods of observation of the star beyond the edge of the rings to both characterize this behavior and to minimize the nonlinear portion of the response when the star was occulted by the rings.

Pointing: Observations were made with either the HSP boresight or the UVIS FUV channel boresight pointed at the star. Nominally these boresights were identical, but were actually offset from each other by about 2 mrad. Simultaneous measurements were made with the UVIS FUV for many of the occultations, but with a long integration period (typically 600 s) to provide simultaneous ring spectral imaging.

Observation Type: VERT (including VCAS, VENC)
Prime Instrument: CIRS
Usual Riders: None
Number of Observations: 16 VERTL, 24 VERTU, 2 VERTULCAS, 3 VCAS & 3 VENC

These observations were designed as a campaign to observe the heating and cooling properties of the rings farther from the shadow region than the SHAD observations, with the idea that vertical structure of the rings might be contributing to previously observed anomalous brightnesses on the afternoon Ansa as heat dissipated through the ring from the lit to unlit side. Also the possible modulation of temperature versus azimuth due to the distribution of particle spin rate and orientation or due to self-gravity wakes was looked for.

The naming convention for these is similar to most of the main mission campaigns in that the designator 'VERT' is followed by a 'U' (or 'UL') or 'L' to indicate whether of the unlit or lit side, then an indicator of 'LP', 'MP', or 'HP' to describe the phase regime it was taken at.

Almost all of these are azimuthal scans, although there are a few lit side observations and one unlit one (rev 67) where large swaths of ring were covered with quasi-radial scans in order to gain insight into the rings' behavior at a large number of radii instead of just the designated radii at which azimuthal scans were usually done. Additionally, the very first lit-side VERT (rev 7) contains a large number of footprints aimed at building a temperature map of both the shadow and noon side regions of the rings.

The VENC and VCAS observations were designed in XM, at times when Cassini was close enough to Saturn that the FP1 footprints fit inside the Cassini or trans-Encke regions of the rings.

Pointing: These were all FP1 to rings, mostly azimuthal scans.

Instrument Parameters: Spectral resolution of 15cm^-1.

Observation	Start Time	Duration
CIRS_007RB_VERTLMP001_PRIME	2005-119T06:00:00	000T11:30:00
CIRS_007RB_VERTLMP003_PRIME	2005-120T16:30:00	000T09:30:00
CIRS_009RA_VERTLMP001_PRIME	2005-156T06:00:00	000T07:00:00
CIRS_009RI_VERTLMP001_PRIME	2005-156T13:00:00	000T08:00:00
CIRS_009RA_VERTLLP001_PRIME	2005-158T02:00:00	000T11:00:00

CIRS_010RB_VERTLMP001_PRIME	2005-175T04:45:00	000T03:00:00
CIRS_010RC_VERTLLP001_PRIME	2005-176T01:00:00	000T04:00:00
CIRS_013RB_VERTLMP001_PRIME	2005-229T18:30:00	000T03:00:00
CIRS_033RI_VERTLMP001_PRIME	2006-324T09:45:00	000T03:15:00
CIRS_034RI_VERTLMP001_PRIME	2006-336T09:00:00	000T03:00:00
CIRS_034RI_VERTLLP001_PRIME	2006-336T14:50:00	000T04:40:00
CIRS_036RI_VERTLMP001_PRIME	2006-363T23:30:00	000T03:00:00
CIRS_037RI_VERTLMP001_PRIME	2007-015T18:00:00	000T02:00:00
CIRS_041RC_VERTLLP001_PRIME	2007-083T08:50:00	000T08:00:00
CIRS_066RI_VERTLMP001_PRIME	2008-121T15:20:00	000T11:40:00
CIRS_072RI_VERTLLP001_PRIME	2008-169T12:00:00	000T03:55:00
CIRS_008RB_VERTULHP001_PRIME	2005-141T17:36:00	000T03:09:00
CIRS_008RI_VERTULHP003_PRIME	2005-141T23:40:00	000T01:50:00
CIRS_010RC_VERTULHP001_PRIME	2005-178T07:36:00	000T03:24:00
CIRS_030RA_VERTULMP001_PRIME	2006-287T07:50:00	000T01:45:00
CIRS_030RA_VERTULMP001_PRIME	2006-287T07:50:00	000T01:45:00
CIRS_033RB_VERTULHP001_PRIME	2006-327T02:30:00	000T04:30:00
CIRS_034RI_VERTULMP001_PRIME	2006-337T04:30:00	000T05:45:00
CIRS_034RB_VERTULHP001_PRIME	2006-339T23:20:00	000T07:00:00
CIRS_041RC_VERTULHP001_PRIME	2007-079T15:15:00	000T04:25:00
CIRS_041RA_VERTULHP001_PRIME	2007-080T07:05:00	000T03:45:00
CIRS_043RB_VERTULMP001_PRIME	2007-112T17:00:00	000T03:45:00
CIRS_043RB_VERTULMP002_PRIME	2007-111T07:50:00	000T05:40:00
CIRS_043RC_VERTULHP001_PRIME	2007-114T06:45:00	000T03:00:00
CIRS_044RA_VERTULMP002_PRIME	2007-128T13:15:00	000T06:30:00
CIRS_044RA_VERTULMP001_PRIME	2007-129T16:30:00	000T03:15:00
CIRS_057RI_VERTULMP001_PRIME	2008-025T20:50:00	000T08:00:00
CIRS_058RI_VERTULMP001_PRIME	2008-036T13:06:00	000T06:30:00
CIRS_061RI_VERTULLP001_PRIME	2008-069T12:21:00	000T08:00:00
CIRS_062RB_VERTULMP001_PRIME	2008-081T09:50:00	000T13:15:00
CIRS_065RI_VERTULMP001_PRIME	2008-109T15:48:00	000T06:00:00
CIRS_067RI_VERTULMP001_PRIME	2008-130T06:00:00	000T06:00:00
CIRS_071RC_VERTULLP001_PRIME	2008-158T12:41:00	000T05:00:00
CIRS_071RC_VERTULLP002_PRIME	2008-159T04:41:00	000T05:00:00
CIRS_072RI_VERTULMP001_PRIME	2008-167T05:10:00	000T01:20:00
CIRS_073RI_VERTULMP001_PRIME	2008-174T04:39:00	000T07:31:00
CIRS_087RI_VENCUNLP001_PRIME	2008-275T17:13:00	000T07:59:00
CIRS_098RI_VENCLSHP001_PRIME	2008-361T16:27:00	000T05:32:00
CIRS_102RI_VENCUNMP001_PRIME	2009-032T14:22:00	000T06:02:00
CIRS_056RI_VERTULCAS001_PRIME	2008-015T10:00:00	000T04:30:00
CIRS_057RI_VERTULCAS001_PRIME	2008-027T06:05:00	000T05:05:00

Observation Type: VTMP
Prime Instrument: CIRS
Usual Riders: None
Number of Observations: 1 VTMPL, 2 VTMPU**,** 11 VTMPN **&** 9 VTMPS

These observations where introduced late in the prime mission and the extended mission and superseded the previous VERTs, for the same reason that the TMAPs were introduced to superseded the TEMPs. That reason was that the rings team decided that azimuthal scans did not return much information compared to the time they took. It was reasoned that by using radial scans placed at a grid of local times, one could constrain heating and cooling curves at many radii instead of at a few designated radii.

The VTMP observations focus mostly on radial scans away from the shadow region, although a few of the observations do look at the shadow region-- hence also taking on the role of the previous SHAD observations.

The naming designation is similar to the prime mission campaigns, with 'VTMP' being followed by 'U' or 'L' to indicate unlit or lit side, and then an approximate latitude followed by a general indicator of whether it was at low, medium, or high phase angle ('LP','MP', or 'HP'). In later observations 'N' and 'S' supersede the use of 'U' and 'L' to denote the side of the rings being observed, where 'N' indicates the North side and 'S' the South side.

Pointing: The observations are FP1 to rings and are usually long blocks of time, with a series of radial spokes. If the observation was long enough, sometimes and azimuthal scan was added. Also, 6 of the observations make use of the P_SHAD_DUR module, which created quasi-radial scans but where the local hour angle varied with radius according to Keplerian rotation rate, such that all points along the scan are an equal number of minutes away from shadow ingress or egress.

Instrument Parameters: These were all designed at 15cm^-1 resolution for rapid, high S/N resolution of the spectrum that would yield temperature and filling factor information.

Observation	Start Time	Duration
CIRS_077RI_VTMPU37MP001_PRIME	2008-202T04:50:00	000T03:45:00
CIRS_078RI_VTMPU36LP001_PRIME	2008-209T01:40:00	000T05:25:00
CIRS_081RI_VTMPN60LP001_PRIME	2008-231T00:30:00	000T04:55:00

CIRS_086RI_VTMPN60LP001_PRIME	2008-267T15:34:00	000T09:56:00
CIRS_089RI_VTMPN60LP001_PRIME	2008-289T20:55:00	000T05:50:00
CIRS_090RI_VTMPN60LP001_PRIME	2008-296T20:31:00	000T09:30:00
CIRS_098RI_VTMPN60MP001_PRIME	2008-359T23:24:00	000T06:12:00
CIRS_104RI_VTMPN60MP001_PRIME	2009-054T15:00:00	000T11:00:00
CIRS_106RI_VTMPN60MP001_PRIME	2009-077T16:20:00	000T08:00:00
CIRS_113RI_VTMPN60MP001_PRIME	2009-178T17:35:00	000T07:00:00
CIRS_103RI_VTMPN60MP002_PRIME	2009-042T16:14:00	000T10:41:00
CIRS_107RI_VTMPN60MP002_PRIME	2009-090T16:45:00	000T06:40:00
CIRS_109RI_VTMPN60MP002_PRIME	2009-121T06:22:00	000T08:00:00
CIRS_062RI_VTMPLLP002_PRIME	2008-084T09:50:00	000T07:00:00
CIRS_086RI_VTMPS70MP001_PRIME	2008-269T08:00:00	000T04:00:00
CIRS_087RI_VTMPS60MP001_PRIME	2008-277T01:20:00	000T02:35:00
CIRS_090RI_VTMPS60MP001_PRIME	2008-298T19:04:00	000T08:00:00
CIRS_102RI_VTMPS60MP001_PRIME	2009-034T14:14:00	000T08:00:00
CIRS_104RI_VTMPS60MP001_PRIME	2009-058T05:10:00	000T04:30:00
CIRS_104RI_VTMPS60MP002_PRIME	2009-058T18:30:00	000T06:50:00
CIRS_108RI_VTMPS60MP002_PRIME	2009-098T10:59:00	000T08:00:00
CIRS_109RI_VTMPS60MP001_PRIME	2009-113T08:40:00	000T09:15:00
CIRS_110RI_VTMPS60MP001_PRIME	2009-128T11:51:00	000T08:00:00