

**Calibration Report for the Side-Looking Imager Strips
of the Descent Imager/Spectral Radiometer
Instrument aboard the Huygens Probe of the Cassini
Mission**

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1.0 Introduction

Titan's atmosphere may contain "layers", or at least concentrations of aerosols at favored altitudes. This layering might be caused by the condensation of different species or aerosols or by the vertical transport process of the aerosols. Changes in the nadir angle dependence of the intensity in the DISR side-looking imager (SLI) are a sensitive way to detect such layers.

SLI images are exposed relatively infrequently during the descent, however. It is possible to fall several kilometers between them. In order to increase the altitude resolution of such measurements a special type of processing of SLI data was devised. The resulting data are called SLI strips.

These data also can provide useful constraints on the attitude of the probe. The shape of the intensity vs. nadir angle is helpful in determining how much the probe is tipped.

2.0 Pixel Layout

The SLI strips data are taken from pixels near both vertical edges of the SLI. The SLI includes 128 CCD columns. The first strip of pixels is taken from columns 6 through 18, and the second set are from columns 109 through 123. The extreme edges of the SLI are avoided, because large numbers of defective pixels are concentrated there.

3.0 Flight Software Processing

The 13 columns on each side of the SLI are summed for each row. The strip data therefore consist of an array of 2 columns x 254 rows of data. Unfortunately due to an error in the flight software, the data are shifted in rows. In the first column the data values for the first two rows are erroneously set to zero. In this column the true first row of data is offset to row 3, the second row to row 4, etc. The last two rows of data are lost. The situation is similar for the second column, except the offset is one row instead of two. The first row is erroneously set to zero, and the last row of data is lost.

Unlike normal imager data there is no:

- Subtraction of 8 data numbers (DN)
- Flat field correction
- Square-root transformation
- DCS bad pixel replacement
- DCS image compression

Because the data are not converted to 8-bits/pixel by square-root processing and not compressed, it is inherently more accurate than SLI image data.

4.0 Computation of Radiance from Data Number

The mean radiance over the 13 summed pixels in each row may be computed using:

1. compute the dark current in each of the pixels from the dark current model (see Dark Current Estimation for the CCD of the Descent Imager/Spectral Radiometer aboard the Huygens Probe of the Cassini Mission)
2. subtract the dark current from the 13 summed pixels in each row
3. divide by the exposure time in seconds
4. divide by the absolute responsivity of each imager pixel at the correct CCD temperature
5. divide by 13

The absolute responsivities can be found in Calibration Report for the Imagers of the Descent Imager/Spectral Radiometer Instrument aboard the Huygens Probe of the Cassini Mission. This will yield the mean radiance in the SLI imager bandpass. The wavelengths of this bandpass can be found in the same document.