

## Chapter 4

# Data Processing and Instrument Characterization

*This chapter is in preparation.*

## 4.1 Overview of Data Processing

### 4.2 Beam Profile

#### 4.2.1 Shape

#### 4.2.2 Centroids

Table 4.2-1: Beam centroids and solid angles

Band	Time range <sup>a</sup>	Centroid position		Solid angle	
		Along-scan ( $\mu$ )	Cross-scan ( $\mu$ )	$\Omega$ ( $10^{-4}$ sr)	Uncertainty (%)
1A	89345–90176	0.86	-1.66	1.198	0.28
	90176–90232	0.88	-2.35		
	90232–90260	1.15	-2.16		
1B	89345–90176	0.40	3.10	1.174	0.56
	90176–90232	0.38	2.48		
	90232–90260	0.58	2.66		
1C	89345–90176	0.06	0.82	1.331	0.26
	90176–90232	0.02	0.16		
	90232–90260	0.30	0.30		
2A	89345–90176	-0.67	1.02	1.420	0.27
	90176–90232	-0.66	0.39		
	90232–90260	-0.40	0.57		
2B	89345–90176	0.22	1.60	1.324	0.35
	90176–90232	0.20	1.02		
	90232–90260	0.48	1.14		
2C	89345–90176	0.14	0.03	1.323	0.34
	90176–90232	0.11	-0.63		
	90232–90260	0.38	-0.46		
3A	89345–90176	-0.61	-0.86	1.285	0.25
	90176–90232	-0.61	-1.56		
	90232–90260	-0.30	-1.32		
3B	89345–90176	-1.62	1.98	1.291	0.22
	90176–90232	-1.63	1.34		
	90232–90260	-1.35	1.58		
3C	89345–90176	-0.65	-0.75	1.282	0.35
	90176–90232	-0.69	-1.46		
	90232–90260	-0.40	-1.19		
4	89345–90176	-2.91	1.37	1.463	0.13
	90176–90232	-2.96	0.68		
	90232–90260	-2.61	0.95		
5	89345–90260	-0.80	1.06	1.427	0.97
6	89345–90260	-0.01	1.05	1.456	1.29
7	89345–90260	-2.97	0.72	1.512	2.69
8	89345–90260	-1.59	0.45	1.425	4.17
9	90046–90116	-1.48	0.73	1.385	2.26
10	90046–90116	-1.27	1.18	1.323	3.41

<sup>a</sup> Time interval over which data were selected for beam profile formation.

4.2.3 Solid Angles

4.3 Attitude Determination

4.4 Stray Light Rejection

4.4.1 Near Field

4.4.2 Far Field

4.5 Photometry

4.5.1 The *DIRBE* Signal Equation

4.5.2 Offsets

4.5.3 Gain

4.5.4 Photometric Calibration Uncertainty

4.5.5 Sensitivity

4.5.6 Comparison of *DIRBE* and *FIRAS* Calibration

4.5.7 Comparison of *DIRBE* and *IRAS* Calibration

4.6 Polarimetry

4.6.1 Method

4.6.2 Calibration

4.6.3 Accuracy

## 4.7 Exclusion of Low Quality Data

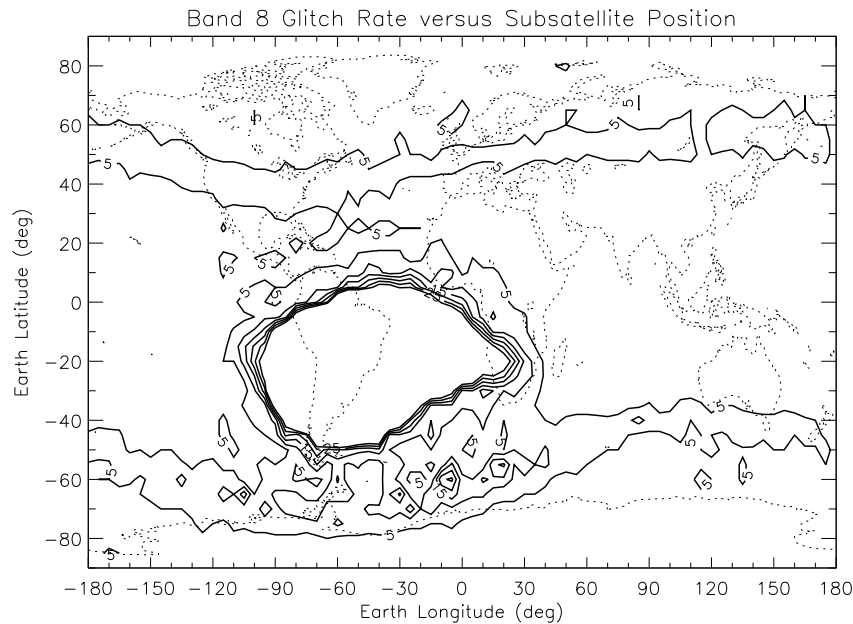


Figure 4.7-1: Number of glitches at  $100\ \mu\text{m}$  as a function of Earth longitude and latitude.

### 4.7.1 Pre-optimization Data

### 4.7.2 Bright Source Exclusion Zones

### 4.7.3 Recovery from Moon Passages

### 4.7.4 SAA Passages

### 4.7.5 Unusually Noisy Data

### 4.7.6 Special Pointing

### 4.7.7 Focal Plane Temperature Constraints

### 4.7.8 *FIRAS* Calibrations

### 4.7.9 Robust Averaging

## 4.8 Known Processing Deficiencies

### 4.8.1 AC *vs.* DC Calibration at $60$ and $100\ \mu\text{m}$

### 4.8.2 DC Linearity Uncertainties at $60$ and $100\ \mu\text{m}$

### 4.8.3 Limitations of PIRE Correction

### 4.8.4 Long-term Photometric Variations

Table 4.7-1: Interpretation of Sentinel Values

Value <sup>a</sup>	Symbol	Interpretation
-16375	BAD_DATA_VALUE	If floating point SDM data value is less than or equal to this value, it is a saturated, missing, or otherwise bad data point.
-16378	DET_OFF_VALUE	If a detector is off in the DARELAYS array then the half minor frame is set to this value.
-16379	QUEST_HMNF_VALUE	If a bit is set in DAMMNFLGS(8) then the minor frame is question- able. Its half minor frame values are set to this value.
-16380	GLITCH_FLAG_VALUE	Value used by BLI to replace photometry values identified as glitches.
-16381	NOT_PROCESSED	Value which replaces original photometry values for detectors not processed, in floating- point TOD data.
-16382	SAT_SIGNATURE	Marks a saturated point in floating-point TOD data.
sat_signature	SKY_SAT_SIGNATURE	Marks a saturated point in skymap data
-16383	TRASHED_SIGNATURE	Data trashed by command
-16384	TEMP_OUT_OF_RANGE	Temperature outside correctable range
-16385	PHASE_OUT_OF_RANGE	Phase outside correctable range
-16386	BIAS_OUT_OF_RANGE	Detector bias outside correctable range
-16387	ATH_OUT_OF_RANGE	ATH (heater) setting outside correctable range
-16388	BAD_IRSCC_FLAG	Value used by BLI to flag the SDM data, if IRS calibration coefficients are bad
-16389	MNF_PARITY_MISMATCH	MNF has parity of detector words disagreeing with parity defining T/M bits.
-16390	NO_ROBUST_AVERAGE	Value used in sky maps to flag where a robust average has been rejected.
-16391	EXCLUDED_DATA	Value used to flag data falling within excluded time ranges. (See BEX_ED)
-16392	INTERPOLATION_SKIPPED	Data did not satisfy criteria for interpolation/extrapolation by BCS
-16393	INTERPOLATION_FAILED	Numerical failures for both methods of elongation interpolation in BCS
-16394	NO_CEL_CALIB	Failure for celestial calibration of photometry
-16395	NO_ABS_CALIB	Failure for absolute calibration of photometry
-16396	NO_POLARIZ_RATIOS	No valid polarization ratios available to form Stokes
-16397	BAD_ORIENTATION	Failure to form Stokes due to bad polarization orientation
-16398	NO_POLARIZ_SOLUTION	Failure to form Stokes due to insoluble simultaneous eqns.
-16399	GRT_NOT_SAMPLED	GRT was not sampled during this half minor frame
-16400	TOO_CLOSE_IRS_OR_ANL	The time since IRS or Anneal was too close (script specified) to processing time for the Time since IRS gain correction.
-16401	NO_HYST_CORRECTION	Could not correct for hysteresis.
-16402	BAD_OR_NO_RAD_OFFSETS	Radiative offsets were bad or not available.
-16403	EXCLUDED_ZONE	Data falling within excluded zone (set by BPW).
-16404	GLITCHY_MF	When the flags for BLI glitch detection red limits exceeded. (set by BPW).

<sup>a</sup> If the DADRBSCI2 value reported in the Time-Ordered Data (see Table 5.7-2) is less than -28358, add 11985 to derive the corresponding sentinel value.

