Addendum: Results From FGS Cycle 5 Calibration Programs #6180 and #6181

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ABSTRACT

Results of the observation of the blue target LAT-COL-1B from Cycle 5 FGS calibration programs #6180, "Red/Blue Transfer Function Calibration" for the Clear (F583W), and PUPIL filters are discussed. Cycle 5 calibration programs have obtained TRANSfer Mode observations at the center of the field of view of FGS #3 for 5 targets of color index B-V ranging from -0.1 to +1.9 mag. The reference files so obtained serve to calibrate, for Cycle 5, the behavior of the Transfer Function or S-curve as a function of the filter and color index for targets of immoderate color index.

1. Introduction

The FGS calibration program for Cycle 5 provides reference Transfer Functions for the reduction of TRANSfer mode data. In addition to reference Transfer Functions obtained for Upgren 69 (V = 9.6, B-V = 0.5) at three positions near the center of the field of view through the Clear, Neutral Density and PUPIL filters, Transfer Functions have also been obtained at the center of the field of view through the Clear, Neutral Density and PUPIL filters for targets ranging in color index from B-V = -0.1 to +1.9 mag (see Table 1).

LAT-COL-1B is one of the targets of the color index calibrations. The first attempt, on 6 Sept. 1995, to observe target LAT-COL-1B in connection with the Cycle 5 FGS calibration program #6180 failed. The reason for the failure was discovered and corrected; the observation was rescheduled and successfully executed on 9 Jan. 1996. Table 1 lists the targets observed in the Cycle 5 TRANSfer mode calibration, their magnitudes, B-V color indices, corresponding program number and the filter(s) used.

Table 1. Targets Observed in Calibration Programs #6180 and #6181.

Target	V mag	(B-V)	Program #	Filter(s)
LAT-COL-1A	9.7	+1.92	6180	F583W, PUPIL
LAT-COL-1B	9.6	+0.18	6180	F583W, PUPIL
SAO 185689	9.3	+1.50	6180	F583W, PUPIL
HD 59149	6.7	+1.28	6181	F5ND
HD 28484	7.9	+1.70	6181	F5ND
HD 28149	5.5	-0.10	6181	F5ND

2. Observations and Data Reductions

Fifteen scans of target LAT-COL-1B were obtained through both the Clear (F583W) and PUPIL filters. The scans for each axis (15 scans on the y-axis and 14 scans on the x-axis; one scan on the x-axis was corrupted by spacecraft jitter) were co-added or merged together then fit with a low-order continuous piece-wise polynomial. These polynomial fits to the data are the reference Transfer Functions to be used in the reduction of TRANSfer Mode science data (for example, the analysis of Transfer Scans of double stars).
Table 2 gives the signal-to-noise ratios of the merged Transfer Scans; column 1 lists the filename, columns 2 and 3 give the average and maximum signal-to-noise ratio of the merged scans for the x axis. The maximum signal-to-noise ratio is defined as the peak-to-peak amplitude of the Transfer Function divided by the standard deviation about the mean of the Transfer Function far from the null (θ > 300 milli-arc seconds). The average signal-to-noise ratio is defined as the average of the absolute value of the amplitude of the signal within ± 300 milli-arc seconds of the null divided by the standard deviation about the mean of the Transfer Function far (θ > 300 milli-arc seconds) from the null. Columns 4 and 5 give the average and maximum signal-to-noise ratios for the y axis.

Table 2. Signal-to-Noise Ratio of Merged Transfer Functions

Filename	Filter	X-Axis		Y-Axis	
		Avg S/N	Max S/N	Avg S/N	Max S/N
F2VU0401M	PUPIL	7	145	5	104
F2VU0402M	F583W	7	137	4	110

These merged Transfer Functions, prior to being fit by a polynomial, are shown in Figure 1 and Figure 2.

Figure 1: PUPIL Filter Calibration Transfer Function for B-V = +0.18

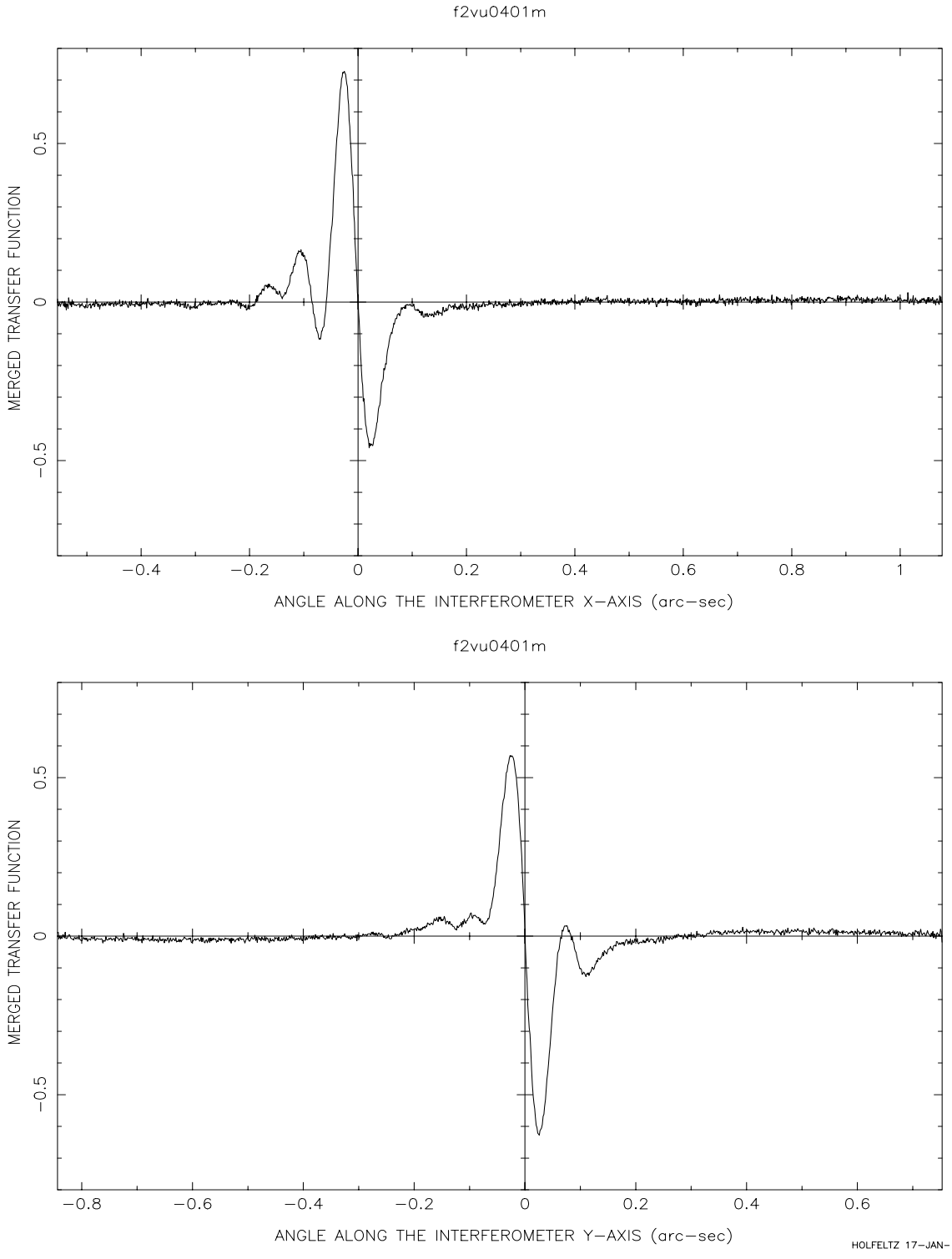
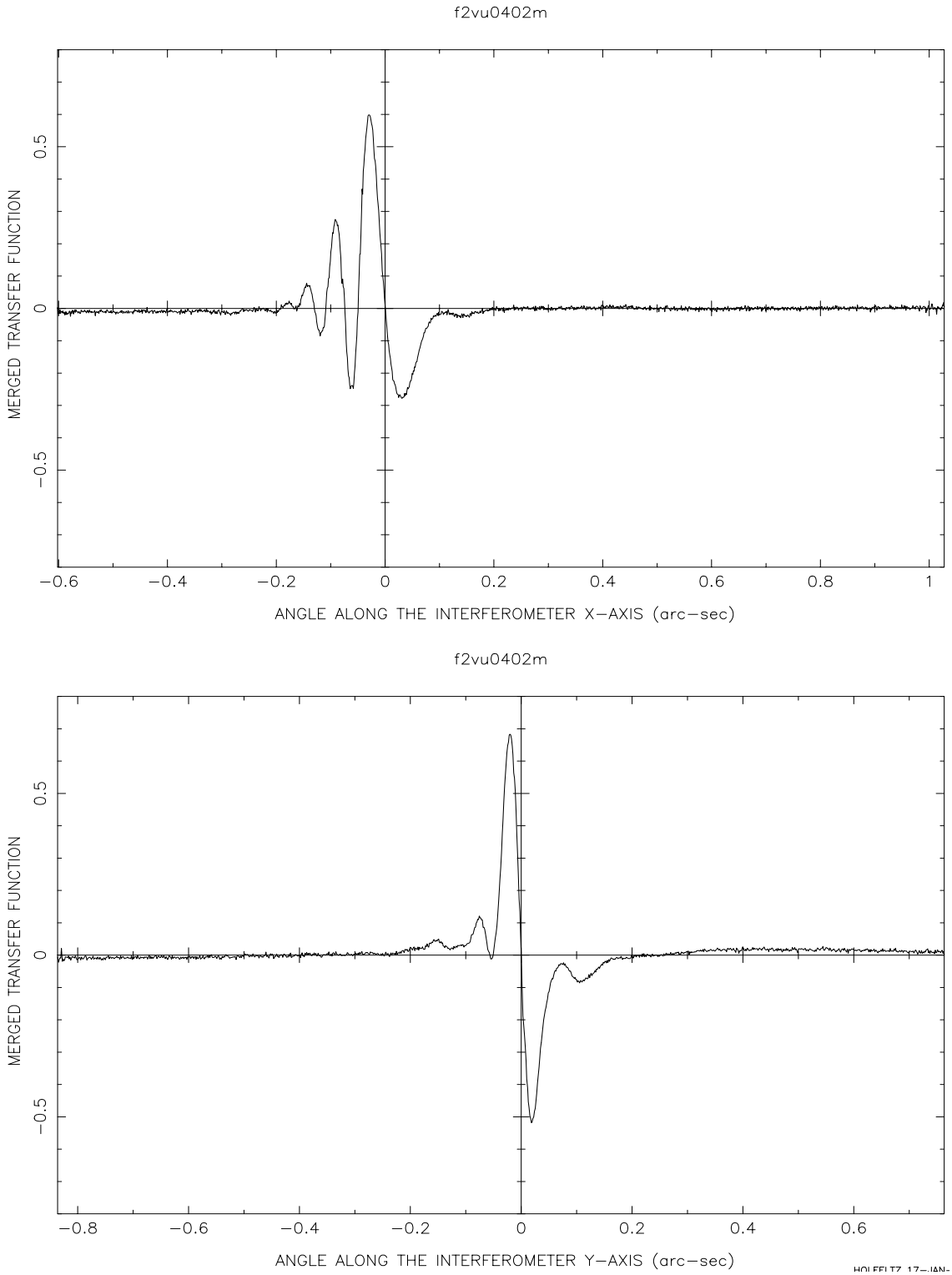


Figure 2: Clear (F583W) Filter Calibration Transfer Function for B-V = +0.18



3. Results

Significant parameters for all Clear (F583W) and PUPIL filter Cycle 5 reference S-curves are summarized in Table 3 and Table 4. Filenames are given in the first column, the B-V color index is listed in column 2, the axis (x or y) in column 3. Columns 4 through 6 give, respectively, the absolute value of the peak of the primary and secondary lobes and the full width at half maximum of the primary lobe. Data for the positive lobes are given first in each table followed by the same information for the negative lobes.

Table 3. Parameters for Clear Filter (F583W) Red & Blue Calibration Transfer Functions

Filename	B-V	Axis	[a]|Primary|	[a]|Secondary|	[b]FWHM
Positive Lobes					
F2VU0402M	+0.18	X	0.59	0.32	0.032
		Y	0.67	0.11	0.029
F2VU0102M	+1.92	X	0.65	0.23	0.030
		Y	0.70	0.10	0.029
F2VU0302M	+1.50	X	0.56	0.27	0.035
		Y	0.72	0.12	0.029
Negative Lobes					
F2VU0402M	+0.18	X	0.28	0.02	0.054
		Y	0.49	0.08	0.032
F2VU0102M	+1.92	X	0.30	0.02	0.060
		Y	0.56	0.07	0.034
F2VU0302M	+1.50	X	0.28	0.02	0.062
		Y	0.56	0.07	0.033

[a] ±0.03

[b] Full width at half maximum for the primary lobe, ±0.001 arcsec

Table 4. Parameters for PUPIL Filter Red & Blue Calibration Transfer Functions

Filename	B-V	Axis	[a]|Primary|	[a]|Secondary|	[b]FWHM
Positive Lobes					
F2VU0401M	+0.18	X	0.71	0.16	0.035
		Y	0.57	0.06	0.040
F2VU0101M	+1,92	X	0.73	0.15	0.041
		Y	0.58	0.06	0.044
F2VU0301M	+1.50	X	0.72	0.15	0.041
		Y	0.56	0.06	0.044
Negative Lobes					
F2VU0401M	+0.18	X	0.44	0.04	0.042
		Y	0.64	0.12	0.037
F2VU0101M	+1.92	X	0.51	0.04	0.045
		Y	0.65	0.11	0.042
F2VU0301M	+1.50	X	0.50	0.04	0.044
		Y	0.64	0.11	0.042

[a] ±0.01

[b] Full width at half maximum for the primary lobe, ±0.001 arcsec

4. Conclusion

The reduction of data using a reference Transfer Function of incorrect color index could result in the failure to detect a secondary component or the spurious “detection” of a non-existent secondary. Observers *must* take the color index of the target into account when choosing the reference Transfer Function to be used in the reduction of the data. The smoothed, merged Transfer Functions (`*.fit`) and the polynomial fits to the merged data (`*.poly`) are available for use on the (VAX/VMS) science cluster at Space Telescope Science Institute on `disk$boston_data:[holfeltz.go.refdat]`. A list of all available reference Transfer Functions (`ref.lis`) is available in the same directory.