FOS Calibration Plan for Cycle 3

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Abstract

We present here a summary of the FOS calibration plan for Cycle 3. Routine calibrations to monitor the instrument and create a base line for the post CO-STAR mission are planned. A summary of the Cycle 3 calibration plan and a comparison to Cycle 2 calibration is also presented.

Details of the Calibration Programs

Absolute Photometry (PROP ID 5046)

A measurement of the absolute sensitivity of both the red and blue FOS detectors will be performed using two spectrophotometric standard stars, BD+28D4211 and WD0501+527 (G191-B2B). All spectral elements will be used in the 4.3 arcsec aperture. Observations will be made near the beginning and end of Cycle 3, in August and November, 1993. Additionally, flat field observations of standard star G191B2B to be made in late September will also be available for sensitivity evaluation. A four-stage peakup acquisition of each star will provide excellent centering in the small apertures and a side-switch operation followed by two-stage peakup in the 0.3 aperture will determine an accurate measure of the separation of the blue and red side apertures in the focal plane.

Measurement of aperture throughput ratio will be made with three representative spectral elements (G190H, G160L and PRISM) for the apertures (4.3", 1.0" and slit) expected to be most commonly used in Cycle 3. Observations for this part of the calibration program will be conducted near the beginning of Cycle 3 with BD+28D4211.

Discriminator Test (PROP ID 5047)

The optimal discriminator settings were determined in OV. Because both the noise and gain are known to be temperature sensitive, it is likely that some fraction of the channels will experience some change in their optimal discriminator settings on orbit. The internal discriminator/noise test will be run to verify the stability of those settings.

Spectral Flat Fields and the Red Monitor (PROP ID 5048)

This set of observations will produce flat field calibrations appropriate to the Cycle 3 time period. Observations will be through both the 4.3" square and the 0.25"×2.0" slit apertures with all usable detector/disperser combinations. Some FOS red detector/disperser combinations have shown temporal variations in their flat field structure during SV and Cycle 1. Hence, three red side spectral elements (G190H, G270H and G160L) will be monitored with the 4.3" aperture and slit at two month intervals. The star used in the flat field and monitoring program is G191-B2B.

Wavelength Calibration: Internal/External Offsets (PROP ID 5049)

Offsets between internal and external wavelength scales will be re-measured for 3 gratings (G130H, G190H and G270H) on the blue side and for 2 gratings (G190H and G400H) on the red side with the 0.3" aperture and two external sources (NGC 6833 and HD207757). Derived offsets will be applied to the polynomial fit of pixel number versus wavelength determined from the lines in the internal Pt/Cr-Ne lamp.

Internal Wavelength Calibration (PROP ID 5050)

This proposal will monitor the stability of the FOS wavelength scale. All standard gratings will be used with the 0.3"circular and either the 0.1"or 0.25" paired apertures. The WAVECAL lamp has a fairly constant output, so that these data are a secondary monitor of any changes in the FOS internal sensitivity. The observations will be be repeated every 2 months during the cycle.

Polarimetric Calibration (PROP ID 5051)

A calibration of the most useful spectropolarimetric modes of the FOS will be checked. This will be achieved by observing the polarimetric standards BD+64D106 and SAO-252052 on the blue side. Further, with the implementation of the onboard GIM correction, red side polarimetry is feasible. Hence, the polarization calibration for the red side will also be checked by using the same two stars. The un-polarized photometric standard BD+28D4211 will be observed to determine the red side instrumental polarization. Other essential parameters that are required by the pipeline to reduce polarimetric observations have been obtained in proposal 4697 towards the end of cycle 2.

Focus, X-Pitch, Y-Pitch (PROP ID 5052)

To determine the optimal focus setting for the FOS the high voltage setting will be varied and on optimal high voltage will be found. The observations of the Pt-Ne lamp will be obtained through the 0.1-PAIR aperture and the G190H grating. Once an optimal high voltage setting is determined and updates made to the PDB, a series of spectra at three different X-Bases will be made to determine the corresponding X-Pitch. Additionally, measurements with the TALEDs through the 0.1-Pair aperture will be used to determine Y-Pitch.

Location of Spectra (PROP ID 5053)

Locations of spectra (Y-bases) will be monitored using observations through the 0.3" aperture at all grating settings once every 3 months to verify repeatability and to measure any long-term drift. This internal test has the highest priority because our ability to acquire spectra depends on our knowledge of Y-Base values.

FOS CYCLE 3 CALIBRATION PLAN

Title	Accuracy	Results	Total Cycle 2 Time (hours)		Total Cycle 3 Time (hours)	
			On-Target	Internal	On-Target	Internal
Absolute Photometry Monitor	1%	RSDP	19.4		13.23	
FOS Spectral Flats and Red Monitor	0.5-1%	RSDP	40.0		19.87	
Internal/External Wavelength Offsets	0.2 diode	RSDP	6.8		8.60	
FOS Polarimetric Calibrations	improve	RSDP	1.7	4.1	2.80	
FOS Location of Spectra: Y-Base Maps	maintain	PDB		6.8		5.20
FOS Discriminator Test	maintain	IMDB		4.5		4.47
FOS Focus, X-pitch, Y-pitch	maintain	IMDB		7.6		7.63
FOS Internal Wavelength Calibration	0.03 diode	RSDP		4.4		11.10
Apeture Throughput and Blue-Red Offset	3%/0."02	RSDP	6.4			
Dark Measures	5%	RSDP		50.7		
		Total Time	84.3	78.1	44.50	28.40