

# FOC Cycle 7 Calibration Plan

---

R. Jedrzejewski  
June 11th 1997

---

## ABSTRACT

*This report describes the Cycle 7 FOC calibration plan. Descriptions of each of the routine monitoring programs are given, with estimates of the fraction of GO programs supported, total number of orbits required, any special requirements, the expected accuracy achievable as a result of the calibration, and the products delivered. The plan will require 16 external and 16 internal orbits, and is purely a monitoring program.*

---

## 1. Introduction

Since the FOC is a relatively little-used instrument, it is hard to justify a large and costly calibration program. We have therefore concentrated on monitoring programs only, to ensure that the instrument is correctly focussed and the UV throughput is nominal, as well as to keep track of the geometric distortion. The program will provide monitoring coverage for the ~200 orbits of remaining Cycle 5-7 FOC programs.

## 2. Program Descriptions

These are provided in the form specified by the Data Quality Coordination Committee in the report DQCC-001 (April 11 1996). A summary table is provided as Table 1, following the program descriptions.

**Proposal ID 7685: FOC Cycle 7 UV Throughput Monitoring**

***Plan***

**Purpose:** Monitor the throughput of the FOC F/96 channel in the 1200-2500 Å range

**Description:** This program is to monitor the throughput of the FOC F/96 camera in the ultraviolet. Since there are 7 reflections in the OTA+COSTAR+FOC lightpath, it is necessary to make sure that degradations in these surfaces do not affect performance, especially in the ultraviolet. After an initial acquisition, exposures are taken using the F120M, F140M, F175W and F253M filters. This continues the Cycle 6 program #6893.

**Fraction of GO/GTO Programs Supported:** Approximately 25%

**Resources:**

**Observation:** 4 executions, 2 orbits/execution for a total of 8 orbits

**Special Requirements:** An INT ACQ for each execution.

**Accuracy:** Will provide approximately 3% accuracy/observation, such that a fall in sensitivity of 5% over a year will be detected with a  $3\sigma$  significance.

**Products:** FOC DQE file in the CDBS will be updated if a significant difference is found.

## Proposal ID 7686: FOC Cycle 7 PSF Monitoring

### Plan

**Purpose:** Maintain the optical focus of FOC+COSTAR by moving the DOB and take confirmatory images.

**Description:** The objective of this program is to ensure that the optical focus of the FOC F/96

+COSTAR system is maintained to a precision that ensures that significant degradation of the PSF does not occur. Cycle 4-6 data has shown that the current description rate of the OTA has dropped to about 0.5 microns/month. This means that to keep the focus to within 1.5 microns of the optimum requires that we adjust the focus every 6 months or so. The current plan is for the OTA to be adjusted every 6 months to correct for desorption, which is adequate for the COSTAR-corrected FOC.

In this version of the PSF monitoring program, the sign of the focus error should be well determined, so our estimate of the accuracy of the focus measurement is improved. Since (in principle) it is not necessary to move the COSTAR DOB (OTA moves every 6 months provide a tight enough focus control), the program is now strictly a monitoring program. If it found that the focus is significantly different from that expected, and if contemporaneous science data also shows evidence for a focus error large enough to significantly degrade the data, a request will be made to move the COSTAR DOB to compensate. This can be accomplished by real-time commands when a suitable window is found.

This program supports the bulk of the FOC science program, since they are all dependent on good PSF image quality to some degree. Observations in the wavelength region  $< 4000$  Angstroms are particularly sensitive to good focus. This program is a continuation of the Cycle 6 program #6895, and uses the method first tested in the cycle 6 program #6931.

**Fraction of GO/GTO Programs Supported:** 100%

### Resources:

**Observation:** 4 executions, 2 orbits/execution for a total of 8 orbits.

**Special Requirements:** Mode 1 Target Acquisition to ensure that the target is accurately centered in the 256x256 formats. Real-time contact needed to move the DOB, if necessary.

**Accuracy:** Phase retrieval on FOC images typically gives an accuracy of  $\pm 1$  micron of equivalent secondary mirror despace. Orbital 'breathing' amplitude is of this order too. There was some ambiguity with respect to sign in previous versions of this proposal, hence the use of the method introduced in the Cycle 6 special calibration program "Exploratory Focus Monitoring Test, #6931".

**Products:** COSTAR DOB position will be changed if a significant focus error is found.

**Proposal ID (none): FOC Cycle 7 Geometric Distortion Monitor**

***Plan***

**Purpose:** Monitor the geometric distortion of the FOC F/96 detector.

**Description:** Internal flatfield images will be taken during occultation for most of the FOC F/96 calibration program. Measurement of the positions of the reseau marks will provide information on the geometric distortion. This ensures that the geometrical properties of the F/96 channel are monitored so that if changes in the distortion occur, the affected users can be notified. The observations are interleaved between prime calibration observations so that no prime telescope time is spent. The LED intensity levels are varied slightly from exposure to exposure to introduce some information on flatfield nonlinearity.

**Fraction of GO/GTO Programs Supported:** Approximately 25%.

**Resources:**

**Observation:** 16 INTERNAL orbits.

**Special Requirements:** None.

**Accuracy:** The plate scale should be monitored to the 0.5% level, rotation to 0.1°.

**Products:** Affected users will be notified if it is found that the measured FOC plate scale differs from that specified in the FOC Instrument Handbook and the data headers. If the discrepancy persists, new header parameters will be delivered. Instrument Science Report delivered at the end of the Cycle, unless changes are found.

**Table 1: FOCCycle 7 Calibration Plan**

ID	Proposal Title	Frequency	Estimated Time (orbits)		Products	Accuracy	Notes
			"External"	"Internal"			
<b>Routine Monitoring Programs</b>							
7685	UV Throughput Monitoring	4x	8		TIPS	3%	
7686	PSF Monitoring	4x	8		TIPS	1 $\mu$	
	Geometric Distortion Monitoring			16		0.5% scale, 0.1 degree rotation	Occultation periods of other programs
TOTAL TIME (including all executions)			16	16			