FGS Cycle 9 Calibration Plan

ID	Proposal Title	Frequency	Estimated Time (orbits)		Scheduling Required	Resources Required (FTE)	Products	Accuracy Required	Notes
			"External"	"Internal"					
Routine Monitoring Programs									
01	Long Term Monitoring of FGS1r in Position Mode	Every 2 months	6		Aug, Oct, Dec, Jan, Mar, May	0.10	Calibration & Alignment Parameters	1 mas over FGS1r FOV	The data from this proposal will maintain FGS1r's astrometric performance at the sub-mas level. Slow changes in distortion and scale are calibrated away. The alignment of FGS1r wr.t. FGS2r, FGS3 will be monitored.
02	Long Term Monitoring of FGS1r in Transfer Mode	Once	3		Second 1/2 of cycle 9	0.05	Monitor S-curve stability	1-2% change in S-curves	The long term stability of the S-curves from 3 stars spanning B-V = 0 to 1.5 will be monitored. This test will also be used to calibrate the POS/TRANS bias, cross-filter effects.
03	Long Term Monitoring of FGS2r in Position Mode	Every 4 months	4		Aug, Dec, Jan, May	0.05	Calibration & Alignment Parameters	10 mas over FGS2r FOV	The accuracy of the FGS2r distortion calibration and alignment matrix will be monitored as the new instrument desorbs over the course of cycle 9.
04	Long Term Stability of FGS2r in Transfer Mode	Every 6 months	2		Oct, Feb	0.10	Monitor S-curve stability	1-2% change in S-curves	Desorption will cause the FGS2r S-curves to evolve. This test will monitor this evolution and the accuracy of parameters used for guide star acquisitions.
Special Calibration Programs									
05	Calibrating FGS1r's Interferometric Response as a Function of Spectral Color.	Once	4		Timed to occur with GO observations.	0.10	S-curve B-V Library	S/N ~ 500	This test adds to the S-curve library of B-V standards needed to support the GO program. The data will also be used to calibrate POS/TRANS bias, cross-filter, and lateral color effects.

ID	Proposal Title	Frequency	Estimated Time (orbits)		Scheduling Required	Resources Required (FTE)	Products	Accuracy Required	Notes
			"External"	"Internal"					
06	Calibrating Scale Along FGS1r's X,Y in Transfer Mode	Once	3		Depends upon Target's P.A.	0.15	x,y axis scale for Transfer Mode obs.	1 mas	This test measures the roll error of the Koesters Prisms in FGS1r by comparing data from observations of a wide binary system at three HST roll angles. The relative scale along x,y is immediately obtained. Absolute scale is derived using supplemental data from the binary's orbital elements.
	10% contingency reserve		2						
TOTAL TIME (including all executions)			**24**			**0.55**			

Proposal ID 01:FGS Cycle 9: Long Term Monitoring of FGS1r in Position Mode

Plan

Purpose	The scale and distortions within an FGS continue to slowly evolve in time. This proposal gathers the data needed to maintain the FGS1r OFAD calibration and relative scale, and hence the instrument's astrometric performance.
Description	The standard FGS astrometric star cluster M35 is used as the target field. Visits are made in Aug., Oct., Dec. at a fixed V1 pointing and ORIENT. Another set of visits are made in Jan., Mar, and May at a different fixed pointing and ORIENT. The relative positions of selected stars are measured by FGS1r in Position Mode. Changes in distortion and plate scale are derived. The calibration pipeline database is updated as needed.
Fraction GO/GTO Programs Supported	92% of FGS usage.
Resources Required: Observation	6 external HST orbits.
Resources Required: Analysis	0.1 FTE
Products	Updates to the calibration pipeline reference files.
Accuracy Goals	Scale and first order distortion changes are measured and calibrated to 0.24×10^{-6}. This maintains sub-mas astrometric performance.
Scheduling& Special Requirements	Visits are moderately time critical. POS TARGs and ORIENTS are specified.

Proposal ID 02:FGS Cycle 9: Long Term Monitoring of FGS1r in Transfer Mode

Plan

Purpose The amplitude and morphology of the FGS1r S-curves have demonstrated remarkable stability over time. This proposal will verify the continued long term stability of the S-curves at three separated spectral colors, i.e., B-V = 0.1, 0.5, and 1.5. Equally important, this proposal will also calibrate the Pos/Trans bias, the cross filter effect as a function of spectral type.

Description This test includes one visit each to three standards (B-V = 0.1, 0.5, 1.5) that were observed in Cycle 8 to verify stability over all wavelengths accessible to the FGS observers. The Pos/Trans bias and cross filter calibrations will be made by observing reference stars in Pos mode.

Fraction GO/GTO Programs Supported 92% of FGS usage.

Resources Required: Observation 4 external HST orbits.

Resources Required: Analysis 0.05 FTE

Products Verify reliability of S-curve library over time. Calibrate Trans/Pos bias, cross filter effect (pipeline reference files).

Accuracy Goals The stability of the S-curves will be measured to an accuracy of ~1%. The Pos/Trans bias and cross filter effects will be measured to better than 1 mas.

Scheduling& Special Requirements Visits are moderately time critical to enable access to POS TARGs and ORIENTS which optimize the reference star availability.

Proposal ID 03:FGS Cycle 9: Long Term Monitoring of FGS2r in Position Mode

Plan

Purpose The scale and distortions within FGS2r are expected to change considerably during its first year in orbit. This proposal gathers the data needed to verify and maintain the FGS2r operational OFAD calibration, plate scale, focal plane alignment, and hence the instrument's performance as a guiding FGS.

Description The standard FGS astrometric star cluster M35 is used as the target field. Visits are made in Aug., & Dec. at a fixed V1 pointing and ORIENT. Another set of visits are made in Jan., & May at a different fixed pointing and ORIENT. The relative positions of selected stars are measured by FGS2r in Position Mode while FGS1r and FGS3 guide on astrometric guide stars. Changes in distortion, plate scale, and alignment relative to FGS1r and FGS3 are derived. The operational calibration database is updated as needed.

Fraction GO/GTO Programs Supported ~67% of all HST usage.

Resources Required: Observation 4 external HST orbits.

Resources Required: Analysis 0.1 FTE

Products Updates to the FGS2r operational calibration database.

Accuracy Goals Scale and first order distortion changes are measured and calibrated to 6×10^{-6}. This maintains adequate FGS2r performance as a guiding FGS.

Scheduling& Special Requirements Visits are moderately time critical. POS TARGs and ORIENTS are specified.

Proposal ID 04:FGS Cycle 9: Long Term Monitoring of FGS2r in Transfer Mode

Plan

Purpose Monitor the evolution of the FGS2r S-curves as the new instrument desorbs during its first year in orbit. These data will be used to access the accuracy of the values assigned to parameters involved in the acquisition and tracking of guide stars by FGS2r. If S-curve performance degrades to unacceptable levels, these data will also provide baseline measurements needed to determine proper re-adjustment of FGS2r'a AMA.

Description In a given visit, the FGS standard star Upgren69 is observed in Transfer Mode through the F583W filter and the 2/3 PUPIL at two locations in the FGS2r FOV. Each visit is one HST orbit.

Fraction GO/GTO Programs Supported 67% of HST science program.

Resources Required: Observation 2 external HST orbits.

Resources Required: Analysis 0.05 FTE

Products Updates to FGS2r commanding database (K-factors). Baseline measurements for potential AMA re-adjustment.

Accuracy Goals Changes is FGS2r S-curves to be measured to ~ 1%.

Scheduling& Special Requirements Visit 01 in October, 2000. Visit 02 in March 2001. POS TARGs are specified.

Proposal ID 05:FGS Cycle 9: Calibrating FGS1r's Interferometric Response as a Function of Spectral Color

Plan

Purpose	Augment the S-curve library of B-V standards needed to support the GO program. The data will also be used to calibrate the Trans/Pos bias, the cross filter effect, and the lateral color effect.
Description	Stars ranging in B-V from 0.0 to 2.2 will be observed in Transfer Mode to obtain color dependent S-curves. These stars, along with selected reference stars, will also be observed in Position mode to calibrate the Trans/Pos bias, the cross filter effect, and the lateral color effect as a function of spectral color.
Fraction GO/GTO Programs Supported	90% of FGS usage.
Resources Required: Observation	4 external HST orbits.
Resources Required: Analysis	0.05 FTE
Products	Additions to the S-curve library. Updates to the calibration pipeline reference files.
Accuracy Goals	S-curve library complete to delta (B-V) ~0.2. Trans/Pos bias, cross filter, and lateral color effects calibrated to ~ 0.5 mas.
Scheduling& Special Requirements	Visits are moderately time critical. POS TARGs and ORIENTS are specified to optimize availability of reference stars.

Proposal ID 06:FGS Cycle 9: Calibrating Scale Along FGS1r's X,Y Axis in Transfer Mode

Plan

Purpose The FGS1r Koesters Prisms are known to be slightly misaligned w.r.t the polarizing beam splitter. For Transfer Mode observing this causes the scale along the X-axis to be slightly different than that along the Y-axis. This makes the observed separation and position angle of the components of a resolved binary system to be HST Orient dependent. This test calibrates this effect.

Description A bright (8<V<10). wide (sep > 100 mas) binary system with a small magnitude difference between the components (dmag < 1) is observed by FGS1r in Transfer Mode in both the F583W filter and F5ND attenuator at three different HST ORIENTS (nominal roll and +/- 25 deg off nominal). Several field reference stars are observed in Position Mode to accurately determine the relative roll of HST for the three visits. The relative scale along X and Y axis is determined from this test. The absolute scale is obtained by using the binary's accurate orbital elements.

Fraction GO/GTO Programs Supported 92% of FGS usage.

Resources Required: Observation 3 external HST orbits.

Resources Required: Analysis 0.15 FTE

Products Updates to the calibration pipeline reference files.

Accuracy Goals The relative scale along the X,Y axis is to be known to ~1 part in 600. The absolute scale is to become known to ~1 part in 500.

Scheduling& Special Requirements Visits are moderately time critical. POS TARGs and ORIENTS are specified.