COS Cycle 17 Calibration Plan

ID	Proposal Title	Frequency	Time (orbits)		Scheduling Required	Resources Required (FTE weeks)	Products	Accuracy Required	Notes
			Ext	Int/P					
NUV Monitoring Programs									
11891	NUV Detector Fold Test	1/year		1	Fall 2009	1	TIR	5% (of peak)	Test health of MAMA detector
11892	NUV Detector Recovery after Anomalous Shutdown	As necessary		(4)	As necessary	(1)	TIR	N/A	Contingency program
11894	NUV Detector Dark Monitor	2/week		130	Start by end of SMOV	4	CDBS(?), ISR	1% globally	Monitor dark rate
11896	NUV Spectroscopic Sensitivity Monitor	Monthly (L) 4/year (M)	41		Start by end of SMOV?	6	ISR; CDBS	3% per resel	FASTEX star (G230L), HST standard G191B2B (G*M). **See details for C17!**
11899	NUV Imaging Sensitivity	1/year (to start with)	2		Early in cycle	3	ISR; CDBS	1% per star	Use stars with range in (known) color to measure color terms
11900	NUV Internal/External Wavelength Scale Monitor	6/year per target	18		Start by end of SMOV	6	ISR; CDBS	0.2 pixel	Monitor internal/external wavelength zeropoint offsets. 3 targets.
FUV Monitoring Programs									
11893	FUV Detector Recovery after Anomalous Shutdown	As necessary		(12)	When necessary	(1)	TIR	N/A	Contingency program
11895	FUV Detector Dark Monitor	5/week		325	Start by end of SMOV	4	ISR	2% with time	Monitor health of FUV detector
11897	FUV Detector Sensitivity Monitor	Monthly (L) 4/year (M)	36		Start by end of SMOV	6	CDBS, ISR	3% per resel	Using high-declination FASTEX standards. **See details for Cycle 17!**
11997	FUV Internal/External Wavelength Scale Monitor	6/year per target	12		Start by end of SMOV	6	ISR, CDBS	0.2 pixel	Monitor internal/external wavelength zeropoint offsets. 2 targets.
Totals Cycle 17			**109**	**456 (+16)**		**36 (+ 2)**	**COS GO/GTO ORBITS in CYCLE 17 : 907 + 217 = 1124**		

Proposal ID 11891: NUV Detector Fold Test

P.I. T. Wheeler

Purpose	Measure the performance of the MAMA microchannel plates
Description	The fold analysis provides a measurement of the distribution of charge cloud sizes incident upon the anode, giving some measure of changes in the pulse height distribution of the MCP and, therefore, MCP gain. While illuminating the detector with a flat field lamp (D2), the valid event rate counter is monitored while various combinations of row- and column-folds are selected. The procedure is implemented using special commanding. It is also exercised during SMOV as proposal 13555 (visit 5)
Fraction GO/GTO Programs Supported	25% (of COS Cycle 17 GO/GTO exposures)
Resources Required: Observation	One visit of 1 internal orbit
Resources Required: Analysis	1 FTE weeks
Products	TIR
Accuracy Goals	Position in peak of fold distribution to be measured to 5% accuracy.
Scheduling & Special Requirements	Execute 6 months after COS SMOV ends

Proposal ID 11892: NUV Detector Recovery after Anomalous Shutdown

P.I. T. Wheeler

Purpose	Recover NUV detector using slower than nominal high-voltage rampup and obtain diagnostics needed to check health during rampup.
Description	This program executes three tests to check NUV-MAMA health after an anomalous shutdown: (1) Signal processing electronics check. This reduces amplifier thresholds to 0.28V and monitors the ORCOUNT rate. (NUV HV is off during this procedure); (2) Slow, intermediate high voltage ramp-up. The NUV is ramped up to an MCP voltage 300V below the nominal operating value. A dark time-tag exposure is taken during this partial ramp-up. Then another time-tag dark exposure during which the event counter is cycled through W, X, Y, Z, OR, EV and VE modes; (3) Slow, full high voltage ramp-up. The NUV is ramped to its nominal MCP voltage. A dark time-tag exposure is taken during this full ramp-up. Then another time-tag dark exposure is obtained during which the event counter is cycled through W, X, Y, Z, OR, EV, and VE modes.
Fraction GO/GTO Programs Supported	25%
Resources Required: Observation	4 internal orbits
Resources Required: Analysis	1 FTE weeks
Products	report
Accuracy Goals	N/A
Scheduling & Special Requirements	Program to execute only when needed.

Proposal ID 11894: NUV Detector Dark Monitor

P.I. T. Ake

Purpose	Perform routine monitoring of MAMA detector dark current. The main purpose is to look for evidence of a change in the dark, both to track on-orbit time dependence and to check for a detector problem developing.
Description	Take ~25 min exposure with the NUV MAMA with shutter closed, twice a week.
Fraction GO/GTO Programs Supported	25%
Resources Required: Observation	130 internal orbits
Resources Required: Analysis	4 FTE weeks
Products	CDBS Dark and Bad Pixel reference files; ISR
Accuracy Goals	1% (Each measurement to yield a Poisson uncertainty of 1% for global dark rate.)
Scheduling & Special Requirements	Should start when schedule allows it just before SMOV formally ends and continue seamlessly to 1 Nov 2010.

Notes: Can be derived from STIS program 10034.

Proposal ID 11896: NUV Spectroscopic Sensitivity Monitor

P.I. R. Osten

Purpose	Monitor sensitivity of each NUV grating mode to detect any change due to contamination or other causes.
Description	Obtain exposures in G230L every month, and in each of the three medium-resolution modes every 3 months. Use high-declination FASTEX standard for L modes and Primary Standard G191B2B for M modes. Use standard target acquisition as determined for similar SMOV programs. Main goal is to track time dependence of sensitivity as a function of wavelength (and/or grating). See notes below, also for the extra visit to tie the primary to the secondary (monitoring) standard star flux scales.
Fraction GO/GTO Programs Supported	25%
Resources Required: Observation	41 external orbits
Resources Required: Analysis	6 FTE weeks
Products	ISR, Time-Dependent Sensitivity reference files.
Accuracy Goals	Minimum S/N of 30 per resolution element at central wavelengths.
Scheduling & Special Requirements	Monthly starting at the end of COS SMOV activities, until 1 Nov 2010.

Notes:

(1) For low-resolution grating, use all central wavelength settings to cover full wavelength range. For medium-resolution gratings, use 1 central wavelength for G185M and 3 central wavelengths (bluest, middle, reddest) for G225M and G285M. The reason for the latter is that G225M and G285M are not coated and it seems prudent to track wavelength dependence of sensitivity degradation for those gratings separately.

(2) In Cycle 17, observe primary standard star LDS749B (which defines the absolute flux calibration) once within hours of the execution of a sensitivity monitor visit, using all FUV gratings in one central wavelength setting. The goal is to tie the zero point (in time) of the time dependence of the sensitivity in the different observing modes to a well-defined epoch through a direct comparison of the primary standard star and the secondary standard star (the latter is used for the sensitivity monitoring).

Proposal ID 11899: NUV Imaging Sensitivity

P.I. P. Goudfrooij

Purpose	The NUV imaging sensitivity is tested using targets with an appropriate range of colors (temperatures) to establish color terms in the sensitivity formula.
Description	Observe several horizontal branch stars in the globular cluster NGC 6681 that cover a range of colors, plus one orbit on Solar-analog standard star P330E to evaluate red response. All these stars have UV-to-optical SEDs measured with STIS.
Fraction GO/GTO Programs Supported	100% (since NUV target acquisitions may be used for all COS programs)
Resources Required: Observation	2 external orbits
Resources Required: Analysis	3 FTE weeks
Products	Reference files, ISR.
Accuracy Goals	1% from counting statistics per star, 5% overall accuracy of sensitivity formula.
Scheduling & Special Requirements	Once during the cycle, preferably early.

Notes: This activity is designed to characterize the performance of the COS/NUV imaging mode beyond the initial measurements conducted in SMOV program 11473. The sensitivity of the main PSA/MIRRORA mode will be fully calibrated in the central position (including color terms) using 12 stars covering a variety of spectral energy distributions. The PSA/MIRRORB sensitivity will also be characterized as a function of location within the aperture by moving a star from the center to various positions with a 3x3 grid pattern and a step of 0.25 arcsec.

Proposal ID 11900: NUV Internal/External Wavelength Scale Monitor

P.I. C. Oliveira

Purpose	Monitor zero-point offsets for the wavelength scale (internal wavecal lamp to external standard wavelength scale) for relevant central wavelength settings.
Description	Observe external radial velocity standard targets in TIME-TAG, FLASH=YES mode, and monitor zero-point offsets between wavelength scale set by internal wavecal vs. that defincd by absorption lines in the target. Do this once a month to establish repeatability of the zero point offsets.
Fraction GO/GTO Programs Supported	25%
Resources Required: Observation	18 external orbits
Resources Required: Analysis	6 FTE weeks
Products	Reference files, ISR.
Accuracy Goals	0.2 pixel wavelength zero point accuracy.
Scheduling & Special Requirements	Once every 1-2 months per target/mode (at least initially), starting the month after SMOV ends.

Notes:
(1) Use precise ACQ/SEARCH, ACQ/PEAKXD, ACQ/PEAKD target acquisition sequence for each visit to ensure very precise aperture centering throughout. Can be derived from SMOV proposal 11474.
(2) Each target in this proposal is observed 6 times in this calibration program, each visit is 1 orbit, for a total of 18 orbits. The visits are spread throughout the duration of Cycle 17, taking into account the visibility constraints of each target. G285M 2676 and 2695 are observed with HD187691 and HD6655, allowing us to cross-check the two targets.
(3) For G230L (the grating with the largest exptime allocated in Cy 17) all cenwaves used in Cy 17 GO programs are monitored. For G185M 4 out of the 6 cenwaves used in Cy 17 are monitored. The 2 cenwaves not monitored only have 400 sec of GO time each. For G225M 2 of the 4 cenwaves used in Cy 17 are monitored, bracketing the cenwaves used in GO programs. For G285M 3 of the 4 cenwaves used in Cy 17 are monitored.

Proposal ID 11893: FUV Detector Recovery after Anomalous Shutdown

P.I. T. Wheeler

Purpose	Recover FUV detector using high voltage rampup in several cycles, ending up with nominal high-voltage rampup, and obtain diagnostics needed to check health during rampup
Description	Turn on and ramp up the FUV high voltage in a conservative manner. Details are to be determined during SMOV, but this is a summary: Initial transition from Operate to HVLow is broken into two parts, with a time gap between turning on the HV and ramping to the HVLow (SAA) voltage. This will be followed by 3 cycles of HV ramp-up and return to HVLow. Cycles will ramp up to successively higher (magnitude) voltage, with the last cycle going to the nominal operating values. There will be a time gap between cycles.
Fraction GO/GTO Programs Supported	75%
Resources Required: Observation	12 internal orbits
Resources Required: Analysis	1 FTE weeks
Products	TIR
Accuracy Goals	N/A
Scheduling & Special Requirements	Execute when needed.

Notes:

Proposal ID 11895: FUV Detector Dark Monitor

P.I. T. Ake

Purpose	Perform routine monitoring of FUV XDL detector dark rate. The main purpose is to look for evidence of a change in the dark rate, both to track on-orbit time dependence and to check for a detector problem developing.
Description	Take ~25 min exposure with the FUV detector with shutter closed, 5 times a week.
Fraction GO/GTO Programs Supported	75%
Resources Required: Observation	325 internal orbit
Resources Required: Analysis	4 FTE weeks
Products	Dark rate reference files, ISR
Accuracy Goals	Obtain a few counts per exposure (for nominal case). Build up decent S/N over time.
Scheduling & Special Requirements	Should start when schedule allows it just before end of SMOV (TBD) and continue seamlessly to Mar 2010.

Notes: “Internal” orbits refer to 1800-s orbits. More orbits than NUV case due to lower count rate in FUV.

Proposal ID 11897: FUV Detector Sensitivity Monitor

P.I. R. Osten

Purpose	Monitor sensitivity of each FUV grating mode to detect any change due to contamination or other causes.
Description	Obtain exposures in G140L every month, and in each of the three medium-resolution modes every 3 months. Use high-declination FASTEX standard stars: WD0947+857 for G140L and G130M, and WD1057+719 for G160M. Use standard target acquisition as determined for similar SMOV programs. See notes below for an extra visit to tie the primary to the secondary (monitoring) standard star flux scales
Fraction GO/GTO Programs Supported	75%
Resources Required: Observation	36 external orbits
Resources Required: Analysis	6 FTE weeks
Products	TDS reference file, ISR
Accuracy Goals	Minimum S/N of 30 per resolution element at the central wavelengths.
Scheduling & Special Requirements	Monthly L-mode visits and quarterly M-mode visits starting right after COS SMOV ends

Notes:

(1) For low-resolution grating, use both central wavelength settings to cover full wavelength range. For medium-resolution gratings, use 1 central wavelength for each.

(2) This program can also be used as a check on the zero-point offset between the internal and external wavelength calibration by means of ISM lines in the spectrum of WD0947+857, one of the two FASTEX standard stars.

(3) In Cycle 17, observe primary standard star GD71 (which defines the absolute flux calibration) once within hours of the execution of a sensitivity monitor visit, using all NUV gratings in one central wavelength setting. The goal is to tie the zero point (in time) of the time dependence of the sensitivity in the different observing modes to a well-defined epoch through a direct comparison of the primary standard star and the secondary standard star (the latter is used for the sensitivity monitoring).

Proposal ID 11997: FUV Internal/External Wavelength Scale Monitor

P.I. C. Oliveira

Purpose	Monitor zero-point offsets for the wavelength scale (internal wavecal lamp to external standard wavelength scale) for relevant central wavelength settings.
Description	Observe external radial velocity standard targets in TIME-TAG, FLASH=YES mode, and monitor zero-point offsets between wavelength scale set by internal wavecal vs. that defincd by absorption lines in the target. Do this once every 2-3 months for each target/obsmode combination to establish repeatability of the zero point offsets.
Fraction GO/GTO Programs Supported	75%
Resources Required: Observation	12 external orbits
Resources Required: Analysis	6 FTE weeks
Products	Reference files, ISR.
Accuracy Goals	0.2 pixel wavelength zero point accuracy.
Scheduling & Special Requirements	Once every 12-3 months per target/obsmode (at least initially), starting the month after SMOV ends.

Notes:
(1) Use precise ACQ/SEARCH, ACQ/PEAKXD, ACQ/PEAKD target acquisition sequence for each visit to ensure very precise aperture centering throughout. Can be derived from SMOV proposal 11487.
(2) Each target in this proposal is observed 6 times in this calibration program, each visit is 1 orbit, for a total of 12 orbits. The visits are spread throughout the duration of Cycle 17, taking into account the visibility constraints of each target.