Cycle 26 STIS Final Calibration Program Plan

STIS Team

STIS Calibration and Monitor Orbits Approved by Cycle

	# of Programs	External Orbits	Parallel Orbits	Internal Orbits	Total Orbits
Cycle 17	25	68	0	1816	1884
Cycle 18	20	22	0	1370	1392
Cycle 19	18	21	0	1418	1439
Cycle 20	20	21	0	1391	1412
Cycle 21	20	21	0	1392	1413
Cycle 22	19	21	0	1387	1408
Cycle 23	22	31	1	1380	1416
Cycle 24	21	27	1	1355	1386
Cycle 25	21	26	0	1355	1381
Cycle 26	21	27	1	1355	1383

STIS Cycle 26 Calibration and Monitoring Orbits Approved

Prop. ID	Title	External	External Parallel	Internal	Frequency (orbits x repeats)	Cycle 25 Allocation
CCD Monitors						
	STIS CCD Performance Monitor			14	2x7	14
	STIS CCD Dark Monitor			730	2x242 + 1x246	730
	STIS CCD Bias and Read Noise Monitor			369	1x182 + 1x183+1x4	369
	STIS CCD Hot Pixel Annealing			39*	3x13	39
	STIS CCD Spectroscopic Flat-Field Monitor			19	1x10 +9	19
	STIS CCD Imaging Flat-Field Monitor			4	1x4	4
	STIS CCD Spectroscopic Dispersion Solution Monitor			3	3x1	3
	STIS CCD Sparse Field CTE			50*	50x1	50
	STIS CCD Full Field Sensitivity	1			1x1	1
	STIS Slit Wheel Repeatability			1	1x1	1
	STIS CCD Spectroscopic Sensitivity Monitor	5			L 1x3, M 2x1	5
MAMA Monitors						
	STIS MAMA Spectroscopic Dispersion Solution Monitor			7	7x1	7
	STIS MAMA Full Field Sensitivity	3			1x3	3
	STIS MAMA Spectroscopic Sensitivity and Focus Monitor	12			1x3/L, 1x1/M, 2x4/E	12
	STIS FUV MAMA Dark Monitor			54	6x9	54
	STIS NUV MAMA Dark Monitor			52	2x26	52
	STIS MAMA FUV Flat-Field Monitor			11*	1x11	11
	STIS MAMA Fold Distribution			2	2x1	2
Contingency programs						
	STIS MAMA Anomalous Recovery			(8)		(8)
Special programs						
	STIS Coronagraphic Performance Monitor	1	1		1x1	
	Monitoring the 3 Primary WD Standard Stars	5			5x1	
TOTAL	**Cycle 26 orbit request**	**27**	**1**	**1355 + (8)**		**Ext: 26 Int: 1355+(8)**

* Internal parallel orbits > 1800s.

Green means "executing on alternating cycle only"

( ) Indicates contingency orbits not included in Cycle 26 request.

Cycle 26 STIS Calibration Plan:
Routine Programs & Monitoring

STIS Team

5/31/2018

STIS Calibration and Monitor Orbits Approved by Cycle

	# of Programs	External Orbits	Parallel Orbits	Internal Orbits	Total Orbits
Cycle 17	25	68	0	1816	1884
Cycle 18	20	22	0	1370	1392
Cycle 19	18	21	0	1418	1439
Cycle 20	20	21	0	1391	1412
Cycle 21	20	21	0	1392	1413
Cycle 22	19	21	0	1387	1408
Cycle 23	22	31	1	1380	1416
Cycle 24	21	27	1	1355	1386
Cycle 25	21	26	0	1355	1381
Cycle 26	19*	21	0	1355	1376

* Includes routine program submissions only

STIS Cycle 26 Calibration and Monitoring Orbits Requested

Prop. ID	Title	External	External Parallel	Internal	Frequency (orbits x repeats)	Cycle 25 Allocation
CCD Monitors						
	STIS CCD Performance Monitor			**14**	**2x7**	**14**
	STIS CCD Dark Monitor			**730**	**2x242 + 1x246**	**730**
	STIS CCD Bias and Read Noise Monitor			**369**	**1x182 + 1x183+1x4**	**369**
	STIS CCD Hot Pixel Annealing			**39***	**3x13**	**39**
	STIS CCD Spectroscopic Flat-Field Monitor			**19**	**1x10 +9**	**19**
	STIS CCD Imaging Flat-Field Monitor			**4**	**1x4**	**4**
	STIS CCD Spectroscopic Dispersion Solution Monitor			**3**	**3x1**	**3**
	STIS CCD Sparse Field CTE			**50***	**50x1**	**50**
	STIS CCD Full Field Sensitivity	**1**			**1x1**	**1**
	STIS Slit Wheel Repeatability			**1**	**1x1**	**1**
	STIS CCD Spectroscopic Sensitivity Monitor	**5**			**L 1x3, M 2x1**	**5**
MAMA Monitors						
	STIS MAMA Spectroscopic Dispersion Solution Monitor			**7**	**7x1**	**7**
	STIS MAMA Full Field Sensitivity	**3**			**1x3**	**3**
	STIS MAMA Spectroscopic Sensitivity and Focus Monitor	**12**			**1x3/L, 1x1/M, 2x4/E**	**12**
	STIS FUV MAMA Dark Monitor			**54**	**6x9**	**54**
	STIS NUV MAMA Dark Monitor			**52**	**2x26**	**52**
	STIS MAMA FUV Flat-Field Monitor			**11***	**1x11**	**11**
	STIS MAMA Fold Distribution			**2**	**2x1**	**2**
Contingency programs						
	STIS MAMA Anomalous Recovery			**(8)**		**(8)**
TOTAL	**Cycle 26 orbit request**	**21**	**0**	**1355 + (8)**		**Ext: 26 Int: 1355+(8)**

* Internal parallel orbits > 1800s.

Green means "executing on alternating cycle only"

( ) Indicates contingency orbits not included in Cycle 26 request.

STIS Cycle 26 Calibration: Changes from Cycle 25

- Two programs alternate between even and odd cycles:
  - STIS MAMA FUV Flat-Field Monitor will execute in Cycle 26 instead of the NUV Flat-Field Monitor
  - CCD Sparse Field CTE Internal program observations will use the GAIN = 4 setting this cycle instead of GAIN = 1.

STIS/CCD Programs

Note: STIS Cycle 26 Phase Is Include
Cycle 25 Usage Statistics

STIS CCD Performance Monitor
PI: Doug Branton

Purpose	To measure the baseline performance of the CCD detector.
Description	This program monitors the performance of the CCD detector on orbit for amplifier D only. Bias and flat field exposures are taken to measure read noise, CTE (EPER test), spurious charge, and gain values with full frame observations. Bias exposures are also taken in sub-array readouts to check the bias level for ACQ and ACQ/PEAK observations. All orbits < 1800s
Fraction GO/GTO Programs Supported	16% of STIS total exposure time.
Resources Required: Observations	14 internal orbits performed in 2 groups of 7
Resources Required: Analysis	2 FTE weeks for analysis and documentation.
Products	Possible update of the gain, bias level, and read noise values in ccdtab. This also provides a relative measure of CTI via the extended pixel edge response test. Possible flight software updates of table CCDBiasSubtractionValue. Summary in the end of cycle ISR and updates to the STIS monitor webpages.
Accuracy Goals	Read noise good to +/- 0.3 ADU, gain error < 0.08 ADU
Scheduling & Special Requirements	Visits occur every 6 months in Mar and Sept.
Changes from Cycle 25	No changes.

STIS CCD Dark Monitor (Parts 1, 2, and 3)
PI: Doug Branton

Purpose	Monitor dark current for the STIS CCD.
Description	Routine monitoring with Amp D and GAIN = 1: obtain 2 visits
Fraction GO/GTO Programs Supported	16% of STIS total exposure time
Resources Required: Observations	242 (part 1) + 242 (part 2) + 246 (part 3) internal orbits <1800s.
Resources Required: Analysis	6 FTE weeks; Retrieve and construct superdarks. These superdarks are compared to previous superdarks and the image statistics are checked to see if there are any anomalous statistical deviations. CTI analysis based on short darks is performed.
Products	Weekly CDBS reference files (superdarks) and a summary in the end of cycle ISR and update of the monitor webpage.
Accuracy Goals	Superdark rms < 0.012 e-/s and S/N > 1.0 per pixel in superdarks.
Scheduling & Special Requirements	Two orbits each day.
Changes from Cycle 25	No Changes

STIS CCD Bias and Read Noise Monitor (Parts 1 & 2)
PI: Doug Branton

Purpose	Monitor the bias in the 1x1 bin settings at gain=1, and 1x1 at gain = 4, to build up high S/N superbiases and track the evolution of hot columns. Also GAIN=1 and GAIN=4, 1x1 biases through AMPS A and C to use in combination with biases taken through AMP D for monitoring of the read noise
Description	Take full frame bias exposures in the 1x1 bin settings at GAIN = 1, and at GAIN = 4 with nominal AMP D. Take full frame biases through AMPs A and C in GAIN = 1 and 4 as well for performing read noise monitoring. All exposures are internal and fit in occultation orbits. In addition to routine monitoring, during one month we use 4 additional internal orbits of GAIN = 1, AMP A biases in support of absolute CTI measurements.
Fraction GO/GTO Programs Supported	16% of STIS total exposure time
Resources Required: Observations	182 (part 1) + 183 (part 2) internal orbits + 4 (CTI) internal orbits <1800s
Resources Required: Analysis	2 FTE weeks. Retrieve and construct superbiases. These are compared to previous superbiases and the image statistics are checked to see if there are any anomalous deviations. Biases with AMPS A and C allow for monitoring of the read noise.
Products	Weekly CDBS reference files (superbiases) and a summary in the end of cycle ISR
Accuracy Goals	Superbiases RMS < 0.95 e- at GAIN = 1 1x1 and RMS < 1.13 e- at GAIN = 4 1x1, S/N > 1 per pixel.
Scheduling & Special Requirements	One orbit per day for the routine monitor. The additional bias for AMP A should be taken the same month as AMP A darks for CTI analysis
Changes from Cycle 25	No changes

STIS CCD Hot Pixel Annealing
PI: Doug Branton

Purpose	To anneal hot pixels and the effectiveness of the CCD hot pixel annealing is assessed by measuring the dark current behavior before and after annealing.
Description	The characteristics of the CCD will first be defined by a series of bias, dark and flat-field exposures taken before the anneal. The CCD Thermoelectric cooler will be turned off to allow the CCD detector temperature to rise from ~ -80 C to +5 C. The CCD will be left in the uncooled state for approximately 12 hours. At the end of this period the Thermoelectric cooler is turned back on and the CCD is cooled to its normal operating temperature. Since the CCD on Side-2 does not have thermistor, a 4 hour period, at a minimum, is necessary to ensure that the CCD is cool and stable. After the CCD has stabilized, bias, dark and flat-field images will be repeated to check for changes in the CCD characteristics. The flat-field exposures will permit evaluation of any window contamination acquired during the annealing period. Pure parallel mode.
Fraction GO/GTO Programs Supported	16% of STIS total exposure time.
Resources Required: Observations	39 internal orbits and all orbits >1800s.
Resources Required: Analysis	2 FTE weeks. By comparing the number of hot pixels before and after the anneal, we see if the hot pixels decrease and estimate the number of hot pixels that persist after the process.
Products	Hot pixel growth rate, median dark count rate, and a summary in the end of cycle ISR
Accuracy Goals	Measure the growth rate of hot pixels to within 1% if possible
Scheduling & Special Requirements	Pure parallel mode exposures. Anneals will execute every 4th week using 3 orbits.
Changes from Cycle 25	No changes.

STIS CCD Spectroscopic Flat-Field Monitor
PI: Joleen Carlberg

Purpose	Obtain medium resolution grating flats to determine the pixel-to-pixel variation for spectroscopic observations and produce the Cycle 26 reference p-flat (M and L modes).
Description	We use the tungsten lamp and the G430M grating to determine the pixel-to-pixel variation of the STIS CCD in spectroscopic mode. The flat exposures are taken with the 50CCD and 52x2 apertures at 5 offset positions in order to map -with a sufficient SNR- the whole sensitive area of the detector. The expected cumulative signal ≥1.4E6 ADU/pixels; while the expected accuracy will be ≤1.5%. All orbits are less < 1800 s.
Fraction GO/GTO Programs Supported	16% of STIS total exposure time.
Resources Required: Observations	19 internal orbits <1800s
Resources Required: Analysis	2.5 weeks FTE
Products	Reference files, summary in end of cycle ISR and ISR as applicable
Accuracy Goals	≤1.5% flat field accuracy
Scheduling & Special Requirements	9 orbits with G430M/5612 & 50CCD spread across the cycle; 1 visit every ~40 days 10 orbits with the G430M/5612 & 52x2
Changes from Cycle 25	No changes.

STIS CCD Imaging Flat-Field Monitor
PI: John Debes

Purpose	Purpose: Collect high SNR white light imaging flats (aperture=50CCD) for monitoring purposes and to create a new reference p-flat for chronographic (and imaging) observations.
Description	Once every 3 months, obtain a series of imaging CCD flats using the MIRROR and the unfiltered 50CCD aperture. The 3 months cadence will allow us to keep monitoring possible (but unlikely) variations across the cycle; while the combined observations will allow us to obtain an average signal ~620000 ADU/pix (similarly to the past cycles) and create a high accuracy (~1%) imaging p-flat. The remaining time in each orbit/visit will be used to monitor the stability of the CORON aperture due to the MSM limited reproducibility.
Fraction GO/GTO Programs Supported	16% of STIS total exposure time.
Resources Required: Observations	4 internal orbits
Resources Required: Analysis	4 weeks FTE
Products	Reference p-flat and TIR or ISR as relevant.
Accuracy Goals	~1% flat field accuracy
Scheduling & Special Requirements	1 orbit every 3 months.
Changes from Cycle 25	None.

STIS CCD Spectroscopic Dispersion Solution Monitor
PI: Daniel Welty

Purpose	To monitor the wavelength calibration / dispersion solutions for some configurations of the STIS/CCD.
Description	Internal wavecals will be obtained with all 6 gratings (G230LB, G230MB, G430L, G430M, G750L, G750M) supported for use with the CCD, for settings chosen to cover Cycle 26 use and to overlap with those used in previous calibration programs (to continue long-term monitoring). All observations will be obtained with the 52x0.1 aperture, which maps to 2 pixels at the CCD. As in previous cycles, the HITM1 lamp will be used, as it has a more favorable spatial illumination pattern, dropping by only a factor of 3 at row 900 (near the E1 pseudo-aperture), relative to the peak brightness at row 420.
Fraction GO/GTO Programs Supported	16% of total STIS prime science exposure time
Resources Required: Observations	3 internal orbits
Resources Required: Analysis	4 FTE weeks
Products	Update wavelength dispersion reference file (as needed, with ISR); summary in the end of cycle ISR
Accuracy Goals	0.2 pixels (wavelength accuracy for row 900) -- Wavelength coefficients are tabulated every 32 rows in the CCD dispersion (_dsp) reference file. Exposure times in this program have typically been chosen to yield a S/N ratio of at least 10 per pixel in row 900 after combining 32 rows. This constraint must be satisfied in the left, middle, and right thirds of the image. Existing recent HITM1 wavecals were used to estimate exposure times.
Scheduling & Special Requirements	These observations are taken once per cycle.
Changes from Cycle 25	No changes from Cycle 25 (the changes made for cycle 25 should yield adequate sets of measurable lines in all settings)

STIS CCD Sparse Field CTE Internal
Sean Lockwood

Purpose	Re-establish an accurate correction for parallel register CTE losses that can be used for direct analysis of science data with negligible background. Do measurements for one gain setting (GAIN=4), alternating with GAIN=1 every-other-cycle.
Description	The sparse field CTE will be measured via internal calibration lamp observations taken through narrow slits. Using the onboard tungsten lamp, narrow slit images are projected at different positions on the detector. At each position a series of exposures is taken alternating between the 'A' and 'C' amplifiers for readout. The further the charge needs to be shifted to be read out, the more charge it will lose. For the parallel CTE measurement, the test will use the the cross disperser slits: 0.05x31NDB and 0.05x31NDA. In order to test the effects of different bias voltages and readout timing, the whole series of exposures are executed once for GAIN=4 and once for GAIN=1 every-other cycle; this process requires a total of 50 orbits per cycle which includes various sets of biases and darks. For the CTE pixel based correction, the test requires 8 orbits for darks read out with amplifier A.
Fraction GO/GTO Programs Supported	16% of STIS total exposure time (cycle 25)
Resources Required: Observations	50 internal visits (7/50 visits will exceed the 1800 s limit by ~100 s in order to capture the full sequence of exposures required for best analysis.)
Resources Required: Analysis	3 FTE weeks
Products	Determine slope for time dependent empirical flux correction of CTE, possible update of ccdtab reference file, and inclusion in a summary ISR.
Accuracy Goals	1%
Scheduling & Special Requirements	Schedule between 01 November 2018 and 01 January 2019. Visits should execute in order.
Changes from Cycle 25	Data taken for gain=4 instead of gain=1; alternates every cycle.

STIS CCD Full-Field Sensitivity
PI: John Debes

Purpose	To monitor CCD sensitivity over the whole field of view.
Description	Measure a photometric standard star field in Omega Cen in 50CCD annually to monitor CCD sensitivity over the whole field of view. Keep the spacecraft orientation within a suitable range (+/- 5 degrees) to keep the same stars in the same part of the CCD for every measurement. This test will give a direct transformation of the 50CCD magnitudes to the Johnson-Cousins system for red sources. These transformations should be accurate to 1%. The stability of these transformations will be measured to the sub-percent level. These observations also provide a check of the astrometric and PSF stability of the instrument over its full field of view. All external orbits > 1800s.
Fraction GO/GTO Programs Supported	16%
Resources Required: Observations	1 external
Resources Required: Analysis	1 FTE week
Products	Summary in the end of cycle ISR
Accuracy Goals	1%
Scheduling & Special Requirements	ORIENT 310.0D TO 310.0 D; BETWEEN 15-JAN-2019:00:00:00 AND 20-MAR-2019:00:00:00
Changes from Cycle 25	None

STIS Slit Wheel Repeatability
PI: Tony Sohn

Purpose	To test the repeatability of slit wheel motions.
Description	A sequence of lamp spectra taken using grating G230MB
Fraction GO/GTO Programs Supported	90% of STIS total exposure time.
Resources Required: Observations	One internal orbit (24 exposures, ~40 mins total) once per cycle.
Resources Required: Analysis	2 FTE days
Products	The average and maximum shifts observed in the dispersion and the spatial direction. Possible ISR that sums up analyses results for the past few cycles.
Accuracy Goals	Shifts should be smaller than 0.5 pixels.
Scheduling & Special Requirements	Between Oct. 01, 2018 and Sept. 30, 2019
Changes from Cycle 25	No changes

STIS CCD Spectroscopic Sensitivity Monitor
PI: Joleen Carlberg

Purpose	Monitor the spectroscopic sensitivity of the STIS CCD using both low- and medium-resolution gratings to reveal contamination issues that may affect the spectroscopic throughput.
Description	This program will monitor the STIS CCD spectroscopic sensitivity using a high-declination spectroscopic calibration star (AGK+81D266). The results will be compared to previous observations to detect trends. The L modes will be observed at the nominal and E1 positions every four months with one orbit per visit. The M modes will be observed at the nominal and E1 positions as well, once per year with two orbits per visit.
Fraction GO/GTO Programs Supported	16%, Cycle 25
Resources Required: Observations	5 external orbits
Resources Required: Analysis	7 FTE weeks: 3 FTE weeks for sensitivity analysis, 2 weeks for ISR, 2 FTE weeks for CTE correction verification
Products	Updated STIS TDSTAB file, an ISR on STIS sensitivity monitoring, summary in end of cycle ISR
Accuracy Goals	Minimum signal to noise of 50 per resolution element at the least sensitive wavelength.
Scheduling & Special Requirements	1 orbit every 4 months for L modes. 2 orbits/year for M modes.
Changes from Cycle 25	No changes

STIS/MAMA Programs

STIS MAMA Spectroscopic Dispersion Solution Monitor
PI: Daniel Welty

Purpose	To monitor the wavelength calibration / dispersion solutions for some STIS MAMA configurations.
Description	Internal wavecals will be obtained with gratings at primary and secondary central wavelengths chosen to cover Cycle 26 use and to overlap with configurations used in previous calibration programs (to continue long-term monitoring). This program uses the LINE lamp for a total of about 1.6 hours (typically at a lamp current of 10 mA) – consuming about 0.1% of the 15000 mAhour expected lifetime. The HITM2 lamp (which is brighter below 1270 A) is now used for two of the shorter wavelength settings. Moderately deep wavecals are included for some echelle modes and for some first order modes to ensure detection of weak lines. All orbits < 1800s.
Fraction GO/GTO Programs Supported	84% of total STIS prime science exposure time; 100% of total STIS SNAP time
Resources Required: Observations	7 internal orbits
Resources Required: Analysis	4 FTE weeks
Products	Update wavelength dispersion reference file (as needed; with ISR); summary in end of cycle ISR
Accuracy Goals	0.1-0.2 pixels internal wavelength precision.
Scheduling & Special Requirements	These observations are taken once per cycle. The shortest wavelength settings should avoid orbits in which the FUV glow is strong (if possible).
Changes from Cycle 25	No changes from Cycle 25 (the changes made for cycle 25 should yield adequate sets of measurable lines in all settings)

STIS MAMA Full-Field Sensitivity
PI: John Debes

Purpose	To monitor the sensitivity of the FUV-MAMA and NUV-MAMA over the full field
Description	By observing the globular cluster NGC6681 once every year at roughly the same orientation, we will monitor the full-field sensitivity of the MAMA detectors and their astrometric and PSF stability. These observations will be used to look for contamination, throughput changes, or formation of color centers in the photocathode and window that might be missed by spectroscopic monitoring or difficult to interpret in flat-fielding. Although this test is done using MAMA imaging modes, the confirmation of detector stability and uniformity provided by this monitor is important for spectroscopic observations as well. All orbits > 1800s.
Fraction GO/GTO Programs Supported	84% of STIS prime exposure time
Resources Required: Observations	3 external orbits
Resources Required: Analysis	1 FTE week
Products	Summary in the end of cycle ISR
Accuracy Goals	1%
Scheduling & Special Requirements	Should roughly match most common orient from previous observations. ORIENT 260.0D TO 266.0 D; BEFORE 16-JUN-2019:00:00:00
Changes from Cycle 25	No Changes

STIS MAMA Spectroscopic Sensitivity & Focus Monitor
PI: Joleen Carlberg

Purpose	Monitor the sensitivity of each STIS MAMA grating mode to detect any changes due to contamination or other effects, and monitor the STIS focus in spectroscopic and imaging modes.
Description	- SENSITIVITY: Obtain exposures in each of the two low-resolution MAMA spectroscopic modes every 4 months, in each of the 2 medium-resolution modes once a year, and in each of the 5 echelle modes every 3 months, using unique calibration standards for each mode (L: GRW+70D5824, M: AGK+81D266, E: BD+28D4211), and compare the results to the first observations to detect any trends. - FOCUS: For this cycle we will continue to monitor the STIS focus (small aperture throughput as a function of UV wavelength) by including a direct comparison between the G230LB 0.1X0.09 and 52x2 throughput, as well as a narrow band OII CCD image during each L-Mode visit. We will continue to also include an OII image with the M-mode visit.
Fraction GO/GTO Programs Supported	Focus monitor: 100% of STIS exposures; Sensitivity monitor: 84% of STIS exposures
Resources Required: Observations	12 external orbits
Resources Required: Analysis	6.5 FTE weeks: 3 FTE weeks for sensitivity analysis, 2 weeks for ISR, 1.5 for focus.
Products	Updated STIS TDSTAB file and ISRs on STIS sensitivity monitoring and focus monitoring. Summary in the end of cycle ISR.
Accuracy Goals	Minimum signal to noise of 50 per resolution element at the least sensitive wavelength. 10% for focus changes.
Scheduling & Special Requirements	Visits need to be approximately equally spaced throughout the cycle. MAMA monthly offsets cancelled for L and M mode observations. SAA-free orbits.
Changes from Cycle 25	Echelle observations have been reordered on the second orbit of each of the 4 echelle visits, continuing a change made in mid-Cycle 25 to help mitigate possible focus-related throughput issues. No changes were made to exposure times.

STIS FUV MAMA Dark Monitor
Sean Lockwood

Purpose	Monitor the behavior of the dark current in the FUV MAMA detector, provide data for dark count corrections for faint object observations, and also provide a check on the health of the detector
Description	Every six weeks a set of six exposures of 1300s is taken with the FUV MAMA with the shutter closed. The exposures are evenly spread over a six-hour SAA-free period.
Fraction GO/GTO Programs Supported	50% (cycle 25)
Resources Required: Observations	54 internal visits
Resources Required: Analysis	2 FTE
Products	Dark current images and temperature-dependent formula for applying to an individual observation. Update to monitoring webpage.
Accuracy Goals	1%
Scheduling & Special Requirements	Groups of visits spaced apart ~every 6 weeks SAA free
Changes from Cycle 25	Corrected schedule to match SMS windows by reducing scheduling from 8 to 7 days.

STIS NUV MAMA Dark Monitor
Sean Lockwood

Purpose	Monitor the behavior of the dark current in the NUV MAMA detector, provide data for dark count corrections for faint object observations, and also provide a check on the health of the detector
Description	Every two weeks a set of two 1300 s exposures is taken with the NUV MAMA with the shutter closed. The exposures are taken separated by six hours within an SAA-free period. This separates long and short term temporal effects.
Fraction GO/GTO Programs Supported	34% (cycle 25)
Resources Required: Observations	52 internal visits
Resources Required: Analysis	2 FTE
Products	Dark reference files and tables modeling time and temperature dependence of dark rates. Update to monitoring webpage.
Accuracy Goals	1%
Scheduling & Special Requirements	Pairs of visits spaced apart every 2 weeks SAA free
Changes from Cycle 25	None

STIS FUV MAMA Flat-Field Monitor
PI: Tony Sohn

Purpose	The goal of this program is to obtain FUV-MAMA flat-field observations to create new p-flats with a SNR of ~100 per low-res pixel. The flats are obtained with the KRYPTON lamp, and the MR grism G140M.
Description	Past experience and observations have shown that 11 visits are sufficient to build a p-flat with the required SNR~100 per low-res pixel. The G140M flats will be taken with the slit at 5 different offset positions in order to illuminate the detector region which are normally shadowed by the slit bars. The exact instrument setup (slit width and central wavelength) may change during the cycle depending on the desired count level of each exposure.
Fraction GO/GTO Programs Supported	50% of STIS total exposure time.
Resources Required: Observations	11 internal orbits and all orbits > 1800s.
Resources Required: Analysis	4 FTE weeks
Products	This cycle p-flat is primarily for monitoring purpose. The achievable SNR is limited by the Poisson noise. If applicable, a new reference p-flat will be created combining FUV flats from cycles
Accuracy Goals	1.0% accuracy in per low-res pixel (i.e., 2x2 high-res pixels)
Scheduling & Special Requirements	FUV- and NUV-MAMA flat observations are executed on alternate cycles to save lamp lifetime.
Changes from Cycle 25	This cycle is for FUV-MAMA flats, while Cycle 25 was for NUV-MAMA flats.

STIS MAMA Fold Distribution
PI: Thomas Wheeler

Purpose	The fold analysis provides a measurement of the distribution of charge cloud sizes incident upon the anode providing some measure of changes in the pulse-height distribution of the MCP and, therefore, MCP gain.
Description	While globally illuminating the detector with a flat field, the valid event (VE) rate counter is monitored, while various combinations of row and column folds are selected.
Fraction GO/GTO Programs Supported	84% of STIS prime orbits
Resources Required: Observations	2 internal orbits
Resources Required: Analysis	0.5 FTE day.
Products	The results will be sent to the STIS Team and Steve Franka of Ball Aerospace.
Accuracy Goals	N/A
Scheduling & Special Requirements	This proposal is executed annually.
Changes from Cycle 25	No changes.

Contingency Programs

STIS MAMA Recovery from Anomalous Shutdown
PI: Thomas Wheeler

Purpose	Safe and orderly recovery of either MAMA detector from an anomalous shutdown.
Description	The recovery procedure consists of three separate tests (i.e. visits) to check the MAMA's health after an anomalous shutdown. Each must be successfully completed before proceeding onto the next. They are: (1) signal processing electronics check, (2) slow, intermediate voltage high-voltage ramp-up, and (3) ramp-up to full operating voltage.
Fraction GO/GTO Programs Supported	84% of STIS prime orbits
Resources Required: Observations	8 internal orbits
Resources Required: Analysis	If activated, 0.5 FTE day per test.
Products	For tests 1-3, only a Go/No-Go to proceed will be given.
Accuracy Goals	N/A
Scheduling & Special Requirements	This is a contingency proposal activated only in the event of an anomalous shutdown. This proposal is usually followed by the STIS MAMA Fold Distribution proposal.
Changes from Cycle 25	No changes

Cycle 25 Usage Statistics

STIS Cycle 25 Usage Statistics for each Configuration/Mode

Configuration/Mode	Percentage of STIS Prime Exposure Time		Percentage of STIS SNAP Exposure Time	
	C24	C25	C24	C25
CCD	**31.1%**	**16.2%**	**--**	**--**
CCD/Imaging	1.1%	7.7%	--	--
CCD/Spectroscopy	30.0%	8.4%	--	--
MAMA/FUV	**41.3%**	**49.8%**	**--**	**50.2%**
FUV/Imaging	14.3%	0%	---	--
FUV/Spectroscopy	27.0%	49.8%	--	50.2%
MAMA/NUV	**27.6%**	**34.1%**	**--**	**49.8%**
NUV/Imaging	0.1%	2.2%	---	--
NUV/Spectroscopy	27.5%	31.9%	--	49.8%

STIS Cycle 25 Usage Statistics for each Grating/Mirror Combination

Configuration/Mode	Grating/Mirror	Percentage of STIS Prime science Exposure Time		Percentage of STIS SNAP science Exposure Time	
		C24	C25	C24	C25
STIS/CCD	G230LB	0.1%	1.1%	--	--
(16.2%)	G230MB	--	0.05%	---	--
	G430L	19.6%	1.4%	--	--
	G430M	0.2%	1.4%	---	--
	G750L	8.1%	1.7%	--	--
	G750M	2.0%	2.8%	---	--
	MIRROR/CORON	1.1%	7.7%	--	--
STIS/MAMA-FUV	E140H	2.0%	7.3%	---	--
(49.8%)	E140M	7.1%	8.9%	---	--
	G140L	8.2%	13.1%	--	50.2%
	G140M	9.7%	20.5%	--	--
	MIRROR	14.3%	--	---	--
STIS/MAMA-NUV	E230H	9.4%	8.6%	--	--
(34.1%)	E230M	10.5%	8.1%	---	--
	G230L	7.7%	14.7%	--	49.8%
	G230M	--	0.5%	--	--
	MIRROR	0.1%	2.2%	---	--

Cycle 25 Instrument Usage Statistics Based on Approved Programs

- STIS orbits comprise ~16.2% of all GO prime orbits in Cycle 25

Instruments	Prime Orbits Usage	SNAP Orbit Usage
ACS	12.7%	14.7%
COS	24.8%	16.0%
STIS	16.2%	5.2%
WFC3	46.3%	64.1%
FGS	0.0%	0%

Cycle 26 STIS Special Calibration Program Plan

STIS Team

7/26/2018

STIS Coronagraphic Monitor

Background:

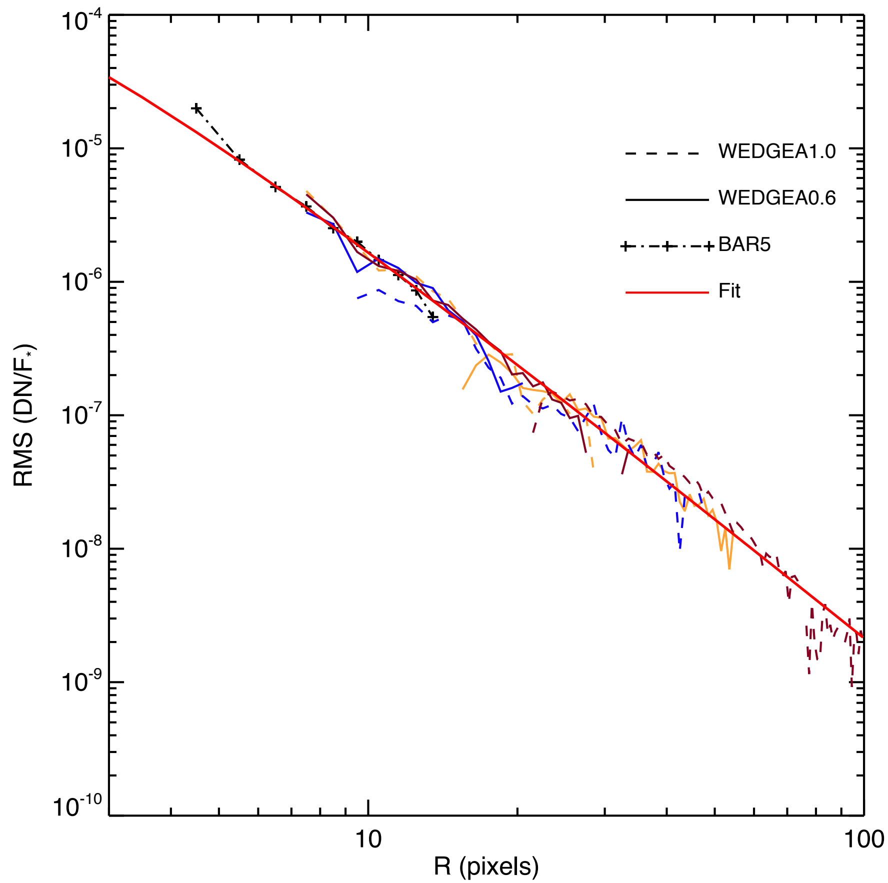
- High jitter motivates an investigation into its impact on coronagraphic performance
- Recent work also shows that performance can be quantified and used for SNR calculations
- → **We can monitor and predict coronagraphic performance!**

Proposed Monitor:

- Roughly reproduce 1 orbit of the nine orbit program 14426
- Goal: measure variance in PSF over many short exposures, possible sequence of longer exposure times to characterize speckle variance out to ~few arcseconds

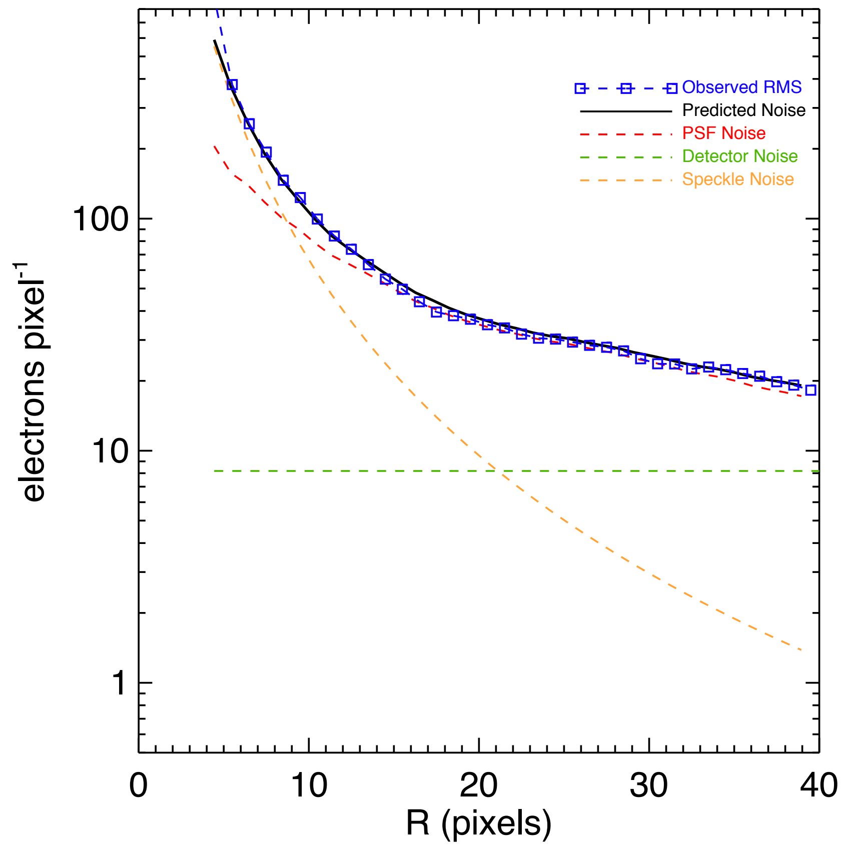
Noise models for STIS Coronagraphy

- A noise model can be used to predict STIS coronagraph performance
- Can empirically test the noise model against real data
- Primary noise due to photon shot noise from PSF wings, secondary noise at small working angles due to quasi-static changes in aberrations which cause spoke-like speckles
- Speckle noise can be empirically measured by subtracting off expected noise



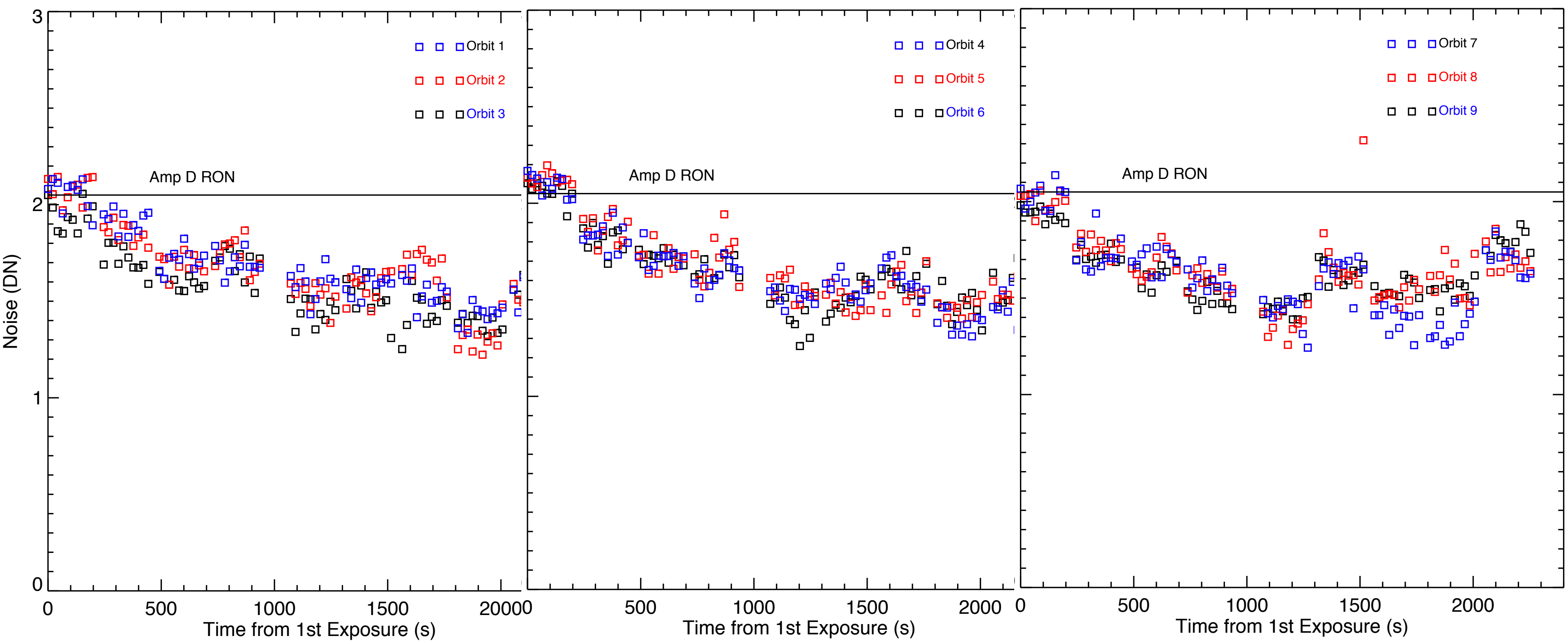
Validating the noise model

Compare to Program 14426 ~81 frames



Secondary Goal

Determine apparent variability in readnoise/herringbone with detector temperature(?)



STIS Coronagraphic Performance Monitor
PI: John Debes

Purpose	To monitor the performance of BAR5 coronagraphy in light of increased spacecraft jitter
Description	By observing the F6V star HD 38393 with BAR5, we will investigate the time variability in coronagraphic performance using Program 14426 as a baseline. Recent work with the STIS coronagraph shows that its performance can be deterministically calculated including systematic noise terms from speckle noise. However, it can be difficult to assess performance over time given the diversity of observing strategies currently used for the STIS coronagraphic locations and the recent large increase in spacecraft jitter. This initial monitor program will be used to assess whether any degradation in performance is measured due to jitter compared to previous observations of this star taken in 2015 as well as to determine whether this program should be repeated.
Fraction GO/GTO Programs Supported	~4% of STIS CCD Programs
Resources Required: Observations	1 external orbit (1 parallel orbit added for WFC3 observations after approval)
Resources Required: Analysis	1 FTE week
Products	STAN/ISR
Accuracy Goals	~100 DN RMS in 0.2s exposure
Scheduling & Special Requirements	Non-interruptible sequence if feasible
Changes from Cycle 25	New Program

Monitoring the 3 Primary WD Standard Stars
PI: Ralph Bohlin

Purpose	Repeated observations of these 3 primaries can reveal any variability in one of the 3 primary WDs, as well as in our MAMA and CCD monitor standards, GRW+70 2824 and AGK+81 266. STIS should observe the primary WD triad with a cadence of every alternate year. Rather than putting 'all our eggs in one basket' and depending only on single sensitivity monitoring stars, prudence suggest that return visits in low dispersion by STIS to the fundamental triad should be executed at something approaching the historic cadence. In addition to variability checks, each new observation adds to the statistical precision of the STIS flux calibration that is defined by these 3 stars.
Description	Observations are in the 5 low dispersion modes G140L, G230L, G230LB, G430L, and G750L with the 52x2 slit. For efficiency, the STIS MAMA and CCD observations will be combined in the same visit; and the wavecals and fringe flats will be pushed to the end-of-orbit occultation, as possible. The MAMA observations may violate a current bright-object limit but have been grandfathered-in, because the set of many past observations have caused no problem.
Fraction GO/GTO Programs Supported	50%
Resources Required: Observations	5 orbits
Resources Required: Analysis	0.1 FTE
Products	The standard data analysis produces Figures that illustrate the average change in response for the 5 STIS low dispersion modes in comparison to the triad of primary standards. The uncertainty in the STIS TDS correction is determined by the level of agreement between the triad of WDs and the respective monitoring standards. Updated absolute flux cal.
Accuracy Goals	<1%
Scheduling & Special Requirements	No
Changes from Cycle 25	Same as Cycle 24