Cycle 29 STIS Regular Calibration Program

STIS Team

2021June03

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
Cycle 27	20	33	0	1358	1391
Cycle 28	23	52	[8]	1349	1401
Cycle 29*	19	21	[8]	1369	1390

[ ] denotes coordinated parallel orbits included with the corresponding external orbits

* Regular calibration and monitoring programs requested for cycle 29

STIS Cycle 28 Calibration and Monitoring Orbits Approved

Prop. ID	Title	External	External Parallel	Internal	Frequency (orbits x repeats)	Cycle 27 Allocation
CCD Monitors						
16336	STIS CCD Performance Monitor			**14**	**7x2**	**14**
16337-16339	STIS CCD Dark Monitor			**728**	**1x242 + 1x242 + 1x248**	**732**
16340-16341	STIS CCD Bias and Read Noise Monitor			**365**	**1x182 + 1x183**	**370**
16342	STIS CCD Hot Pixel Annealing			**39***	**3x13**	**39***
16343	STIS CCD Spectroscopic Flat-Field Monitor			**19**	**1x10 + 1x9**	**19**
16344	STIS CCD Imaging Flat-Field Monitor			**4**	**1x4**	**4**
16345	STIS CCD Spectroscopic Dispersion Solution Monitor			**3**	**3x1**	**3**
16346	STIS CCD Sparse Field CTE			**50***	**50x1**	**50***
16347	STIS CCD Full Field Sensitivity	**1**			**1x1**	**1**
16349	STIS Slit Wheel Repeatability			**1***	**1x1**	**1***
16348	STIS CCD Spectroscopic Sensitivity Monitor	**5**			**1x3 (L) + 2x1 (M)**	**5**
MAMA Monitors						
16350	STIS MAMA Spectroscopic Dispersion Solution Monitor			**7**	**7x1**	**7**
16351	STIS MAMA Full Field Sensitivity	**3**			**1x3**	**3**
16352	STIS MAMA Spectroscopic Sensitivity and Focus Monitor	**12**	[8]		**1x3(L), 1x1(M), 2x4(E)**	**12**
16353	STIS FUV MAMA Dark Monitor			**54**	**6x9**	**54**
16354	STIS NUV MAMA Dark Monitor			**52**	**2x26**	**52**
16355	STIS MAMA FUV Flat-Field Monitor			**11***	**1x11**	**11***
16356	STIS MAMA Fold Distribution			**2**	**2x1**	**2**
Special and contingency programs						
16436	Monitoring the Three Primary White Dwarf Standard Stars	5			**1x1 + 2x1 + 2x1**	
16437	Absolute Fluxes of Faint WD Standards for Cross Calibration	12			**2x2 + 2x1 + 2x1 + 2x2**	**12**
16438	FUV Flux Variations at Off-Nominal Detector Positions	9			**3x3**	
16442	Assessing Flux Reproducibility in STIS Spatial Scans	5			**5x1**	
16357	STIS MAMA Anomalous Recovery (Contingency)			**(8)**		**(8)**
TOTAL	**Cycle 28 orbit request**	**52**	**[8]**	**1349+ (8)**		**Ext: 33 Int: 1358+(8)**

* Contains internal parallel orbits > 1800s.

Green means "executing on alternating cycle only"

( ) Indicates contingency orbits not included in Cycle 28 request.

[ ] Indicates coordinated parallel orbits included in the external total

Cycle 29 STIS Calibration Plan:
Routine Programs & Monitoring

STIS Cycle 29 Calibration and Monitoring Orbits Requested

Prop. ID	Title	External	External Parallel	Internal	Frequency (orbits x repeats)	Cycle 28 Allocation
CCD Monitors						
	STIS CCD Performance Monitor			**14**	**7x2**	**14**
	STIS CCD Dark Monitor			**742**	**1x248 + 1x248 + 1x246**	**728**
	STIS CCD Bias and Read Noise Monitor			**371**	**1x182 + 1x183**	**365**
	STIS CCD Hot Pixel Annealing			**39***	**3x13**	**39***
	STIS CCD Spectroscopic Flat-Field Monitor			**19**	**1x10 + 1x9**	**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**			**1x3 (L) + 2x1 (M)**	**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**	[8]		**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 NUV Flat-Field Monitor			**11***	**1x11**	**11***
	STIS MAMA Fold Distribution			**2**	**2x1**	**2**
Special and contingency programs						
	STIS MAMA Anomalous Recovery (Contingency)			**(8)**		**31+(8)**
TOTAL	**Cycle 29 orbit request**	**21**	**[8]**	**1369+ (8)**		**Ext: 52 Int: 1349+(8)**

* Contains internal parallel orbits > 1800s.

Green means "executing on alternating cycle only" – even cycles do FUV, odd cycles do NUV

( ) Indicates contingency orbits not included in Cycle 29 request.

[ ] Indicates coordinated parallel orbits included in the external total

STIS Cycle 29 Calibration Changes from Cycle 28

Two programs alternate between even and odd cycles:

- the STIS MAMA NUV Flat-Field Monitor will execute in Cycle 29 instead of the FUV Flat-Field Monitor
- the CCD Sparse Field CTE Internal program observations will use the GAIN = 1 setting this cycle (instead of GAIN = 4)

The biennial program monitoring the three primary white dwarf flux standards was executed in cycle 28, so it will not be done in cycle 29

Parallel exposures with WFC3 are again added to the STIS MAMA Spectroscopic Sensitivity and Focus Monitor echelle visits

Cycle 29 has 53 weeks (instead of 52) – affects daily CCD monitors

STIS/CCD Programs

Note: STIS Cycle 29 Phase Is Include Cycle 28 Usage Statistics

STIS CCD Performance Monitor
PI: Matthew Maclay

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	21.6% 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. Regular updates to the STIS monitors web page and a summary in the end of cycle ISR.
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 28	No changes.

STIS CCD Dark Monitor (Parts 1, 2, and 3)
PI: Matthew Maclay

Purpose	Monitor dark current for the STIS CCD.
Description	Routine monitoring with Amp D and GAIN = 1: obtain 2 visits per day
Fraction GO/GTO Programs Supported	21.6% of STIS total exposure time
Resources Required: Observations	252 (part 1) + 252 (part 2) + 238 (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), regular updates to the STIS monitors web page, and a summary in the end of cycle ISR.
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 28	No Changes

STIS CCD Bias and Read Noise Monitor (Parts 1 & 2)
PI: Matthew Maclay

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.
Fraction GO/GTO Programs Supported	21.6% of STIS total exposure time
Resources Required: Observations	189 (part 1) + 182 (part 2) internal orbits (all <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 biases for AMPs A and C should be taken for 6 consecutive days during most months.
Changes from Cycle 28	No changes

STIS CCD Hot Pixel Annealing
PI: Matthew Maclay

Purpose	To anneal hot pixels. 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	21.6% of STIS total exposure time.
Resources Required: Observations	39 internal orbits (3 every 4 weeks); 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 28	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 29 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 < 1800 s.
Fraction GO/GTO Programs Supported	21.6% of STIS total exposure time (cycle 28).
Resources Required: Observations	19 internal orbits (all <1800s)
Resources Required: Analysis	2.5 weeks FTE
Products	Reference files, summary in end of cycle ISR and special 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 28	No changes.

STIS CCD Imaging Flat-Field Monitor
PI: Kimberly Ward-Duong

Purpose	Purpose: Collect high SNR white light imaging flats (aperture=50CCD) for monitoring purposes and to create a new reference p-flat for coronagraphic (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 (similar to 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	21.6% of STIS total exposure time (Cycle 28)
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 28	No changes

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 29 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	16.5% of total STIS prime science exposure time (cycle 28)
Resources Required: Observations	3 internal orbits
Resources Required: Analysis	2 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 (typically Nov-Dec).
Changes from Cycle 28	No changes from Cycle 28 (the changes made for cycle 26 should yield adequate sets of measurable lines in all settings)

STIS CCD Sparse Field CTE Internal
PI: 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=1), alternating with GAIN=4 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 is executed once for GAIN=1 and once for GAIN=4 every-other cycle; this process requires a total of 50 orbits per cycle which includes various sets of biases and darks.
Fraction GO/GTO Programs Supported	21.6% of STIS total exposure time (cycle 28)
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 2021-November-01 and 2022-February-01. Visits should execute in order.
Changes from Cycle 28	Data taken for gain=1 instead of gain=4 (alternates every cycle). Extended scheduling window out from January to February to reflect typical schedulablility.

STIS CCD Full-Field Sensitivity
PI: Matthew Maclay

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	21.6% of total STIS exposure time (cycle 28)
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-2022:00:00:00 AND 20-MAR-2022:00:00:00
Changes from Cycle 28	None

STIS Slit Wheel Repeatability Monitor
PI: Amy M Jones

Purpose	To test the repeatability of the slit wheel motions
Description	A sequence of lamp spectra taken using grating G230MB
Fraction GO/GTO Programs Supported	90.6% of total STIS exposure time (Cycle 28)
Resources Required: Observations	One internal orbit (24 exposures, ~40 minutes total) once per cycle
Resources Required: Analysis	2 FTE days
Products	The average and maximum shifts observed in the dispersion and spatial directions. Possibly an ISR that sums up the analysis and results from the past few cycles
Accuracy Goals	Shifts should be smaller than 0.5 pixels
Scheduling & Special Requirements	Between 01 Nov 2021 and 06 Nov 2022 (generally early in the cycle)
Changes from Cycle 28	No changes

STIS CCD Spectroscopic Sensitivity Monitor
PI: Svea Hernandez

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	21.6% of STIS total exposure time (cycle 28)
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 28	No changes

STIS/MAMA Programs

STIS MAMA Spectroscopic Dispersion Solution Monitor
PI: Daniel Welty

Purpose	To monitor the wavelength calibration / dispersion solutions for selected STIS MAMA configurations.
Description	Internal wavecals will be obtained with gratings at primary and secondary central wavelengths chosen to cover Cycle 29 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	74.1% of total STIS prime science exposure time (cycle 28)
Resources Required: Observations	7 internal orbits
Resources Required: Analysis	6 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 (typically in Nov-Dec). The shortest wavelength settings should avoid orbits in which the FUV glow is strong (if possible).
Changes from Cycle 28	No changes from Cycle 28 (the changes made for cycle 26 should yield adequate sets of measurable lines in all settings)

STIS MAMA Full-Field Sensitivity
PI: Matthew Maclay

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	78.4% of STIS total exposure time (cycle 28)
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-2022:00:00:00
Changes from Cycle 28	No Changes

STIS MAMA Spectroscopic Sensitivity & Focus Monitor
PI: Svea Hernandez

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. Echelle visits include parallel WFC3/F438W observations to independently monitor the focus on orbital timescales.
Fraction GO/GTO Programs Supported	Focus monitor: 100% of STIS exposures. Sensitivity monitor: 78.4% of STIS total exposure time (cycle 28)
Resources Required: Observations	12 external orbits (coordinated parallel observations included in 8 of those)
Resources Required: Analysis	8 FTE weeks: 3 FTE weeks for sensitivity analysis, 2 weeks for ISR, 3 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 28	No changes

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	39.6% of STIS total exposure time (cycle 28)
Resources Required: Observations	54 internal orbits
Resources Required: Analysis	2 FTE-weeks
Products	Dark current images and temperature-dependent formula for applying to an individual observation. Update to monitoring webpage. DQ flags for pipeline super-darks.
Accuracy Goals	1% (statistical error on the total number of counts in an image)
Scheduling & Special Requirements	Groups of visits spaced apart every ~6 weeks SAA free
Changes from Cycle 28	No changes

STIS NUV MAMA Dark Monitor
PI: Amy M Jones

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	38.8% of total STIS exposure time (cycle 28)
Resources Required: Observations	52 internal orbits
Resources Required: Analysis	2 FTE weeks
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 28	None

STIS NUV-MAMA Flat-Field Monitor
PI: Amy Jones

Purpose	The goal of this program is to obtain NUV-MAMA flat-field observations to create new p-flats with a SNR of ~100 per low-res pixel. The flats are obtained with the D_2 lamp, and the medium-resolution G230M grating.
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 G230M flats will be taken with the slit at 5 different offset positions in order to illuminate the detector regions 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	38.8% of STIS total exposure time (Cycle 28).
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 NUV flats from several 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 lifetimes. Visits are spaced by ~1 month through the cycle.
Changes from Cycle 28	This cycle is for NUV-MAMA flats, while Cycle 28 was for FUV-MAMA flats. Exact setup may differ from Cycle 27 (pending results from special calibration program 16517).

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	78.4% of STIS total exposure time (cycle 28)
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 28	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	78.4% of STIS total exposure time (cycle 28)
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 28	No changes

Cycle 28 Usage Statistics

STIS Cycle 28 Usage Statistics for each Configuration/Mode

Configuration/Mode	Percentage of STIS Prime Exposure Time		Percentage of STIS SNAP Exposure Time		Percentage of STIS Total Exposure Time	
	C27	C28	C27	C28	C27	C28
CCD	**20.9%**	**19.0%**	**--**	**47.5%**	**20.9%**	**21.6%**
CCD/Imaging	3.0%	5.6%	--	0.0%	3.0%	5.1%
CCD/Spectroscopy	17.9%	13.4%	--	47.5%	17.9%	16.5%
MAMA/FUV	**39.6%**	**43.5%**	**--**	**0.0%**	**39.6%**	**39.6%**
FUV/Imaging	0.0%	4.7%	--	0.0%	0.0%	4.3%
FUV/Spectroscopy	39.6%	38.8%	--	0.0%	39.6%	35.3%
MAMA/NUV	**39.5%**	**37.5%**	**--**	**52.5%**	**39.5%**	**38.8%**
NUV/Imaging	0.0%	0.0%	--	0.0%	0.0%	0.0%
NUV/Spectroscopy	39.5%	37.5%	--	52.5%	39.5%	38.8%

STIS Cycle 28 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		**Percentage of STIS Total Science Exposure Time**	
		C27	C28	C27	C28	**C27**	**C28**
STIS/CCD	G230LB	2.7%	3.8%	--	20.6%	**2.7%**	**5.3%**
(21.6%)	G230MB	2.6%	--	--	0.0%	**2.6%**	**0.0%**
	G430L	3.2%	3.9%	--	26.9%	**3.2%**	**6.0%**
	G430M	6.6%	1.4%	--	--	**6.6%**	**1.2%**
	G750L	1.5%	3.5%	--	--	**1.5%**	**3.1%**
	G750M	1.4%	0.9%	--	--	**1.4%**	**0.8%**
	MIRROR/CORON	3.0%	5.6%	--	--	**3.0%**	**5.1%**
STIS/MAMA-FUV	E140H	7.0%	3.9%	--	--	**7.0%**	**3.5%**
(39.6%)	E140M	8.5%	6.7%	--	--	**8.5%**	**6.1%**
	G140L	17.0%	16.5%	--	--	**17.0%**	**15.0%**
	G140M	7.2%	11.8%	--	--	**7.2%**	**10.7%**
	MIRROR	--	4.7%	--	--	**--**	**4.3%**
STIS/MAMA-NUV	E230H	1.6%	5.4%	--	52.5%	**1.6%**	**9.6%**
(38.8%)	E230M	10.4%	4.5%	--	--	**10.4%**	**4.1%**
	G230L	27.5%	27.6%	--	--	**27.5%**	**25.1%**
	G230M	--	--	--	--	**--**	**--**
	MIRROR	--	--	--	--	**--**	**--**

Cycle 28 Instrument Usage Statistics Based on Approved Programs

STIS orbits comprised ~22.8% of all GO prime orbits
(regular + mid-cycle) in Cycle 28

Instruments	Prime Orbits Usage Regular (mid I / mid II)	SNAP Orbit Usage Regular
ACS	10.9% (13% / 6%)	11.9%
COS	20.6% (2% / 7%)	--
STIS	22.4% (28% / 19%)	26.8%
WFC3	46.1% (58% / 69%)	62.3%
FGS	0.0%	--

[Taken from presentations (on 10/15/2020 and 4/27/2021) by C. Leitherer on Cycle 28 regular and mid-cycle (I / II) results, based on 2868 and (363 / 251) total orbits approved.]