# Cycle 31 STIS Regular Calibration Program

STIS Team

2023June08

# STIS Approved Calibration and Monitor Orbits

| | # 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 |
| **Cycle 30** | 20 | 26 | [8] | 1342 | 1368 |
| **Cycle 31*** | 19 | 21 | [8] | 1348 | 1369 |

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

* Regular calibration and monitoring programs requested for cycle 31

# STIS Cycle 30 Calibration and Monitoring Orbits Approved

| Prop. ID | Title | External | External Parallel | Internal | Frequency (orbits x repeats) | Cycle 29 Allocation |
|---|---|---|---|---|---|---|
| **CCD Monitors** | | | | | | |
| 16945 | STIS CCD Performance Monitor | | | **14** | **7x2** | **14** |
| 16946-16948 | STIS CCD Dark Monitor | | | **728** | **1x252 + 1x252 + 1x224** | **742** |
| 16949-16950 | STIS CCD Bias and Read Noise Monitor | | | **364** | **1x182 + 1x182** | **371** |
| 16951 | STIS CCD Hot Pixel Annealing | | | **39*** | **3x13** | **39*** |
| 16944 | STIS CCD Spectroscopic Flat-Field Monitor | | | **19** | **1x10 + 1x9** | **19** |
| 16952 | STIS CCD Imaging Flat-Field Monitor | | | **4** | **1x4** | **4** |
| 16954 | STIS CCD Spectroscopic Dispersion Solution Monitor | | | **3** | **3x1** | **3** |
| 16953 | STIS CCD Sparse Field CTE | | | **50*** | **50x1** | **50*** |
| 16955 | STIS CCD Full Field Sensitivity | **1** | | | **1x1** | **1** |
| 16958 | STIS Slit Wheel Repeatability | | | **1*** | **1x1** | **1*** |
| 16957 | STIS CCD Spectroscopic Sensitivity Monitor | **5** | | | **1x3 (L) + 2x1 (M)** | **5** |
| **MAMA Monitors** | | | | | | |
| 16959 | STIS MAMA Spectroscopic Dispersion Solution Monitor | | | **7** | **7x1** | **7** |
| 16956 | STIS MAMA Full Field Sensitivity | **3** | | | **1x3** | **3** |
| 16960 | STIS MAMA Spectroscopic Sensitivity and Focus Monitor | **12** | [8] | | **1x3(L), 1x1(M), 2x4(E)** | **12** |
| 16961 | STIS FUV MAMA Dark Monitor | | | **48** | **6x9** | **54** |
| 16962 | STIS NUV MAMA Dark Monitor | | | **52** | **2x26** | **52** |
| 16963 | STIS MAMA FUV Flat-Field Monitor | | | **11*** | **1x11** | **11*** |
| 16964 | STIS MAMA Fold Distribution | | | **2** | **2x1** | **2** |
| **Special and contingency programs** | | | | | | |
| 16966 | Monitoring the Three Primary White Dwarf Standard Stars | 5 | | | **5x1** | **0** |
| 16965 | STIS MAMA Anomalous Recovery (Contingency) | | | **(8)** | | **(8)** |
| **TOTAL** | **Cycle 30 orbit request** | **26** | **[8]** | **1342 + (8)** | | **Ext: 21 Int: 1369+(8)** |

* Contains internal parallel orbits > 1800s.

Green means "executing on alternating cycle only"

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

[ ] Indicates coordinated parallel orbits included in the external total

# Cycle 31 STIS Calibration Plan:
## Routine Programs & Monitoring

# STIS Cycle 31 Calibration and Monitoring Orbits Requested

| Prop. ID | Title | External | External Parallel | Internal | Frequency (orbits x repeats) | Cycle 30 Allocation |
|---|---|---|---|---|---|---|
| **CCD Monitors** | | | | | | |
| | STIS CCD Performance Monitor | | | **14** | **7x2** | **14** |
| | STIS CCD Dark Monitor | | | **728** | **1x252 + 1x252 + 1x224** | **728** |
| | STIS CCD Bias and Read Noise Monitor | | | **364** | **1x182 + 1x182** | **364** |
| | 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** | **6x8** | **48** |
| | 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, CCD/MAMA, and contingency programs** | | | | | | |
| | STIS MAMA Anomalous Recovery (Contingency) | | | **(8)** | | **(8)** |
| **TOTAL** | **Cycle 31 orbit request** | **21** | **[8]** | **1348+ (8)** | | **Ext: 26 Int: 1342+(8)** |

* Contains internal parallel orbits > 1800s.

Green means "executing on alternating cycle only"

( ) Indicates contingency orbits not included in Cycle 31 request.

[ ] Indicates coordinated parallel orbits included in the external total

# STIS Cycle 31 Calibration Changes from Cycle 30

Two programs alternate between even and odd cycles:

- the STIS MAMA NUV Flat-Field Monitor will execute in cycle 31 instead of the FUV Flat-Field Monitor
- the CCD Sparse Field CTE internal program observations will use the GAIN = 1 setting in cycle 31 (instead of GAIN = 4)

The biennial program monitoring the three primary white dwarf flux standards was executed in cycle 30, so will not be done in cycle 31.

Ten of the 50 visits for the CCD sparse field CTE monitor have been extended beyond the usual 1800 s limit, to obtain increased S/N in the weaker exposures (vs. seven such visits in previous cycles).

The FUV MAMA dark monitor has 54 orbits (instead of 48), due to phasing of the visits (every 6 weeks) relative to the start of the cycle.

# STIS/CCD Programs

**Note: STIS Cycle 31 Phase Is Include Cycle 30 Usage Statistics**

# STIS CCD Performance Monitor
## PI: Matthew Dallas

| | |
|---|---|
| **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** | 9.4% of STIS total exposure time (cycle 30). |
| **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 30** | No changes. |

# STIS CCD Dark Monitor (Parts 1, 2, and 3)
## PI: Sophia Medallon

| | |
|---|---|
| **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** | 9.4% of STIS total exposure time |
| **Resources Required: Observations** | 252 (part 1) + 252 (part 2) + 224 (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 30** | No Changes |

# STIS CCD Bias and Read Noise Monitor (Parts 1 & 2)

PI: Daniel Stapleton  Co-I: Matthew Dallas

| | |
|---|---|
| **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** | 9.4% of STIS total exposure time (cycle 30) |
| **Resources Required: Observations** | 182 (part 1) + 182 (part 2) internal orbits |
| **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 CRDS 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 30** | No changes |

# STIS CCD Hot Pixel Annealing
# PI: Sophia Medallon

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|---|---|
| **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** | 9.4% 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 4$^{th}$ week using 3 orbits. |
| **Changes from Cycle 30** | No changes. |

# STIS CCD Spectroscopic Flat-Field Monitor
## PI: Matthew Dallas

| | |
|---|---|
| **Purpose** | Obtain medium resolution grating flats to determine the pixel-to-pixel variation for spectroscopic observations and produce the Cycle 31 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** | 9.4% of STIS total exposure time (cycle 30). |
| **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<br>10 orbits with the G430M/5612 & 52x2 |
| **Changes from Cycle 30** | No changes. |

# STIS CCD Imaging Flat-Field Monitor
## PI: Emily Rickman

| | |
|---|---|
| **Purpose** | To 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** | 9.4% of STIS total exposure time (Cycle 30) |
| **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 30** | 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 31 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** | 8.0% of total STIS exposure time (cycle 30) |
| **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 (generally early in the cycle). |
| **Changes from Cycle 30** | No changes |

# 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=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. |
| **Fraction GO/GTO Programs Supported** | 9.4% of STIS CCD total exposure time (cycle 30) |
| **Resources Required: Observations** | 50 internal visits (10/50 visits will exceed the usual 1800 s limit by 412 s in order to capture the full sequence of exposures required for best analysis.) In previous cycles, 7 visits had exceeded the 1800 s limit (by ~100 s). |
| **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 2023-November-06 and 2024-February-01.<br>Visits should execute in order. |
| **Changes from Cycle 30** | Data taken for gain=1 instead of gain=4 (alternates every cycle).<br>Faintest flux group (10 visits): Increased exposures per visit from 10 to 16; 2212 s per visit > 1800 s limit.<br>Next 2 flux groups (11 visits): Increase exposures per visit from 10/11 to 12 per visit; under 1800 s limit.<br>Added Matthew Dallas as Co-I. |

# STIS CCD Full-Field Sensitivity
## PI: Emily Rickman

| | |
|---|---|
| **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** | 9.4% of total STIS exposure time (cycle 30) |
| **Resources Required: Observations** | 1 external orbit |
| **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-2024:00:00:00 AND 20-MAR-2024:00:00:00 |
| **Changes from Cycle 30** | No changes |

# 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 (2697A), cycling through the three narrowest long STIS slits. |
| **Fraction GO/GTO Programs Supported** | 95% of total STIS exposure time (Cycle 30) |
| **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 06 Nov 2023 and 03 Nov 2024 (generally early in the cycle) |
| **Changes from Cycle 30** | No changes |

# STIS CCD Spectroscopic Sensitivity Monitor
## PI: Daniel Stapleton

| | |
|---|---|
| **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** | 9.4% of STIS total exposure time (cycle 30) |
| **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 30** | 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 31 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** | 87.0% of total STIS prime science exposure time (cycle 30) |
| **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. The shortest wavelength settings should avoid orbits in which the FUV glow is strong (if possible). |
| **Changes from Cycle 30** | No changes |

# STIS MAMA Full-Field Sensitivity
## PI: Emily Rickman

| | |
|---|---|
| **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** | 90.6% of STIS total exposure time (Cycle 30) |
| **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-2024:00:00:00 |
| **Changes from Cycle 30** | No changes |

# STIS MAMA Spectroscopic Sensitivity & Focus Monitor
## PI: Daniel Stapleton

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|---|---|
| **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.<br>• 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: 90.6% of STIS total exposure time (cycle 30) |
| **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 30** | 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** | 51.7% of STIS total exposure time (cycle 30) |
| **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 (6 orbits total) every ~6 weeks<br>SAA free |
| **Changes from Cycle 30** | 54 internal visits (instead of 48) due to phase wrt cycle boundaries.<br>Added Amy Jones as Co-I. |

# 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** | 38.9% of STIS total exposure time (cycle 30) |
| **Resources Required: Observations** | 52 internal orbits |
| **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** | two 1-orbit visits every 2 weeks<br>SAA free |
| **Changes from Cycle 30** | No changes |

# 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 DEUTERIUM lamp, and the medium resolution grating G230M. |
| **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 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** | 38.9% of STIS total exposure time (Cycle 30). |
| **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 purposes. 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 lifetime. Visits (1 orbit each) are spaced by ~1 month through the cycle. |
| **Changes from Cycle 30** | This cycle is for NUV-MAMA flats, while Cycle 30 was for FUV-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** | 90.6% of STIS total exposure time (cycle 30) |
| **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** | 5% for peak of fold distribution |
| **Scheduling & Special Requirements** | This proposal is executed annually (usually in spring). Special commanding is required. |
| **Changes from Cycle 30** | 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** | 90.6% of STIS total exposure time (cycle 30) |
| **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. Special commanding is required. |
| **Changes from Cycle 30** | No changes |

# Cycle 30 Usage Statistics

# STIS Cycle 30 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 | |
|---|---|---|---|---|---|---|
| | C29 | C30 | C29 | C30 | C29 | C30 |
| **CCD** | **16.0%** | **9.4%** | **100.0%** | **0.0%** | **17.8%** | **9.4%** |
| CCD/Imaging | 52.9% | 1.4% | 0.0% | 0.0% | 2.9% | 1.4% |
| CCD/Spectroscopy | 13.1% | 8.0% | 100.0% | 0.0% | 14.9% | 8.0% |
| **MAMA/FUV** | **47.4%** | **51.7%** | **0.0%** | **0.0%** | **46.4%** | **51.7%** |
| FUV/Imaging | 2.6% | 3.6% | 0.0% | 0.0% | 2.5% | 3.6% |
| FUV/Spectroscopy | 44.8% | 48.1% | **0.0%** | 0.0% | 43.9% | 48.1% |
| **MAMA/NUV** | **36.6%** | **38.9%** | **0.0%** | **0.0%** | **35.8%** | **38.9%** |
| NUV/Imaging | 2.7% | 0.0% | 0.0% | 0.0% | 2.6% | 0.0% |
| NUV/Spectroscopy | 33.9% | 38.9% | 0.0% | 0.0% | 33.2% | 38.9% |

[Compiled by Merle Reinhart]

# STIS Cycle 30 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** | |
|---|---|---|---|---|---|---|---|
| | | C29 | C30 | C29 | C30 | **C29** | **C30** |
| STIS/CCD | G230LB | 3.6% | 2.4% | 100.0% | 0.0% | **5.6%** | **2.4%** |
| (9.4%) | G230MB | 0.0% | 0.0% | 0.0% | 0.0% | **0.0%** | **0.0%** |
| | G430L | 6.4% | 1.8% | 0.0% | 0.0% | **6.3%** | **1.8%** |
| | G430M | 0.0% | 0.0% | 0.0% | 0.0% | **0.0%** | **0.0%** |
| | G750L | 1.9% | 3.7% | 0.0% | 0.0% | **1.9%** | **3.7%** |
| | G750M | 1.2% | 0.1% | 0.0% | 0.0% | **1.2%** | **0.1%** |
| | MIRROR/CORON | 2.9% | 1.4% | 0.0% | 0.0% | **2.9%** | **1.4%** |
| STIS/MAMA-FUV | E140H | 2.8% | 8.6% | 0.0% | 0.0% | **2.7%** | **8.6%** |
| (51.7%) | E140M | 2.3% | 11.6% | 0.0% | 0.0% | **2.3%** | **11.6%** |
| | G140L | 27.3% | 18.0% | 0.0% | 0.0% | **26.7%** | **18.0%** |
| | G140M | 12.5% | 9.9% | 0.0% | 0.0% | **12.2%** | **9.9%** |
| | MIRROR | 2.6% | 3.6% | 0.0% | 0.0% | **2.5%** | **3.6%** |
| STIS/MAMA-NUV | E230H | 4.0% | 16.1% | 0.0% | 0.0% | **3.9%** | **16.1%** |
| (38.9%) | E230M | 3.8% | 3.2% | 0.0% | 0.0% | **3.7%** | **3.2%** |
| | G230L | 26.1% | 19.6% | 0.0% | 0.0% | **25.5%** | **19.6%** |
| | G230M | 0.0% | 0.0% | 0.0% | 0.0% | **0.0%** | **0.0%** |
| | MIRROR | 2.7% | 0.0% | 0.0% | 0.0% | **2.6%** | **0.0%** |

# Cycle 30 Instrument Usage Statistics Based on Approved Programs

STIS orbits comprised ~14.0% of all GO prime orbits (regular programs only) in Cycle 30

| Instruments | Prime Orbits Usage Regular | SNAP Orbit Usage Regular |
|---|---|---|
| ACS | 12.5% | 13% |
| COS | 18.9% | 0% |
| STIS | 14.0% | 0% |
| WFC3 | 54.5% | 88% |
| FGS | 0.0% | 0% |

[Taken from presentation (10/21/2022) by C. Leitherer to STUC on Cycle 30 regular program results, based on 3470 total orbits approved.]