

Cycle 20 STIS Calibration Plan

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STIS Cycle 20 Usage Statistics Based on Phase II Submissions

- STIS orbits comprise 14.7% of all prime exposure time[†] in Cycle 20 when considering all instruments.
(Compared to 22.2% in Cycle 19.)

Instruments*	Prime Exposure Time %	SNAP Exp Time %
ACS	21.5	40.8
COS	24.1	0.0
STIS	14.7	6.3
WFC3	38.2	50.2
FGS	1.5	2.7
NICMOS	N/A	N/A

* Based on Merle Reinhart's Cycle 20 statistics in /home/reinhart.

[†] Exposure times have some inaccuracies due to the way sub-exposures are treated in the database query.

STIS Cycle 20 Exposure Time Percentages as a Function of Configuration/Mode

Configuration/ Mode	% Prime Time Cycle 20	% Prime Time Cycle 19	% SNAP Time Cycle 20	% SNAP Time Cycle 19
CCD	22.9%	53.4%	---	---
CCD/Imaging	5.1%	2.9%	---	---
CCD/Spectroscopy	17.6%	50.5%	100%	---
FUV	49.7%	19.3%	---	100%
FUV/Imaging	9.7%	1.3%	---	---
FUV/Spectroscopy	40.0%	18.0%	---	---
NUV	27.2%	27.3%	---	---
NUV/Imaging	0.4%	1.0%	---	---
NUV/Spectroscopy	26.6%	26.3%	---	---

STIS Cycle 20 Exposure Time Percentages as a Function of Grating/Mirror

Configuration/ Mode	Grating/Mirror	% Prime Time Cycle 20	% Prime Time Cycle 19	% SNAP Time Cycle 20	% SNAP Time Cycle 19
STIS/CCD	G230LB	---	2.4%	---	---
	G430L	2.6%	22.3%	---	100%
	G430M	3.1%	7.3%	---	---
	G750L	7.0%	13.1%	---	---
	G750M	5.1%	5.4%	---	---
	MIRROR	5.1%	2.9%	---	---
STIS/FUV	E140H	10.0%	2.4%	---	---
	E140M	10.7%	6.3%	---	100.0%
	G140L	10.8%	8.1%	---	---
	G140M	8.6%	1.2%	---	---
	MIRROR	9.6%	1.3%	---	---
STIS/NUV	E230H	2.0%	0.9%	---	---
	E230M	14.4%	8.3%	---	---
	G230L	9.7%	16.7%	---	---
	G230M	---	0.4%	---	---
	MIRROR	0.3%	1.0%	---	---

STIS Cycle 20 Calibration and Monitor Orbits Request

Prop. ID	Title	External	External Parallel	Internal	Frequency	Cycle 19 Allocation
CCD Monitors						
	CCD Performance Monitor			14	2x7	14
	CCD Dark Monitor			730	364+366	732
	CCD Bias and Readnoise Monitor			369	182+183+4	366
	CCD Hot Pixel Annealing			39*	13x3	39
	CCD Spectroscopic Flats			19	various	37
	CCD Imaging Flats			4	various	8
	CCD Spectroscopic Dispersion Solution Monitor			3	3x1	3
	CCD Sparse Field CTE			82	82x1	82
	CCD Full Field Sensitivity	1			1x1	1
	Slit Wheel Repeatability			1	1x1	1
	CCD Spectroscopic Sensitivity Monitor	5			3x1/L, 1x2/M	5
	CCD Residual Images after Saturation			4	4x1	0
MAMA Monitors						
	MAMA Dispersion Solutions			7	7x1	7
	MAMA Full Field Sensitivity	3			1x3	3
	MAMA Spectroscopic Sensitivity and Focus Monitor COS Observations of Geocoronal Ly α Emission	12	4		3x1/L, 1x1/M, 4x2/E	12 + 5
	FUV MAMA Dark Monitor			54	9x6	64
	NUV MAMA Dark Monitor			52	26x2	52
	MAMA FUV Flats			11*	11x1	11
	MAMA Fold Distribution			2	1x2	2
	MAMA Anomalous Recovery			(6)		
Cycle 20 Total		21	4	1391		1444

STIS Cycle 17:
25 programs
68 external orbits
86 parallel orbits
1816 internal orbits
1970 total orbits

STIS Cycle 18:
20 programs
22 external orbits
39 parallel orbits
1370 internal orbits
1431 total orbits

STIS Cycle 19:
18 programs
21 external orbits
5 parallel orbits
1418 internal orbits
1444 total orbits

STIS Cycle 20:
20 programs
21 external orbits
4 parallel orbits
1391 internal orbits
1426 total orbits

Number of STIS Cycle 20
GO External Orbits = 245

*Internal parallel orbits > 1800s. Green means "executing this cycle only". () Indicates contingency orbits not included in Cycle 20 request.

STIS Cycle 20 Calibration Outsourcing Programs

Outsourced Calibration and Monitoring				
Prop. ID	Title	External	Internal	Frequency
12923	Pointing the Finger: Calibrating the Hidden Features of STIS and Enabling New Coronagraphy at Separations of 0.15"	6		1x1
12947	Determination of the line-spread function of the EI40H grating with the 0.2 x 0.5 slit		1*	1x1

* Indicates orbits > 1800s

** Indicates orbits > 1800s and a mixture of external and internal orbits

() indicates contingency orbits not included Cycle 20 request.

CCD Performance Monitor

P.I. Svea Hernandez

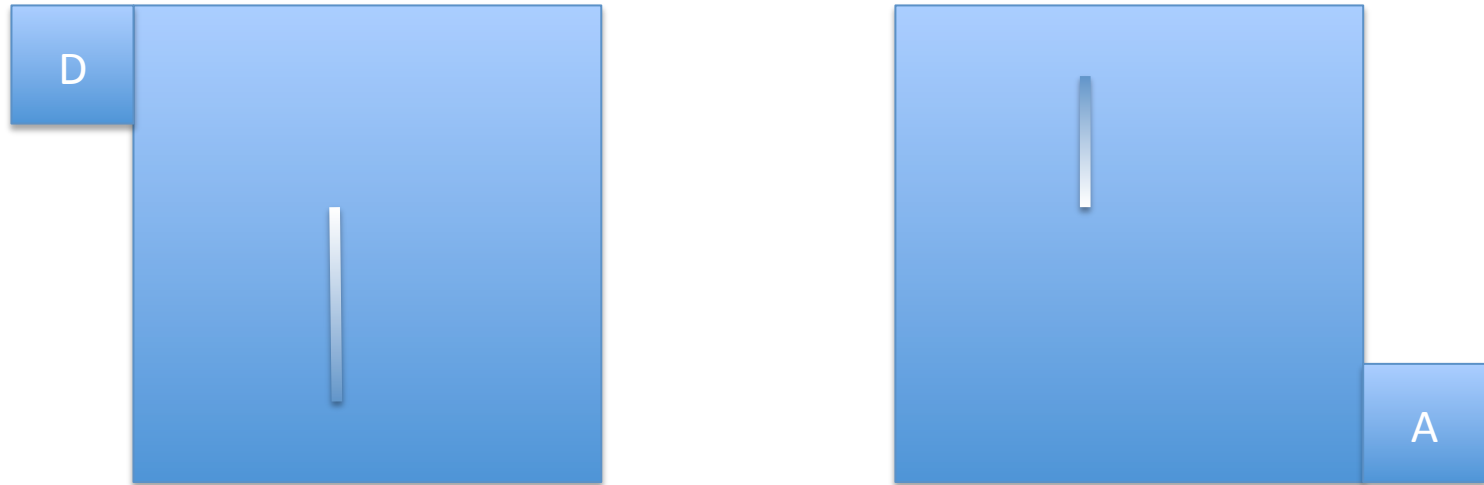
Purpose	To measure the baseline performance of the CCD system.
Description	This program monitors the performance of the CCD system on orbit during 2013. Only primary amplifier D is used. Bias and Flat Field exposures are taken in order to measure read noise, CTE (EPER test), spurious charge and gain. Full frame observations are made. Bias frames are taken in sub-array readouts to check the bias level for ACQ and ACQ/PEAK observations. All orbits < 1800s.
Fraction GO/GTO Programs Supported	23% of STIS total exposure time.
Resources Required: Observations	14 internal orbits, performed in two groups of 7.
Resources Required: Analysis	2 FTE weeks for analysis. Provides baseline measurements of gains, read noise, charge transfer efficiency, spurious charge and performance verification of binning and sub-array readout capabilities. Provides a rough assessment of changes in flat field features due to dust motes or other particulates.
Products	Possible update of the gain and read out 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. Possible report in a STAN and a summary in the end of cycle ISR.
Accuracy Goals	Read-out noise error < 0.3 electrons. Gain error < 0.08 electrons.
Scheduling & Special Requirements	Orbits will occur every 6 months starting in March 2013 and then in September 2013.
Changes from Cycle 19	No changes.

CCD Dark Monitor (Parts I & 2)

P.I. Svea Hernandez

Purpose	Monitor the darks for the STIS CCD.
Description	<p>Obtain darks at GAIN=1 in order to monitor CCD behavior and chart growth of hot and bad pixels. Check how well the anneals work for the CCD. All exposures are internals and fit in occultation orbits.</p> <p>In addition to routine monitoring, one month of 60s daily darks will be replaced with AMP=A 60s darks to conduct a measure of the absolute CTI as a function of the number of transfers in the STIS CCD using warm pixels and a direct comparison to typical AMP=D 60s darks. We will schedule this month during periods when the STIS CCD is not being heavily used, thus mitigating any potential impact to GOs.</p> <p>All orbits < 1800s.</p>
Fraction GO/GTO Programs Supported	23% of STIS total exposure time.
Resources Required: Observations	364 (pt1) + 366 (pt2) internal orbits (twice per day)
Resources Required: Analysis	2 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.
Products	Weekly CDBS reference files (superdarks) and a summary in the end of cycle ISR.
Accuracy Goals	Superdark rms < 0.012 e-/s. S/N > 1.0
Scheduling & Special Requirements	Two orbits per day. Schedule the CTI measurements during the month when the STIS CCD has the least use.
Changes from Cycle 19	Changed visit strategy during one month to support absolute CTI measurements using hot pixels.

Studying CTI with the STIS CCD



- Currently, the STIS calibration program includes an absolute test of CTI spectroscopically with the Internal Sparse Field Monitor.
- Inspired by Jay Anderson, we wish to investigate absolute CTI *with STIS CCD darks* using parallel amplifiers and switching the readout direction--
the only instrument on HST that can perform this experiment.
- By taking a series of short darks with Amplifier D and then Amplifier A, we can measure the absolute effects of CTI as a function of transfers for warm pixels (WPs).

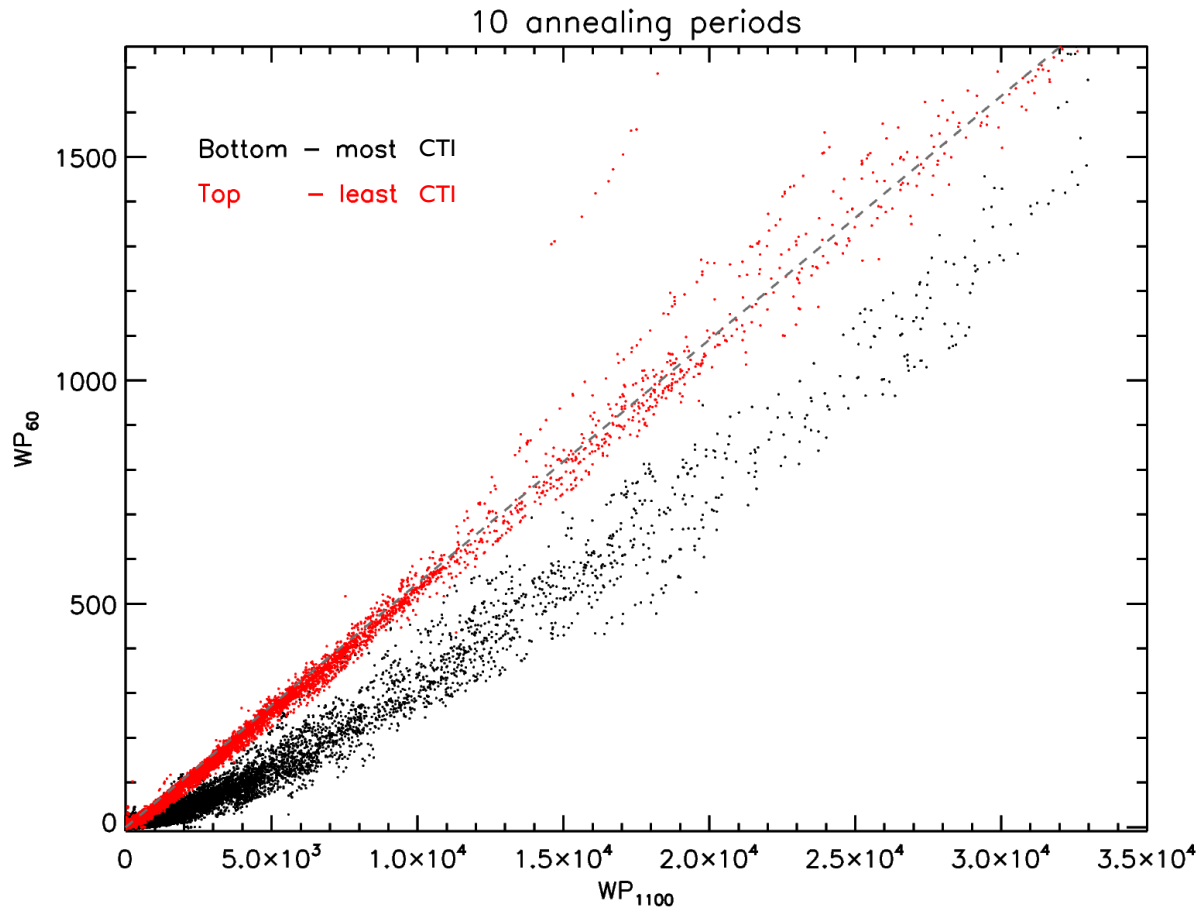
Estimating Absolute CTI

The ACS & WFC3 Approach

- ACS and WFC3 compare long and short darks to determine the magnitude of CTI as a function of flux level.
- Warm pixels (WPs) with more flux are less biased by CTI losses, and provide an accurate baseline for comparison to the same WPs in shorter darks.
- This assumption breaks down for low flux levels (or older detectors) where CTI is still significant in the long darks.

Strategy for STIS

- Use one month of short daily darks (60s), which are already part of our routine dark monitoring, for readout through both amplifiers A & D.
- This requires additional bias exposures, but these fit within our routine bias monitoring, at the expense of one month of monitoring the GAIN=4 read noise.



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

P.I. Svea Hernandez

Purpose	Monitor the bias in the 1x1 bin settings at GAIN=1, and 1x1 at GAIN = 4, to build up high S/N superbias and track the evolution of hot columns. Also GAIN=1, 1x1 biases through AMPS A and C to use in combination with biases taken through AMP D for monitoring of the read noise.
Description	<p>Take full frame bias exposures in the 1x1 bin settings at GAIN=1, and 1x1 at GAIN = 4. Take full frame biases through AMPS A and C. All exposures are internals and fit in occultation orbits.</p> <p>In addition to routine monitoring, during one month we need 4 additional orbits of GAIN=1, AMP=A biases in support of absolute CTI measurements using hot pixels in darks.</p> <p>All orbits < 1800s.</p>
Fraction GO/GTO Programs Supported	23% of STIS total exposure time.
Resources Required: Observations	182 (part1) + 183 (part2) + 4 (CTI) internal orbits
Resources Required: Analysis	2 FTE weeks. Retrieve and construct superbias. These superbias are compared to previous superbias and the image statistics are checked to see if there are any anomalous statistical deviations. Furthermore, acquisition of biases through AMPS A and C will allow the read noise monitor to be accomplished.
Products	Weekly CDBS reference files (superbias) and a summary in the end of cycle ISR.
Accuracy Goals	Superbias rms < 0.95 e- at GAIN=1 1x1 and rms < 1.13 e- at GAIN=4 1x1. S/N > 1.
Scheduling & Special Requirements	One orbit per day. The additional biases for AMP=A should be during the same month as the AMP=A darks for CTI.
Changes from Cycle 19	Changed one monitoring visit to support absolute CTI measurements using hot pixels.

CCD Hot Pixel Annealing

P.I. Svea Hernandez

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. All visits > 1800s. Pure parallel mode.
Fraction GO/GTO Programs Supported	23% 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	Anneals will execute every 4th week using 3 orbits.
Changes from Cycle 19	No changes.

CCD Spectroscopic Flats

P.I. Elena Mason

Purpose	Obtain MR grating flats to determine the pixel-to-pixel variation for spectroscopic observations and produce the cycle 20 reference p-flat (m- and l-mode).
Description	We will use the tungsten lamp and the MR grating G430M to determine the pixel-to-pixel variation of the STIS CCD in spectroscopic mode. The flat exposures will be taken with the apertures 50CCD and 52x2 at 5 offset positions in order to map -with a sufficient SNR- the whole sensitive area of the detector. The expected signal is $\geq 1.4E6$ ADU/pixels; while the expected accuracy will be $\leq 1.5\%$.
Fraction GO/GTO Programs Supported	18% of STIS total exposure time.
Resources Required: Observations	19 internal orbits: 9 for G430M 5216 50CCD, 10 for G430M 5216 52x2. All orbits are < 1800 sec duration.
Resources Required: Analysis	2.5 FTE weeks
Products	Reference files (m- and l-mode p-flats).
Accuracy Goals	$\leq 1.5\%$ RMS of the final flat image.
Scheduling & Special Requirements	The 50CCD exposures will be distributed across the cycle for monitoring purposes.
Changes from Cycle 19	The 18 orbits requested in cycle 18 (and 19) for the exposures with the LR gratings (G430L and G750) have been dropped, as the new dust-mote map at the magnification of the LR gratings has been created. Time variation of the dust motes are expected to be sufficiently slow that yearly monitoring is not necessary.

CCD Imaging Flats

P.I. Elena Mason

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-month cadence will allow us to monitor possible (but unlikely) variations across the cycle. The combined observations will allow us to obtain an average signal ~620000 ADU/pix (similar 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 MSM limited reproducibility.
Fraction GO/GTO Programs Supported	5% of STIS total exposure time.
Resources Required: Observations	4 internal orbits
Resources Required: Analysis	4 FTE weeks.
Products	Reference file and relevant ISR or TIR.
Accuracy Goals	~1%
Scheduling & Special Requirements	1 orbit every 3 months
Changes from Cycle 19	The number of orbits has been halved with respect to previous cycles. In addition, the set of exposures with the aperture F28X50LP has been dropped. They will be (partly) replaced with the aperture CORON in order to monitor MSM reproducibility and test the possibility of producing a coronagraphic I-flat.

CCD Spectroscopic Dispersion Solution Monitor

P.I. Paule Sonnentrucker

Purpose	To constrain the wavelength and spatial distortion maps
Description	Internal wavecalcs will be obtained with all 6 gratings (G230LB, G230MB, G430L, G430M, G750L, G750M) supported for use with the CCD. All observations will be obtained with the 52x0.1 aperture, which maps to 2 pixels at the CCD. The HITMI lamp will be used, rather than the LINE lamp. The HITMI lamp has a more favorable spatial illumination pattern, dropping by only a factor of 3 at row 900, relative to the peak brightness at row 420. A comparison LINE lamp wavecal is however included with the G430L/4300 grating. All orbits < 1800s.
Fraction GO/GTO Programs Supported	18% of STIS total exposure time.
Resources Required: Observations	3 internal orbits
Resources Required: Analysis	4 FTE weeks
Products	Reference file, ISR, and a 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 HITMI wavecalcs were used to estimate exposure times assuming no significant degradation since Cycle 19.
Scheduling & Special Requirements	none
Changes from Cycle 19	No changes.

CCD Sparse Field CTE

P.I. Svea Hernandez

Purpose	Acquire an accurate correction for parallel register CTE losses that can be used for direct analysis of science data with negligible background. Do measurements for both GAIN settings (1 and 4).
Description	The sparse field CTE will be measured via internal calibration lamp observations taken through narrow slits. The strategy of the test is as follows. 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 cross disperser slits: 0.05x31NDB and 0.05x31NDA. In order to test the effects of different bias voltages the whole series of exposures are executed once for GAIN=1, and once for GAIN=4; this process requires a total of 74 orbits which includes various sets of biases. For the CTE pixel based correction, the test requires 8 orbits for darks read out with amplifiers A and C. All orbits < 1800s.
Fraction GO/GTO Programs Supported	23% of STIS total exposure time.
Resources Required: Observations	82 internal orbits
Resources Required: Analysis	2 FTE weeks
Products	Determine slope for time dependent correction of CTE, possible update of ccdtab reference file, and summary in the end of cycle ISR.
Accuracy Goals	CTE correction coefficients will be determined to a relative accuracy of 1%.
Scheduling & Special Requirements	The whole set of calibration exposures is repeated for GAIN=1 and GAIN=4. The first set should execute in November 2012 and includes visits 01-32; these must be done consecutively. The second set should be scheduled for December 2012 and includes visits 33-82, consecutively as well.
Changes from Cycle 19	No changes

CCD Full Field Sensitivity

P.I. Julia Roman-Duval

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. Although this test is done using CCD imaging mode, 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	23% of STIS total exposure time.
Resources Required: Observations	1 external orbit
Resources Required: Analysis	1 FTE week
Products	Possible STAN, possible ISR, and a summary in the end of cycle ISR.
Accuracy Goals	1%
Scheduling & Special Requirements	ORIENT 310.0D TO 310.0 D; BETWEEN 15-JAN-2013:00:00:00 AND 20-MAR-2013:00:00:00
Changes from Cycle 19	No changes.

Slit Wheel Repeatability

P.I. Audrey DeFelice

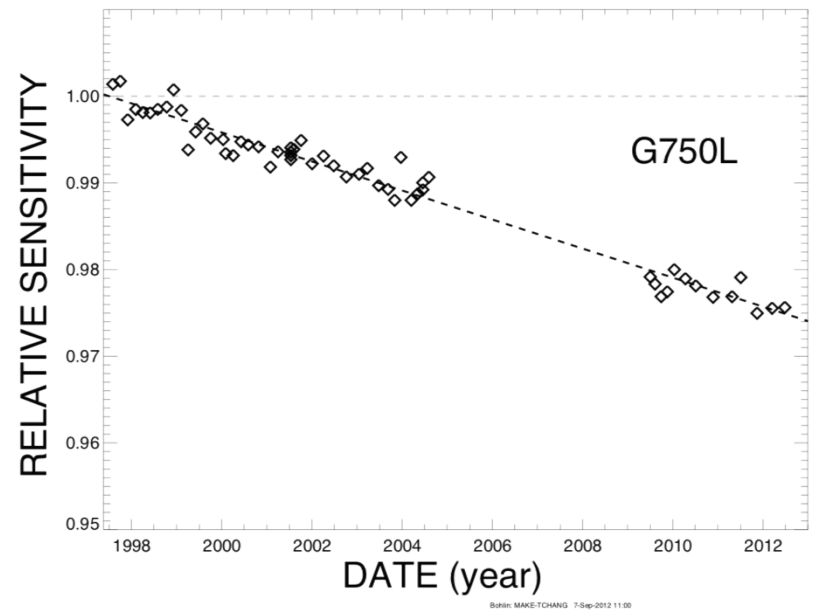
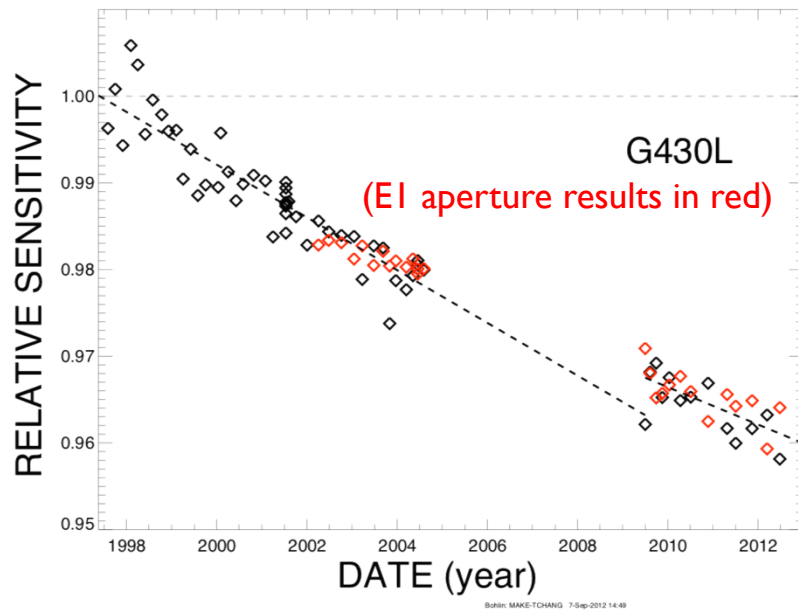
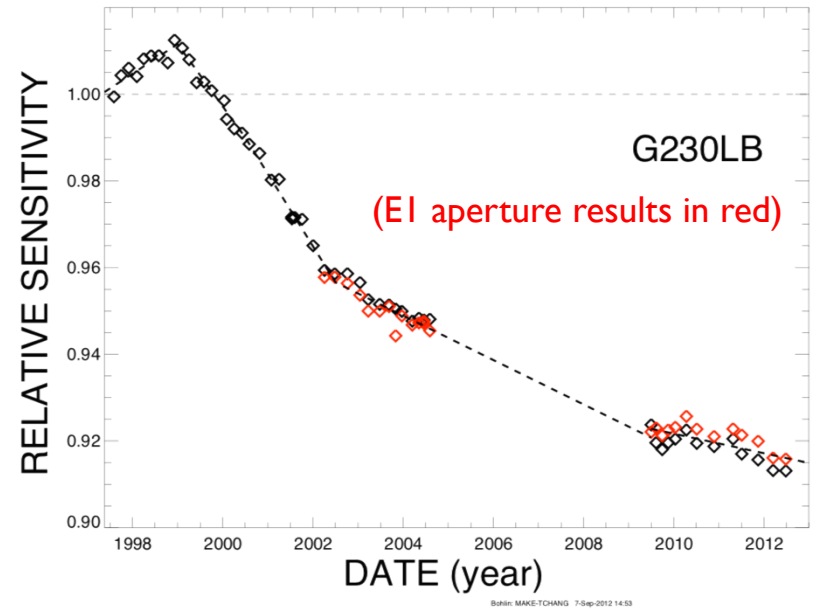
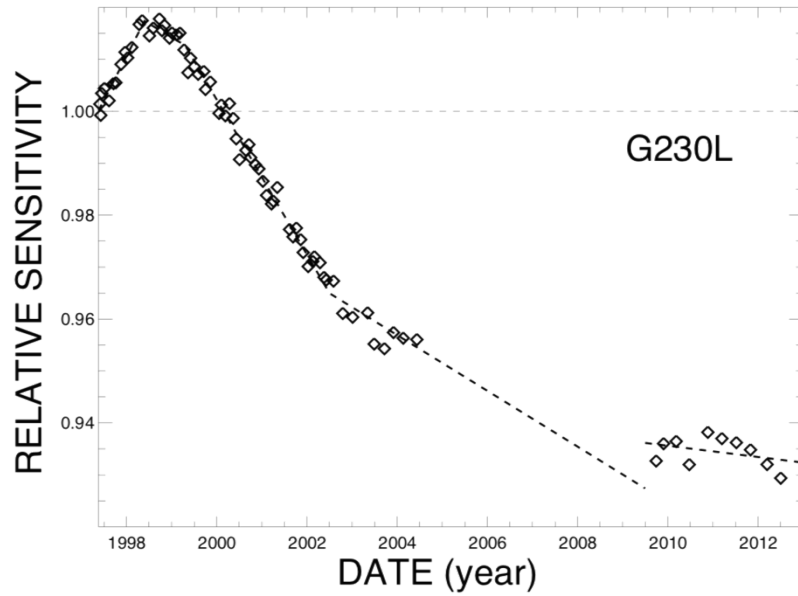
Purpose	Test the repeatability of the slit wheel by taking a sequence of comparison lamp spectra with grating G230MB (2697) and the three smallest long slits (52X0.2, 52X0.1, and 52X0.05). This is a clone of Cycle 18 Program 12410.
Description	Verify the repeatability of the slit wheel for three STIS slits (52X0.2, 52X0.1, and 52X0.05) by taking images with the Pt/Cr/Ne LINE lamp and the CCD detector. Use the G230MB (2697) grating with the CCD, and rotate the slit wheel among the 3 chosen slits. Detector: CCD Grating: G230MB (2697) Slits: 52x0.2, 52X0.1, 52X0.05 Grating A: 52X0.2 (10 seconds) Grating B: 52X0.1 (10 seconds) Grating C: 52X0.05 (20 seconds) Sequence: A-B-C-B-C-A-A-B-A-C-B-B-A-B-C-B-C-C-A-B-A-C-B-A forward motion: B - 4 times C - 6 times Backward motion: A - 6 times B - 4 times No motion: A/B/C - 1 time. All orbits > 1800s.
Fraction GO/GTO Programs Supported	84% of STIS total exposure time.
Resources Required: Observations	1 internal orbit and orbit > 1800s.
Resources Required: Analysis	1 FTE week
Products	Report and summary in the end of cycle ISR.
Accuracy Goals	0.2 pixel after removing the 0th order shift
Scheduling & Special Requirements	Schedule early in Cycle 19.
Changes from Cycle 19	No changes.

CCD Spectroscopic Sensitivity Monitor

P.I. Stephen Holland

Purpose	Monitor the spectroscopic sensitivity of the CCDs using both low- and medium-resolution grating settings to reveal any contamination issues which might affect the spectroscopic throughput.
Description	This calibration program will monitor the spectroscopic sensitivity of CCD spectroscopic settings using the same high-declination calibration standard. Results will be ratioed to the first observations to detect any trends. Every 4 months, the L-modes will be observed at settings which cover both the nominal position and the recommended EI position which places the spectrum closer to the CCD readout. These visits comprise one orbit each. This program also monitors the medium-resolution gratings, with one visit. This visit takes observations at 2 central wavelength settings of G230MB and G430M, at each of the nominal and EI pseudo-aperture positions, and at 1 central wavelength setting of G750M (with the addition of an observation at the pseudo-aperture position to that at the nominal position).
Fraction GO/GTO Programs Supported	18% of STIS total exposure time.
Resources Required: Observations	5 external orbits: 3x1 orbits for L mode monitoring, 2 orbits for 1 visit of M mode monitoring + verification of CTE
Resources Required: Analysis	7 FTE weeks total: 5 FTE weeks for sensitivity analysis and 2 FTE weeks for CTE analysis
Products	Interim reports and ISR on sensitivity and summary in the end of cycle ISR. Update of TDS reference file as appropriate.
Accuracy Goals	Minimum of S/N of 50 at the wavelength of least sensitivity.
Scheduling & Special Requirements	L modes observed every 4th month, M modes observed once.
Changes from Cycle 19	Added additional resource analysis time for CTE analysis.

CCD Spectroscopic Sensitivity Plots



CCD Residual Images after Saturation

P.I. Charles Proffitt

Purpose	Determine if radiation damage has resulted in traps with sufficiently long time scales that the CCD can show residual images after severe over-illumination.
Description	Use internal tungsten or HITM lamp to over-illuminate a region of the the CCD by varying known factors, and then follow with a series of dark images to look for residuals.
Fraction GO/GTO Programs Supported	23% of STIS total exposure time.
Resources Required: Observations	4 internal orbits
Resources Required: Analysis	1 FTE week for analysis; an additional 1 week to write a report..
Products	Report for cycle close out ISR.
Accuracy Goals	20% measure of residual dark rate.
Scheduling & Special Requirements	
Changes from Cycle 19	New proposal.

Cycle 9 Residual Image Measurement

- 8853 cycle 9 (Goudfrooij), August 2000
 - Overexposed gain=1 by $\sim 3x$, $15x$, & $50x$
 - Did with both
 - UV bright star + G230LB “UV”
 - Tungsten lamp + 0.05X31NDB “red”
 - Looked for residuals in series of 300 s darks
 - Also did series with bias images in place of darks
 - Results
 - Found 50%+/-20% enhancement (relative to typical 0.0041 median dark rate) in 1st 300 s dark following 50X over illumination
 - No difference between “red” and “UV” over-illumination
 - No effect on bias exposures

Proposed for Cycle 20

- Expected scaling
 - Now on-orbit $\sim 4.8X$ longer than in Cycle 9
 - Expect radiation damage roughly linear with time
 - Dark current now about $4X$ higher (0.016 vs 0.0041)
 - Guess similar ratio of residual dark current to normal dark current
- Suggested Changes
 - Do only internal lamp test
 - Use wider clear 0.2×29 aperture with brighter HITM2 lamp to increase count rate and area of detector affected
 - Use calibration option POS="3.6e-4" (used in sparse field CTI tests) to tilt MIRVIS to move illuminated position to \sim row 924 to minimize CTI effects
 - Do some visits with shorter darks and subarray readouts to probe over illumination at shorter time scales

Suggested Plan

(4 short internal orbits)

- V1 (most direct comparison to 8853)
 - 300 s full frame dark
 - 36 s 0.2X29 MIRVIS HITM2 exposure (50X full GAIN=4 well)
 - Slit centered on row 924 with MSM tilt
 - Two 300 s full frame darks
- V2 (readout on shorter time scales)
 - Use 200 pixel high subarray at top of CCD to speed all readouts.
 - 3 x 60s subarray darks
 - 0.6 s 0.2X29 MIRVIS HITM2 exposure (0.8X baseline)
 - 36 s 0.2X29 MIRVIS HITM2 exposure (50X)
 - Slit centered on row 924 with MSM tilt; readout rows 824 to 1024
 - 9X 60s subarray darks; readout rows 824 to 1024
- V3 & 4 (vary saturation level)
 - Repeat visit 2, but with various saturation levels to test linearity
 - Keep on hold until V2 evaluated to make best choice of flux level and expo sequence

MAMA Dispersion Solutions

P.I. Paule Sonnentrucker

Purpose	To constrain the wavelength dispersion solutions.
Description	Internal wavecalcs will be obtained at primary and secondary central wavelengths chosen to cover Cycle 19 use. There is also overlap with choices of configurations used with previous calibration programs which will enable long-term monitoring. This program uses the LINE lamp for a total of approximately 8 hours, typically at a lamp current of 10 mA, consuming about 0.5% of the 15000 mA-hour lifetime. Extra-deep wavecalcs 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	67% of STIS total exposure time.
Resources Required: Observations	7 internal orbits
Resources Required: Analysis	4 FTE weeks
Products	Possible new reference file and summary in the end of cycle ISR.
Accuracy Goals	0.1 pixels internal wavelength precision.
Scheduling & Special Requirements	none
Changes from Cycle 19	No changes.

MAMA Full Field Sensitivity

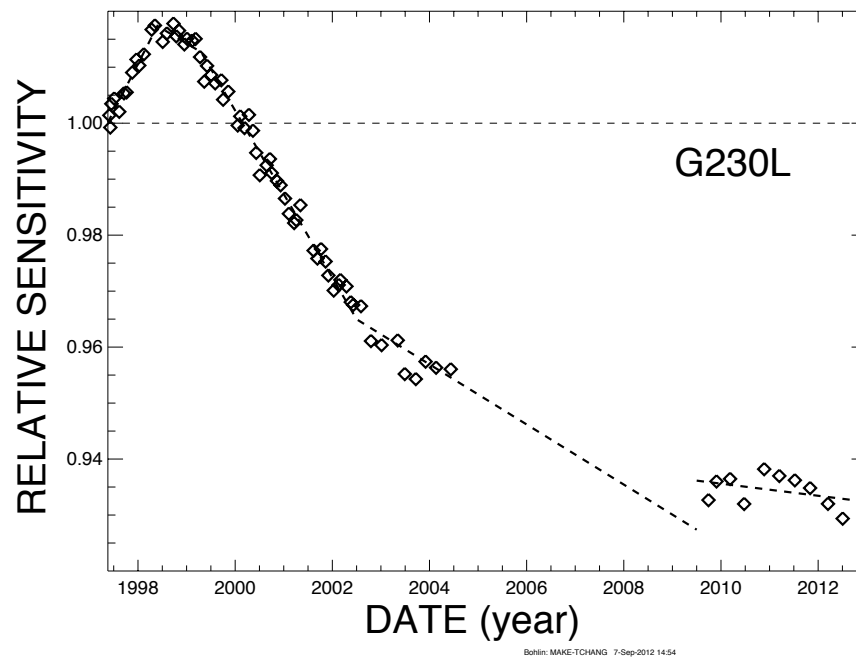
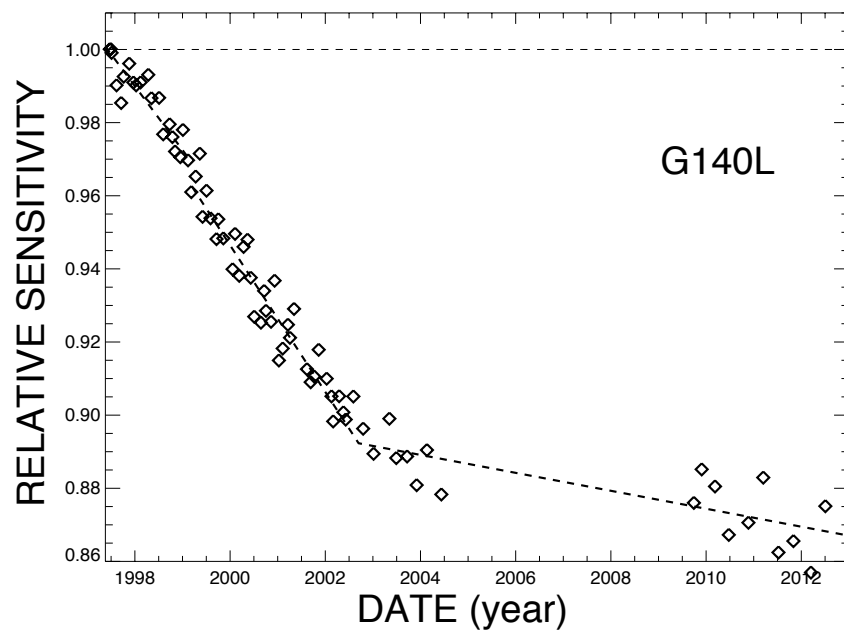
P.I. Julia Roman-Duval

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	77% of STIS total exposure time.
Resources Required: Observations	3 external orbits
Resources Required: Analysis	1 FTE week
Products	Possible STAN, possible ISR, and a summary in the end of cycle ISR.
Accuracy Goals	Percent level; counting statistics signal-to-noise on bright stars
Scheduling & Special Requirements	Should roughly match most common orient from previous observations. ORIENT 260.0D TO 266.0 D; BEFORE 16-JUN-2013:00:00:00
Changes from Cycle 19	No changes.

MAMA Spectroscopic Sensitivity and Focus Monitor (P.I. Stephen Holland) and COS Observations of Geocoronal Lyman α Emission (P.I. Sean Lockwood)

Purpose	Monitor sensitivity of each MAMA grating mode to detect any change due to contamination or other causes. Also monitor the STIS focus in a spectroscopic and an imaging mode. For COS, in parallel with the STIS observations, obtain G130M and G140L spectra of the geocoronal Lyman-alpha emission feature with S/N ratios sufficient to trace the line wings.
Description	<p>Obtain exposures in each of the 2 low-resolution MAMA spectroscopic modes every 4 months, in each of the 2 medium-resolution modes once a year, and in each of the 4 echelle modes every 6 months, using unique calibration standards for each mode, and ratio the results to the first observations to detect any trends. In addition, each L-mode sequence will be preceded by two spectroscopic ACQ/PEAKs with the CCD/G230LB and crossed linear patterns, with the purpose of measuring the focus (PSF across the dispersion as a function of UV wavelength); and each M-mode sequence will be preceded by a CCD/F28X500II direct image also to monitor the focus. All orbits > 1800s.</p> <p>We have received requests from GOs for high-S/N observations of the geocoronal Lyman α line profile observed with G130M in order to model and subtract the line wings from their spectra. Three programs in Cycle 20 require high S/N Ly α profiles. Observations to date provide insufficient airglow data to construct such profiles. We propose airglow observations totaling 10 ks for the most-used CENWAVE, 1327. The data will be archived, but must be reduced by the GOs themselves.</p>
Fraction GO/GTO Programs Supported	<p>67% of STIS total exposure time.</p> <p>9% of COS total exposure time.</p>
Resources Required: Observations	<p>STIS: 12 external orbits (3x1 for L, 1x1 for M, and 4x2 for E)</p> <p>COS: 4 parallel orbits</p>
Resources Required: Analysis	STIS: 6.5 FTE weeks for sensitivity, 4 FTE weeks for focus
Products	Interim reports and ISR on sensitivity monitor and summary in the end of cycle ISR. Wavelength-dependent trends for implementation as pipeline corrections. ISR on focus monitors. If the focus quality is found to degrade significantly, a separate program to take corrective action (such as adjustment of the STIS tip/tilt mirror) may be implemented. For COS, there are no products. Observers must reduce this data themselves.
Accuracy Goals	Minimum S/N of 50 per resolution element at the wavelength of least sensitivity for L modes, and at the central wavelengths for M and E modes. 10% for focus changes, i.e., FWHM of the profile across the dispersion.
Scheduling & Special Requirements	Monthly MAMA offsets are to be cancelled and centering returned to nominal for all exposures in this program. L mode exposures 3x, M mode exposures once, echelle exposures 4x. COS observations are obtained as parallels with STIS external calibration observations.
Changes from Cycle 19	One less parallel orbit for COS.

MAMA Spectroscopic Sensitivity Plots

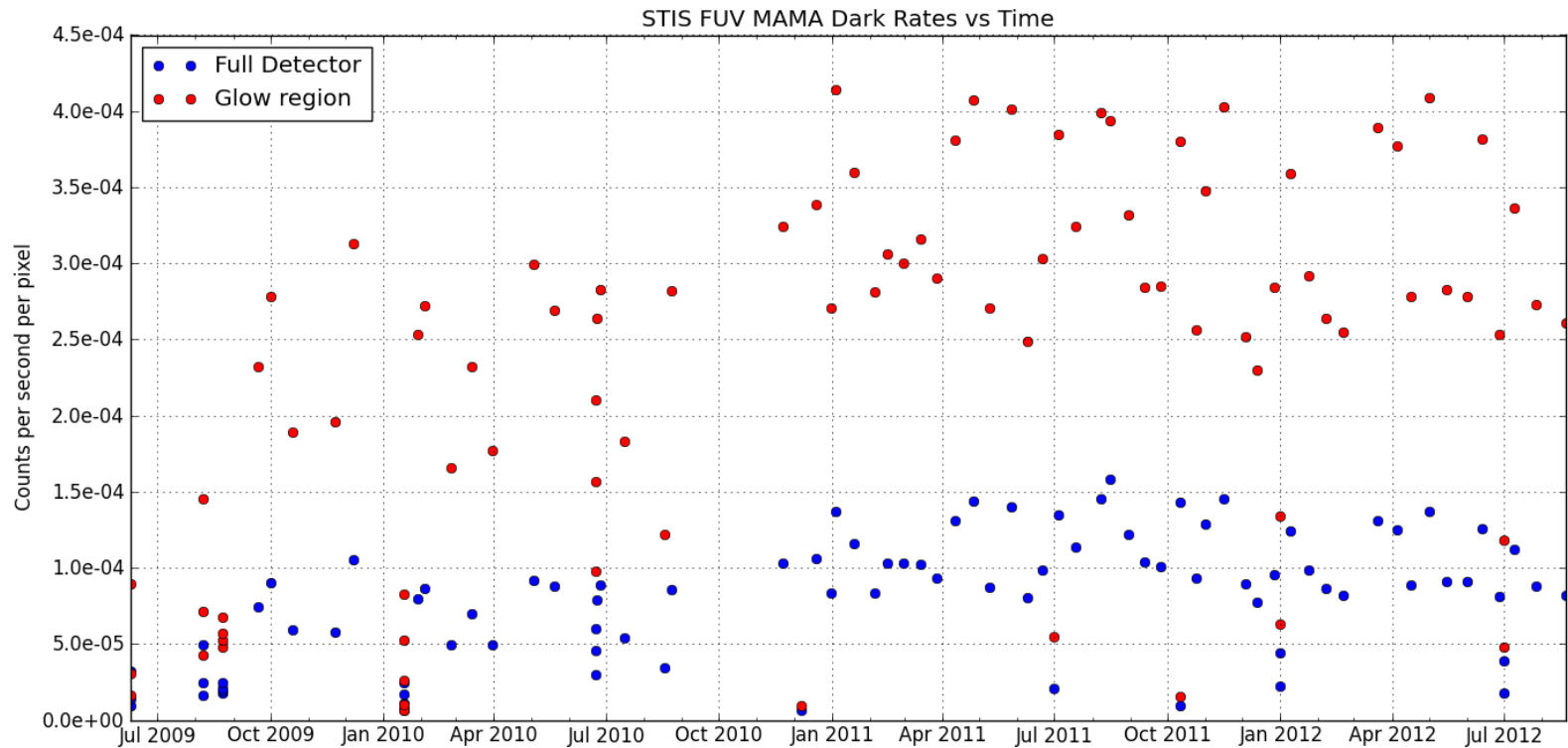


FUV MAMA Dark Monitor

P.I. Colin Cox

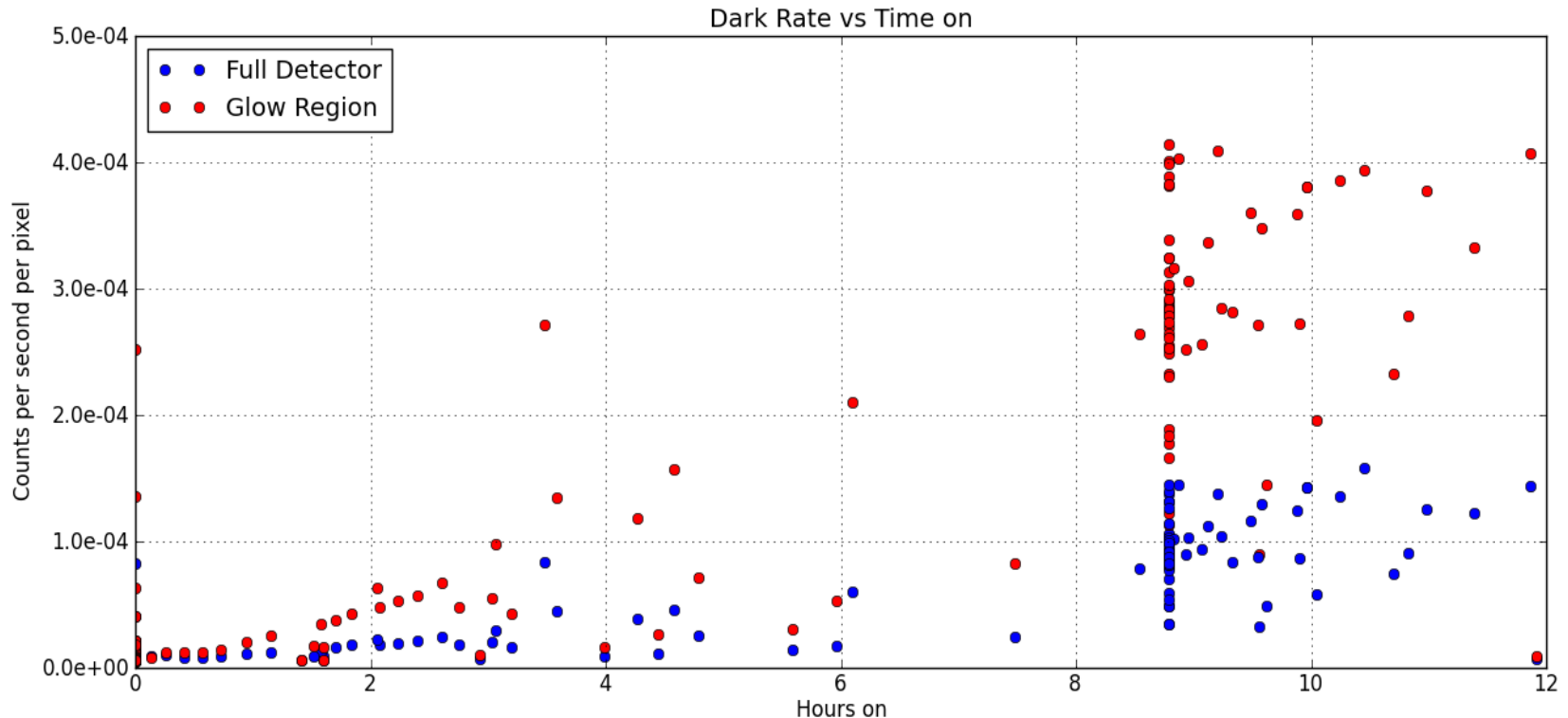
Purpose	This proposal monitors the behavior of the dark current in the FUV MAMA detector. This proposal will provide the primary means of checking on health of the FUV MAMA detector system through frequent monitoring of the background count rate. The purpose is to look for evidence of change in the dark rate, indicative of developing detector problems, and characterize its temporal evolution.
Description	Every 6 weeks, 6 exposures of 1380s are taken at one hour intervals with the FUV MAMA with the shutter closed. The exposures are taken in ACCUM mode. The length of the exposures is chosen to make them parallels.
Fraction GO/GTO Programs Supported	50% of STIS total exposure time.
Resources Required: Observations	54 internal orbits
Resources Required: Analysis	2 FTE weeks
Products	Reference dark files, ISR, and summary in the end of cycle ISR.
Accuracy Goals	Each measurement will give a statistical uncertainty of 5% for the global dark rate.
Scheduling & Special Requirements	All measurements taken in SAA free periods in six sequential orbits. This will match the time-on range of typical GO observations.
Changes from Cycle 19	Sequence and timing changes to better sample dark current with MAMA temperature.

STIS FUV MAMA DARK RATE SINCE SM4



FUV MAMA Dark rate as function of time turned on

Most measurements have been made in pairs, at initial turn-on time and 9 hours later. It would be more useful to make a series of measurements within the first 6 hours of turn-on time which is when most observations occur.

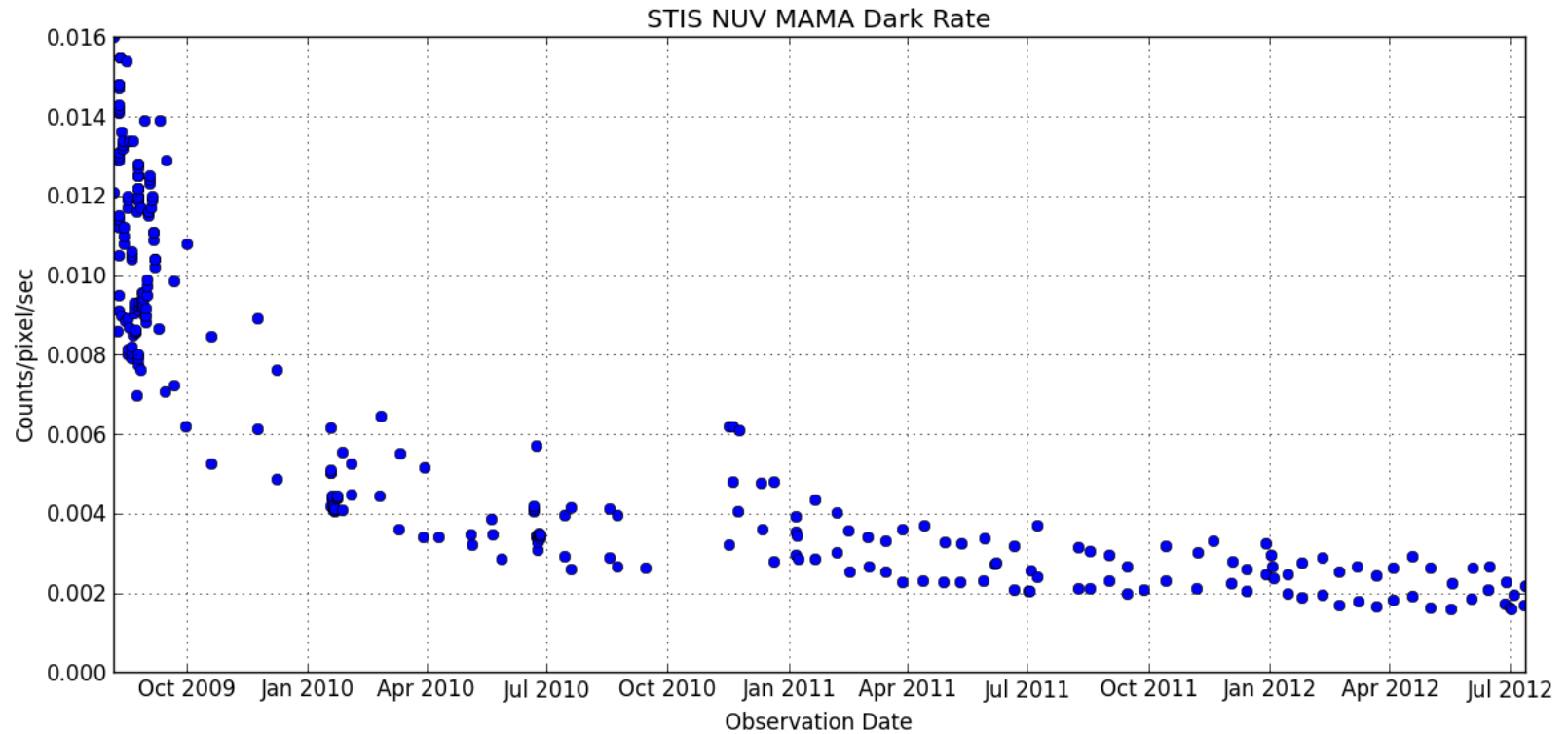


NUV MAMA Dark Monitor

P.I. Colin Cox

Purpose	This proposal monitors the behavior of the dark current in the NUV MAMA detector. This proposal will provide the primary means of checking on health of the NUV MAMA detector system through frequent monitoring of the background count rate. The purpose is to look for evidence of change in the dark rate, indicative of developing detector problems, , and characterize its temporal evolution.
Description	Every 2 weeks, 2 exposures of 1380s are taken at opposite ends of an SAA-free block. The exposures are taken in ACCUM mode with the shutter closed. The length of the exposures is chosen to make them parallels.
Fraction GO/GTO Programs Supported	27% of STIS total exposure time.
Resources Required: Observations	52 internal orbits
Resources Required: Analysis	2 FTE weeks
Products	Reference dark files, ISR, and summary in the end of cycle ISR.
Accuracy Goals	Each measurement will give a statistical uncertainty of 5% for the global dark rate.
Scheduling & Special Requirements	All measurements taken in SAA free periods.
Changes from Cycle 19	Separated the NUV Dark monitor proposal from the FUV proposal.

STIS NUV MAMA DARK RATE SINCE SM4



MAMA FUV Flats

P.I. Elena Mason

Purpose	This program is aimed at obtaining FUV-MAMA flat-field observations to create new p-flats with a SNR of ~ 100 per (low resolution) pixel. The flats are obtained with the Krypton lamp and the MR grating G140M, similar to the cycle 17 and 18 programs. However the exact instrument setup (slit width and central wavelength) might change depending on the desired count level (which will be close to the internally allowed global rate limit).
Description	Past experience and observations have shown that ~ 11 visits are sufficient to create a cumulative image with ~ 2500 counts/pixel (high resolution mode, equivalent to ~ 10000 count/pixel in low resolution mode). We will start taking exposures with the setup G140M/52x0.1/1470 (as in the cycle 18 program) and move to G140M/52x0.1/1420 as soon as the global rate has decreased below 180000-190000 counts/sec (maximum allowed is ~ 280000 counts/pixel). On the basis of past experience exposures will be at least 4740 sec long. Hence, all orbits exceed the 1800 s execution time. Different visits will have different slit offsets in order to illuminate the pixels which are normally shadowed by the slit bars.
Fraction GO/GTO Programs Supported	50% of STIS total exposure time.
Resources Required: Observations	11 internal orbits and all orbits > 1800 s.
Resources Required: Analysis	4 FTE weeks
Products	The cycle 20 p-flat is for monitoring purposes. The achievable SNR is limited by the Poisson noise so a new reference p-flat will be created combining cycle 17, 18 and 20 FUV flats. ISR as applicable.
Accuracy Goals	1.0%: Accuracy is per low-res pixel (2x2 high-res pixels).
Scheduling & Special Requirements	Observations in Cycle 19 were not done. Similar to the NUV flat program, the observations are executed on alternate cycles, to save lamp lifetime.
Changes from Cycle 19	No program during Cycle 19, but similar to the Cycle 18 version of this program. Replaces the MAMA NUV Flat program from Cycle 19.

MAMA Fold Distribution

P.I. Tom Wheeler

Purpose	The performance of MAMA microchannel plates can be monitored using a MAMA fold analysis procedure that provides a measurement of the distribution of charge cloud sizes incident upon the anode giving some measure of change 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. The process is implemented using special commanding and is the same for the FUV- and NUV- MAMAs with the exception of the gratings/aperture/lamp combinations used for flat field illumination. This proposal executes the same steps as Cycle 18 proposal 12416 and is described in STIS ISR 98-02R. All orbits > 1800s.
Fraction GO/GTO Programs Supported	77% of STIS total exposure time.
Resources Required: Observations	2 internal orbits
Resources Required: Analysis	0.1 FTE weeks
Products	Fold Analysis findings are reported to the STIS Science Team and V. Argabright of Ball Aerospace after completion of analysis, typically one-two weeks after the execution of the test. A summary in the end of cycle ISR.
Accuracy Goals	Position of the peak in the fold distribution can be measured to about 5% accuracy from this procedure.
Scheduling & Special Requirements	
Changes from Cycle 19	No changes.

MAMA Anomalous Recovery

P.I. Tom Wheeler

Purpose	This proposal is designed to permit a safe and orderly recovery of the FUV- or NUV-MAMA detector after an anomalous shutdown. This is accomplished by using slower-than-normal MCP high-voltage rampings and diagnostics. Anomalous shutdowns can occur because of bright object violations, which trigger the Bright Scene Detection or Software Global Monitors. Anomalous shutdowns can also occur because of MAMA hardware problems.
Description	<p>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. This proposal executes the same steps as Cycle 18 proposal 12429.</p> <p>(1) signal processing electronics check. This reduces amplifier thresholds to 0.28V and monitors the ORCOUNT rate.</p> <p>(2) Slow, intermediate voltage high-voltage ramp-up. The MCP is slow-ramped to a voltage 300V below nominal. A dark time-tag exposure is taken during this partial ramp. A second dark accum exposure is taken where the event counter is cycled through W, X, Y, Z, OR, EV and VE.</p> <p>(3) Ramp-up to full operating voltage. As before, a dark time-tag exposure is taken during this ramp-up. A second dark accum exposure is taken where the event counter is cycled through W, X, Y, A, OR, EV and VE. This is followed by a fold analysis test.</p>
Fraction GO/GTO Programs Supported	77% of STIS total exposure time. This is a contingency procedure only. Up to 6 orbits would be needed if activated.
Resources Required: Observations	contingency program only
Resources Required: Analysis	0.4 FTE weeks
Products	
Accuracy Goals	n/a
Scheduling & Special Requirements	contingency program only
Changes from Cycle 19	No changes.