# 10729: ACS CCD Daily Monitor

**Purpose.** This program consists of a series of basic tests to measure the readnoise and dark current of the ACS CCDs and to track the growth of hot pixels. The images acquired in this program are used for the creation of reference files (bias and dark frames) used for data reduction. This program will be executed every other day (Mon, Wed, Fri and Sun) for the entire cycle. In order to facilitate scheduling the program will be split in two separate proposals to cover six months each.

**Description.** This program is essentially a copy of the equivalent program that executed during cycle 13. Four days a week a series of bias and dark frames will be collected. Four 1000 sec dark frames are acquired at the default gain setting. Since for cycle 14 the default gain settings for WFC observations will be switched to 2 e-/ADU the dark frames will be also acquired with gain=2. Four bias frames will be acquired before and after the dark frame sequence. Two of the bias frames will be at default gain setting (2 e-/ADU for both WFC and HRC) and the other two at the other supported gain settings (1 e-/ADU for WFC and 4e-/ADU for HRC).

This program is carried out with internal targets and should be scheduled during occultations. Frame acquisition need not to be contiguous.

**Fraction GO/GTO Programs Supported.** Every program using the ACS CCD's channels will make use of the reference files (superbias and superdarks) generated with the data collected with this program. Programs which endeavor to detect transient phenomenon (e.g. supernovae, variable stars, microlensing, etc) are particularly reliant on an up-to-date hot pixel catalog.

**Resources Required: Observation.** This program requires the acquisition of 16 internal frames with ACS ccds (8x1000 sec darks and 8 bias frames) every other day (four days a week) for a total of 64 frames every week. All of these data can be obtained during Earth occultation and represents approximatively 20% of the ACS occultation time. The program will be divided into two proposals of about 420 internal orbits each for a total of 840 orbits.

**Resources Required: Analysis.** About 0.4 FTE will be required to reduce and analyze the data to produce and deliver calibration files.

**Products.** From this program we will produce and deliver pipeline superdarks and superbiases suitable for calibration and later OTFR use.

**Accuracy Goals.** Our goal is to produce a clean daily dark (i.e. one in which each pixel is free from the affects of cosmic rays) as well as a biweekly superbias.

**Scheduling and Special Requirements.** We would prefer to avoid acquisition during SAA passages (SAA impacted orbit are usable) because the enhanced cosmic ray rate would impact our ability to discriminate hot pixels from multiple CR impacts and would populate the bias frames with unwanted CRs during readout.

## 10730: ACS External CTE Monitor

**Purpose.** This program will obtain a direct calibration of photometric losses due to imperfect CTE by imaging stars in 47 Tuc.

**Description.** Observations of 47 Tuc with half-FOV sized dithers, various filters, exposure times and pre-flash levels to characterize impact of CTE on photometry.

**Fraction GO/GTO Programs Supported.** Nearly every program using the ACS CCD's to measure photometry will make use of the CTE calibration generated by this program. Programs which endeavor to perform high precision photometry are particularly reliant on the up-to-date CTE calibration.

**Resources Required: Observation.** This program requires 9 external orbits each time it executes. The next execution is August - Sept 2005 utilizing Cycle 13 allocation. The Cycle 14 allocation would be for Spring 2006. The "CCD Geometry, Flat Fielding and Photometry – Stability" program on 47 Tuc is also capable of providing information on CTE changes over time. We will review prior to the next calibration cycle whether this program can be dropped, or whether two visits per year are advisable as in past cycles. If the latter then Cycle 15 would nominally request 18 orbits, with the first execution in early fall, and we would be able to maintain standard cadence of every 6 months.

**Resources Required: Analysis.** About 0.3 FTE will be required to plan, reduce and analyze the data, provide correction formulae and publish reports.

**Products.** Photometry correction formulae, likely to be published in an ISR.

**Accuracy Goals.** $\sim$10 – 20% of the size of the correction, roughly 1 – 2% in absolute photometry precision.

**Scheduling and Special Requirements.** This program is done every 6 months but due to past scheduling it need be done only once in Cycle 14, in the Spring of 2006.

## 10732: ACS Internal CTE monitor

**Purpose.** This program will measure the internal charge transfer efficiency (CTE) of the HRC and WFC detectors once per year, to track the accumulating CCD damage due to on-orbit radiation exposure. The internal CTE data can be much more easily related to ground testing for fostering engineering understanding, than the external CTE observations aimed at obtaining an empirical correction for science data.

**Description.** EPER (extended pixel edge response) and FPR (first pixel response) data will be collected over a range of signal levels, but skewed towards the low levels where CTE losses are most significant (although we will begin including more of the higher signal levels now). The internal tungsten calibration lamps will be used, with default amps and gains. Both parallel and serial CTE measurements can be made with the data.

**Fraction GO/GTO Programs Supported.** Not directly used for calibration corrections, in an indirect sense supports all CCD observations.

**Resources Required: Observation.** About 35 internal orbits of CTE data at a wide range of signal levels will be obtained every 12 months (in April). A one-orbit monthly check at the Fe55-like signal level ( 1620e) for WFC is also included in the anneal program. The total request is 35 internal orbits.

**Resources Required: Analysis.** About 0.1 FTE will be required to reduce and analyze the data, and publish results. IDL scripts initially created pre-flight by Mike Jones (and later modified for inflight data by Marco Sirianni) will be used to reduce the EPER and FPR data.

**Products.** An ISR describing the CTE trend / forecast was published in April 2005, including a comparison against predictions based on similar pre- flight data, so further results will be continually added to the plots on the CTE webpage.

**Accuracy Goals.** A fractional precision of at least 10e-7 (six 9s) for the measurements will be needed to track the effect, although higher precision is typical.

**Scheduling and Special Requirements.** There are no externally-pointed observations, so this program should be executed during Earth occultations, but not during SAA passages. Specially designed timing patterns (invoked via the CTE optional parameter) produce extra (75) overscan pixels for EPER data, and create the electronic knife-edge for FPR data. Short dark pseudo-bias frames are also obtained with the same CTE clocking pattern for bias correction. April 2006 scheduling is preferred to keep a one year cadence.

## 10733: ACS CCD Hot Pixel Annealing

**Purpose.** To anneal out hot CCD pixels caused by radiation damage.

**Description.** Every four weeks the CCD TECs are turned off and heaters activated to bring the detector temperatures to about +20 degrees C. This state will be held for 6 hours after which the CCDs are returned to normal operating conditions. To assess the effectiveness of this procedure and to provide longitudinal data for hot pixel monitoring a bias and four dark images will be taken before and after for both WFC and HRC in parallel. This will replace the daily dark program for that day. The charge transfer efficiency (CTE) of the ACS CCD detectors declines as damage due to on-orbit radiation exposure accumulates. This degradation has been closely monitored at regular intervals, because it is likely to determine the useful lifetime of the CCDs. We now combine the annealing activity with the charge transfer efficiency monitoring and also merge into the routine dark image collection. To this end, the monthly (but not those at a large number of signal levels executed yearly in the Internal CTE Monitor) CTE EPER and FPR exposures have been moved into this proposal .

**Fraction GO/GTO Programs Supported.** Supports all CCD measurements which is about 94% of ACS observations.

**Resources Required: Observation.** 143 internal orbits.

**Resources Required: Analysis.** About 0.2 FTE will be required to analyze the data.

**Products.** Hot pixel counts as a function of time. CTE trend and forecast.

**Accuracy Goals.**

**Scheduling and Special Requirements.** All observations are internal and so should be scheduled during Earth occultations but not during SAA passages.Specially designed timing patterns (invoked via the CTE optional parameter) produce extra (75) overscan pixels for EPER data, and create the electronic knife-edge for FPR data. Short dark "pseudo-bias" frames are also obtained with the same CTE clocking pattern for bias correction.

## 10736: ACS UV Contamination Monitor

**Purpose.** To monitor possible variation of UV throughput with time. Also, as with all Cal programs using the SBC acquire dark reference data in occultation following external observation. Secondary objectives are to test the flux and wavelength calibrations of PR200L beyond 4000 Angstroms.

**Description.** The observations consist of imaging with SBC and HRC of the cluster NGC 6681, where several stars have been well-observed with STIS for its own UV sensitivity monitoring program. HRC observations will be made with the F220W, F250W, F330W filters and PR200L. The SBC observations will be through all six filters (F115LP, F122M, F125LP, F140LP, F150LP, F165LP), and PR110L. (PR130L is covered in this cycle by the Geometric Distortion for SBC program.) The observation will be taken twice a year for the SBC, since drifts have been shown to exist only at a moderate level. For the HRC two visits will take place, immediately before and after an anneal in order to test whether this has an effect on the sensitivity. In order to test the flux and wavelength calibrations of PR200L beyond 4000 Angstroms, we will also take exposures of the same field using F435W, F555W, F625W, and F814W. Two SBC dark frames of 1020 sec will follow the SBC orbits.

**Fraction GO/GTO Programs Supported.** The results from this calibration program will directly affect all GO and GTO programs doing UV observations, approximately 5%.

**Resources Required: Observation.** This program requires 4 external, and 2 internal orbits.

**Resources Required: Analysis.** The reduction and analysis of the data, as well as the delivery of relevant products and all documentation from this program will require approximately 0.3 FTE.

**Products.** Updates to UV photometric calibration zero points, dark reference files, and ISR.

**Accuracy Goals.** Goal is 1% for the UV photometry, and <10% for the relative SBC dark current (which is a very small absolute quantity).

**Scheduling and Special Requirements.** None.

## 10737: ACS CCD Geometry, Flat fielding, Photometry - Stability

**Purpose.** This program will verify that the low frequency flat fielding, the photometry, and the geometric distortion are stable in time and across the field of view of the CCD arrays.

**Description.** A moderately crowded stellar field in the cluster 47 Tuc is observed every three months with the HRC (at the cluster core) and WFC (6 arcmin West of the cluster core) using the full suite of broad and narrow band imaging filters. The positions and magnitudes of objects will be used to monitor local and large scale variations in the plate scale and the sensitivity of the detectors and to derive an independent measure of the detector CTE. An additional orbit is required to compare WFC observations taken at gain 1 with those taken at the new default gain 2. Primary broadband filters have quarterly observations, narrow band filters have observations every six months.

**Fraction GO/GTO Programs Supported.** 100% of CCD programs.

**Resources Required: Observation.** HRC: 1 orbit every 3 months for a total of 4 orbits.
WFC: 2 orbits every 3 months for a total of 8 orbits.
One additional orbit to evaluate the relative gain ratios.
The total for both detectors is 13 orbits.

**Resources Required: Analysis.** Approximately 0.6 FTE.

**Products.** Updates to the relative sensitivity as a function of position on the detector will be provided via updated flat field reference files. Any changes in absolute sensitivity of the detectors as a function of time will be used to update the CCD QE curves used by the pipeline. The relative gain ratios will be used to verify the values in the CCD parameters table.

**Accuracy Goals.** Variations with respect to previous observations will allow us to create flats which are accurate to 1% over the detector field of view. No absolute photometric calibration is provided by this program, although drifts in time of the sensitivity are tracked to ~0.1% per year.

**Scheduling and Special Requirements.** None. Observations using the HRC & SBC UV filters will be obtained in the UV Contamination Monitor program.

## 10739: ACS Internal Flat Fields.

**Purpose.** The stability of the CCD flat fields will be monitored using the calibration lamps and a sub-sample of the filter set. For the SBC imaging filters, differences in the low-frequency flat field structure with wavelength will be assessed. New high signal P-flats will be obtained for the SBC prisms.

**Description.** Internal flats will be obtained for the HRC and WFC detectors using the tungsten lamp and a subset of filters (F435W, F625W, F814W). High signal observations will be used to assess the stability of the pixel-to-pixel flat field structure and to monitor the position of the dust motes. Internal flats will be obtained for the SBC imaging filters (F115LP, F125LP, F140LP, F150LP, F165LP, F122M) using the deuterium lamp. High signal P-flats already exist for F125LP. One orbit per filter will be sufficient to quantify any differences in the low-frequency structure between flats. New P-flats will be obtained for the SBC prisms (PR110L & PR130L), requiring ∼24 hours of lamp burn time to reach S/N = 100. This additional use of the deuterium lamp is expected to lower its brightness from a current value of ∼82% to about ∼68% of the initial on-orbit brightness.

**Fraction GO/GTO Programs Supported.** 100%.

**Resources Required: Observation.** The CCD flats will be monitored once per year, for a total of 4 orbits (HRC = 1 orbit, WFC = 3 orbits). The SBC imaging flats will require 1 orbit per filter, for a total of 6 orbits. The SBC prism flats require 17 orbits per filter, for a total of 34 orbits. The total number of internal orbits required for all three detectors is 44.

**Resources Required: Analysis.** Approximately 0.2 FTE.

**Products.** Results from this program will impact the standard flat field calibration files included in the pipeline, and an ISR will document the results.

**Accuracy Goals.** The accuracy of the flat field calibration is expected to be better than 1%.

**Scheduling and Special Requirements.** Long exposures (greater than 1000 sec) with the deuterium lamp are required for the SBC.

## 10738: ACS Earth Flats

**Purpose.** Sky flats will be obtained by observing the bright Earth with the HRC and WFC. These observations will be used to verify the accuracy of the flats currently in the pipeline and to monitor any changes. Weekly coronagraphic monitoring is required to assess the changing position of the spots.

**Description.** This program will obtain sequences of flat field images by observing the bright Earth. Coronagraphic observations will be taken in combination with the F330W filter at the beginning and the end of each orbit to assure sufficient illumination. The supplemental HRC and WFC observations will be taken to fill the orbit and will serve as verification of the stellar L-flat corrections currently used by the pipeline.

**Fraction GO/GTO Programs Supported.** About 50%.

**Resources Required: Observation.** A single orbit is required each week to monitor the position of the coronographic spots, for a total of 52 orbits, all of which take place during Earth occultation.

**Resources Required: Analysis.** Approximately 0.1 FTE.

**Products.** Results from this program will verify if any changes are required to the flat field calibration files included in the pipeline. The coronagraphic spot positions will be used to update the spot position reference table.

**Accuracy Goals.** The Earth flats will be statistically accurate to 0.25% per pixel. The position of the coronagraphic spot will be determined at the level of 1 pixel or better.

**Scheduling and Special Requirements.** We require observations of the bright Earth during occultation.

## 10734: ACS CCD Post-Flash Verification

**Purpose.** To monitor performance of the post-flash facility.

**Description.** Internal FLASH exposures are obtained at high SNR for each detector and each shutter side, as well as at each (LOW, MID, HIGH) LED current setting. The shutters are moved by inserting short internal cal lamp exposures between FLASH exposures. A series of short (1 s) FLASH exposures is also obtained without any intervening configuration change, to test short-term repeatability.

**Fraction GO/GTO Programs Supported.** Potentially supports all CCD measurements which is about 94% of ACS observations. Has not been activated for science observations so far, and is not supported for Cycle 14.

**Resources Required: Observation.** 4 internal orbits.

**Resources Required: Analysis.** About 0.05 FTE will be required to analyze the data.

**Products.** Normalized pre-flash images at LOW, MID and HIGH LED current settings.

**Accuracy Goals.** This is a qualitative tracking of capability; actual use for data analysis support would require additional observations.

**Scheduling and Special Requirements.** Performed about once per year. Schedule for May 2006. No compression should be applied to the images.

## 10740: ACS Photo-& Spectrophotometry Abs. Cal.

**Purpose.** Verify repeatability of the ACS instrumentation on a single bright star to $\pm 0.2\%$. Determine any shift in the filter bandpasses since the preflight lab measurements. Determine the relative magnitude of the 3 primary WD calibrators to 0.1%. Refine the sensitivity calibration of the CCD prism and grisms at field center and determine the repeatability accuracy of this calibration. Determine the level of variability of the three HST red standard stars VB-8 (M7), 2M0038+18 (L3.5) and 2M0559-14 (T5) and also measure their short wavelength (<7000A) fluxes.

**Description.** This program consists of three parts: (1) Observe a subset of the primary WDs with HRC and WFC to verify repeatability to 0.2%, because the filter shifts are based on photometric differences between stars of 1%. These observations are also required to establish relative magnitudes of the primary WD standards at the 0.1% level. The target should be GD71 to supplement GD153 and G191B2B, which were done in the cycle 13 program 10374. One orbit on the most important filters, including the grism and the prisms, should be expended with each camera for both stars for a total of 2 orbits to verify the validity in the shorter wavelength tail where the sensitivity is drastically less than in the 'head' of the spectral convergence near 4500A. Complete filter bandpasses can be derived directly from the ratio of grism observations with and without the filter in place only for F814W, so this cycle 13 segment is not included for cycle 14.
(2) High S/N photometric and spectroscopic observations of three red stars, VB-8 (M7), 2M0038+18 (L3.5) and 2M0559-14 (T5) with WFC to verify the repeatability of these late type stars that are notorious for variability. Highly overexposed PR200L data is required with VB8, to determine scattering to short wavelengths, so uses HRC instead of WFC.
(3) Two orbits are required to extend the the prism, grism, and F850LP cross-calibration with NICMOS and STIS to their faint limits with WD1657+343 and the solar analog C26202.

**Fraction GO/GTO Programs Supported.** 90%.

**Resources Required: Observation.** 7 Orbits.

**Resources Required: Analysis.** 0.3 FTE

**Products.** Better filter bandpasses, improved sensitivities, and more accurate flux standards.

**Accuracy Goals.** See above.

**Scheduling and Special Requirements.** None.

## 10735: ACS SBC MAMA recovery

**Purpose.** This proposal is designed for the initial turn-on of the ACS MAMA detector and to permit recovery after an anomalous shutdown.

**Description.** The Initial MAMA turn-on/recovery from anomalous shutdown consists of three tests: a signal processing electronics check, high voltage ramp-up to an intermediate voltage, and high voltage ramp-up to the full operating voltage. During each of the two high voltage ramp-ups, diagnostics are performed during a dark ACCUM. The turn-on is followed by a MAMA Fold Analysis.

**Fraction GO/GTO Programs Supported.** Supports all SBC measurements which is about 2% of ACS observations.

**Resources Required: Observation.** 4 internal orbits per occasion. Normally less than once per year.

**Resources Required: Analysis.** About 1 day (0.004 FTE) will be required to analyze the data.

**Products.** A TIR would be written to document the procedure and results.

**Accuracy Goals.**

**Scheduling and Special Requirements.** It is a goal to schedule each visit when TDRSS is visible so that voltages and count rates can be monitored. Note that Visits containing MAMA high voltage activities must be scheduled outside of the SAAs. No SBC observations may be scheduled until analysis is complete.

## 10741: ACS Continuum L-Flats for Ramp Filters

**Purpose.** Ramp filter transmission varies by as much as 10% and more across the filter monochromatic FOV. To correct for this effect, this program will obtain continuum low-frequency flatfields (L-flats) for the most frequently used ramp filters. The respective reference files will be installed in the ACS calibration pipeline.

**Description.** Stellar fields of the globular cluster 47 Tuc will be observed with WFC and HRC for FR656N. The WFC will additionally be used to obtain L-flats at the two primary Cycle 14 filters(wavelengths): FR462N(4488A) and FR601N(5998A) both of which are "Outer" ramp filters. Using the full WFC readout will return data simultaneously for the "Inner" and "Middle" ramps paired with these. At FR462N, paired with FR423N and FR388N, all of which are average-to-high use ramps observations will be taken at three wavelengths which should allow full L-flats as a function of wavelength to be derived for all three ramps, and to test this approach. The exposure times will be $2\times339$ seconds at all settings. L-flats will be obtained from these data by confronting the measured stellar fluxes with the fluxes of the same stars observed in well calibrated broadband filters.

**Fraction GO/GTO Programs Supported.** The ramp filter L-flats will support the 40 GO/GTO programs from Cycles 11 - 14. The availability of ramp filter flatfielding will encourage the use of ramp filters in the future, which would partially compensate for the loss of the HST major spectroscopic capabilities after the failure of the STIS.

**Resources Required: Observation.** The program requires three orbits (2 WFC, 1 HRC) and will execute once.

**Resources Required: Analysis.** Estimated 0.4 FTE is required to plan the program, reduce and analyze the data, create and install reference files, and write up relevant documentation.

**Products.** L-flat reference files for the calibration pipeline; an ISR.

**Accuracy Goals.** Flatfielding accuracy comparable to that of the broadband filters. The accuracy will be tested by comparing the 47 Tuc main-sequence widths from ramp filter data and broadband data.

**Scheduling and Special Requirements.** None.

## 10742: ACS Ramp Filter and Grism Zeroth Order Wavelengths.

**Purpose.** To check the throughput of the ACS Ramp Filters as a function of wavelength, and simultaneously obtain a wavelength calibration of the ACS grism zeroth order.

**Description.** A bright, well-characterized white dwarf will be observed through the ACS ramp filters crossed with the grism. This will allow us to determine the throughput of the ramp filters as a function of wavelength as well as calibrate the zeroth order of the grism. A similar program was attempted in the past (Cal 9761) but all WFC observations were lost due to incorrect commanding of image sections with ramp filters early in the life of the ACS. Furthermore, the program neglected to cross the F606W filter with the ramp – thus an accurate wavelength zeropoint for the grism spectra obtained on the HRC could not be determined. This program will not only verify the wavelength calibration of the ramp filters (its original purpose in 9761), but will also provide a calibration of the zeroth order of the ACS grism. This in turn could free many observers from having to obtain a direct image of a field.

**Fraction GO/GTO Programs Supported.** This program will provide an assurance of the correct wavelength response of the ramp filters, and thus is important for all users of those filters. It also has the potential to impact a substantial fraction of the users of the ACS grisms.

**Resources Required: Observation.** 4 external orbits.

**Resources Required: Analysis.** Approximately 0.3 FTEs, work to be shared with ST-ECF (Grism).

**Products.** Tables of wavelength vs. throughput of the ramp filters. Calibration tables of wavelength vs. position for the zeroth order of the ACS grism. ISRs on both. The work on the zeroth order may lead to an entirely new way of taking ACS grism data which would have to be explored separately.

**Accuracy Goals.** To measure the throughput of the ramps to better than a few percent with a wavelength accuracy of a few angstroms.

**Scheduling and Special Requirements.** None.

## 10731: ACS UV and Narrow-band Filter Red Leak Checks.

**Purpose.** The purpose of the observations is to perform a check of the red leaks in the UV and narrow band filters and derive the passband of the UV filters in the red part of the spectrum (i.e. longward 6000A).

**Description.** We observe a mag V=4.64 type O7 star, namely 15Mon, with the HRC and the G800L grism in order to obtain the spectrum longward 6000 A. Then we cross the G800L with each of the UV filters (i.e. F220W, F250W, and F330W), thus obtaining the spectrum of the star in the red leak of the filters. For the narrow band filters, we will observe the same star with the F814W crossed with the narrowband filters (F502N, F658N).

**Fraction GO/GTO Programs Supported.** 10 – 20% of the HRC time is dedicated to observations with UV filters. F658N and F502N are used for ∼5% of the HRC time.

**Resources Required: Observation.** Two external orbits.

**Resources Required: Analysis.** Approximately 0.1 FTE.

**Products.** We will check the accuracy of the passbands of UV and narrowband filters derived from ground based tests. We will derive correction factors for photometry with UV filters.

**Accuracy Goals.** From S/N calculation we estimate that we will derive the passband and relative throughput of the UV filters in the red part of the spectrum to better than ∼10%.

**Scheduling and Special Requirements.** None.

## 10743: ACS Improved Wavelength Calibration of SBC Prisms

**Purpose.** We propose to improve the wavelength calibration of the SBC PR110L and PR130L prisms by observing additional calibration targets. Our current calibration programme includes two QSOs at redshifts $z = 0.098$ (PG1404+226) and $z = 0.168$ (PG1322+659), placing the Ly $\alpha$ line at 1335Å and 1420Åand the C [IV] line at 1701Å and 1809Å. At the present time, only the higher-redshift QSO has been observed and in this target only the Ly $\alpha$ line could be securely identified. Observations of PG1404+226 are scheduled for Jun 24 2005. Considering that these targets will provide only 2 or 3 sampling points, it is desirable to obtain additional observations in order to improve the wavelength calibrations.

**Description.** We will obtain additional observations of 2 QSOs at redshifts $z = 0.15$ to $z = 0.45$ in order to achieve better sampling of the wavelength range from 1400–1800Å. As in our Cycle 13 programme, the QSOs will be observed at a variety of pointings across the SBC detector in order to map spatial variations in the wavelength solution. The exposures can be kept short (typically 2 min per prism spectrum) but since the QSOs must be observed in separate visits, one orbit is required per target. The targets will be observed in sequences of three exposures: 1 direct imaging exposure (typically 30 s in F165LP) followed by the PR110L and PR130L exposures (120 s each). No CR-SPLIT is required for the SBC. The targets will be selected from the catalogue of Véron-Cetty & Véron (2003: A&A 412, 399) which has over 1600 entries for the redshift range $0.15 < z < 0.45$.

**Resources Required: Observation.** 1 orbit per target, i.e. 2 orbits for 2 QSOs.

**Resources Required: Analysis.** The analysis will be carried out by the ST-ECF

**Products.** The calibrations will be published in Instrument Science Reports and made available to the user community as configuration files for the aXe spectral extraction package.

**Accuracy Goals.** We aim to calibrate the wavelength scale to an accuracy of $\sim 0.5$ pixels or better. Due to the highly non-linear dispersion of the prisms, this translates to a wavelength accuracy of between $\sim 1.2$Å and $\sim 0.5$Å at 1200Å (PR110L and PR130L), about 5 Å at 1500Å and 10Å at 1800Å.

**Scheduling and Special Requirements.** Preferably the observations should be scheduled as early as possible in order to make the calibrations available to the community. There are Cycle 13 proposals running with the SBC prisms which remain to be well calibrated. Targets will be selected in such a way as to make early scheduling possible.

## 10722: ACS Geometric Distortion Solutions for the SBC.

**Purpose.** The primary goal of this calibration program is to improve the accuracy of the geometric distortion solution for the ACS/SBC imaging modes and to calculate the geometric solution for PR130L for the first time. The secondary goals are to generate an L-flat for PR130L and to provide independent checks for the L-flat and quantum efficiencies of the SBC imaging modes. HRC data obtained to support the SBC calibration will provide L-flats for F220W and F250W.

**Description.** Due to the failure of STIS at the beginning of cycle 13, the SBC has become the only HST instrument with FUV capabilities. This has increased its demand in cycle 14 compared to previous cycles. We propose here a series of observations that should improve its calibration.

The geometric distortion solution currently used for the SBC imaging modes and prism was derived directly from the HRC one without using SBC exposures and has an accuracy of a few tenths of a pixel. On the other hand, the accuracy of the HRC geometric solution itself is better by two orders of magnitude. We propose here to image a crowded field with 300 bright point sources using both detectors in order to measure the stellar positions in both of them and to use the high accuracy of the HRC solution to derive a better one for the SBC.

The data that will be obtained for the previous two purposes can also be used to provide independent measurements of the imaging and prism L-flats and of the QE of three of the SBC filters.

The selection of a target for this program is not simple because one has to reach a compromise between peak flux (if too bright, it cannot be observed with SBC; if too dim, the number of orbits becomes prohibitive), number of sources, and spatial coverage of the detector. An excellent choice is NGC 604, a scaled OB association in M33 which has well characterized UV properties obtained from previous HST observations. We have tested that NGC 604 can be safely observed using F122M, F150LP, F165LP, and PR130L.

We propose to observe NGC 604 using the F220W and F250W filters on HRC to produce a $\pm 6$, $\pm 12$ arcsec dither pattern that can be used to generate a master coordinate list and L-flats. Then, the target would be observed in two additional visits, each with a different orientation, using F122M, F150LP, F165LP, and PR130L.

**Fraction GO/GTO Programs Supported.** SBC exposures are 6% of the total ACS exposures for cycle 14.

**Resources Required: Observation.** We require 6 external orbits. They are to be divided into three visits, one HRC and two SBC.

**Resources Required: Analysis.** Approximately 0.5 FTE. Most of the software required to process the data has already been written for previous STIS and ACS programs.

**Products.** Two or three ISRs as well as new geometric distortion and L-flat calibration files.

**Accuracy Goals.** Imaging and cross-dispersion $<0.1$ pixel, dispersion $\sim 0.5$ pixel.

**Scheduling and Special Requirements.** The two SBC visits must have different orientations in order to provide a better sampling of the geometric distortion and to reduce the number of superpositions between different sources in the prism exposures. Also, the PR130L and F122M observations must be taken in shadow in order to minimize the geocoronal background.

We have tested that the two SBC visits are schedulable in September-October with a relative orientation between 45 and 135 degrees. The HRC visit is also schedulable, with the first window in September.

## 10771: ACS CTE and QE as function of temperature.

**Purpose.** CCDs are known to respond to different operating changes in a number of ways – dark current and hot pixel strengths (quantified with a previous test), quantum efficiency and charge transfer efficiency changes. We propose to temporarily operate the CCDs at temperature set points both above and below current nominals by 4 degrees and measure both QE and CTE at these levels. This will provide information relevant to long-term capabilities, and provide needed background data for considering the importance of installing the Aft Shroud Cooling System during the next servicing mission.

**Description.** The fields in 47 Tuc used for the standard External CTE Monitor will be observed with the shifts normally used for that program in order to determine changes of CTE at the two temperature set points. In order to provide easily interpretable data identical observations (orients, exposure times, etc.) are desired at the nominal and plus and minus tempertures. These observations will also provide a check on QE by comparing intensities of stars near the amplifier.

A field in GOODS south will also be observed at each temperature providing data that can be easily analyzed to define the detection threshold for faint objects at each temperature.

**Fraction GO/GTO Programs Supported.** CCD exposures represent 94% of the total ACS program, and these results will be relevant for future usage for a large fraction of these.

**Resources Required: Observation.** Eight orbits will be used for the 47 Tuc observations to fix QE and CTE dependence on temperature, and four on GOODS South for defining the detection limit. An equal number of internals will be used to provide biases and darks to be used in calibration of the external data.

**Resources Required: Analysis.** Approximately 0.3 FTE. Most of the software required to process the data has already been written for previous ACS programs.

**Products.** An ISR discussing results.

**Accuracy Goals.** CTE determined to a level supporting photometry at the 1 – 2% level consistent with usual External CTE monitoring, and QE to better than 1%.

**Scheduling and Special Requirements.** The three CTE visits at different temperatures on 47 Tuc should be obtained at the same orient. Data is desired by November 2005 in order to support near-term discussion on the need for ASCS.