WFPC2 Cycle 9 Calibration Plan

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ABSTRACT

This report presents the details of the WFPC2 Cycle 9 calibration plans. The proposal suite is aimed at maintaining the calibration accuracy of WFPC2 via monitoring programs, as well as continuing some previous proposals into Cycle 9 and performing several new tests. The standard monitoring programs will be continued (e.g., decontaminations, photometric and astrometric monitors, darks, biases, internal flats, and earthflats). In addition, the CTE monitor, PSF and photometric checks will be performed. Three new programs are planned as well: a red leak check, a verification of the wavelength stability of the narrowband and linear ramp filters, and a CTE calibration. The CTE calibration, in conjunction with WIYN groundbased observations (if approved), will permit a direct verification of the absolute photometric calibration of WFPC2 in observations that may be affected by CTE, providing a more robust determination of the zero point for many WFPC2 observations.

1. Introduction

Calibration plans for Cycle 9 are being finalized and as always, observers are welcome to suggest new calibrations or comment on the existing plans (email help@stsci.edu). The Cycle 9 calibration program is aimed at maintaining the calibration of WFPC2 via monitoring programs, as well as continuing two proposals from previous Cycles into Cycle 9 (photometric and PSF characterizations) and performing several new tests (on-orbit redleak check, CTE, wavelength stability check of narrowbands and linear ramp filters). A short overview is provided in Table 1; the entire program is estimated to require 67 external orbits (including several extra orbits to allow for smooth transitions between Cycles and a ~10% reserve for unanticipated items) and 2452 internal or occultation periods.

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Table 1: Summary of WFPC2 Orbits Required for Cycle 9 Calibrations

proposal type	external orbits	internal (occultations)
monitors	38	2437
special (continuations)	8	--
special (new)	15	15
reserve	6	--
total	67	2452

Monitors

As in the past, a large part of the program consists of routine monitors and decontamination (decon) procedures. The decons will continue to be performed on a monthly basis, to remove the UV contaminants and anneal hot pixels. The monitoring programs will be used to track the health and performance of the cameras via internal exposures (biases, darks, flats, kspots), Earth flats, and external exposures (imaging of standard stars and fields, e.g., UV throughput, CTE, and astrometric monitors).

Continuations of Special Programs

The photometric and PSF checks will be done once during Cycle 9. The photometric check (observations of the standard star GRW+70D5824 in PC1 and WF3 using filters that are not routinely monitored) will verify the zeropoints and contamination rates in the non-standard filters. The PSF check will consist of dithered observations of the crowded ω Cen field in the standard wide-band photometric filters, providing a high S/N, critically sampled PSF across the full WFPC2 field of view and over most of the visible wavelength regime. The program will support PSF fitting photometry, provide data to test PSF subtraction as well as dithering techniques (e.g., effects of OTA breathing and gain) and be a source of PSFs for the online WFPC2 PSF Library.

New Special Programs

Three new programs are planned for Cycle 9: a redleak check, a CTE calibration, and a wavelength stability check of the narrowband and ramp filters.

The redleak check will provide on-orbit verification of the red leaks in the WFPC2 UV filters. Two solar analog targets, for which FOS spectrophotometry is available, will be observed; measured countrates will be compared to SYNPHOT predictions of the expected count rates from the UV proper and from the red leak. The results should benefit programs that rely on precision multicolor photometry and comparison with model spectra; some discrepancies reported thus far could be explained by a significant (> 10%) error in the estimated red leak.

There are two parts to the planned CTE program: a monitor and a suite of observations to complement a proposed groundbased CTE program. The monitor, an extension of proposal 8447, will consist of observations of ω Cen (NGC 5139) taken every 6 months, in F814W and F555W, with a variety of preflash levels (20 to 1000 electrons).

The absolute calibration portion of the CTE program will consist of observations of previously observed globular clusters, matching targets selected for a companion groundbased proposal - subject to approval of the latter. Three globulars will be chosen from a list of five (Eridanus, NGC 2419, Pal 3, Pal 4, and Pal 14); the ω Cen field, while ideal for HST observations, is too crowded for groundbased observations at the relevant magnitudes (V~22). The HST observations will maximize the benefit from the groundbased observations and provide: 1) An independent, absolute determination of the current CTE effect, 2) A measure of time variations of CTE (by comparison with archival data), and 3) A set of observations bracketing the range of signal and background in science images (200 to 1000 electrons per star, on backgrounds ranging from 10 to 300 electrons). Comparisons of the HST and groundbased datasets will provide a direct verification of the zeropoints for many WFPC2 observations: while there is no evidence that the current WFPC2 photometric calibration is inapplicable to faint sources, enough corrections need to be applied that a direct verification is extremely desirable.

Finally, a check of the wavelength stability of the narrowband and ramp filters will be performed: on-orbit ramp filter VISFLATs, crossed and uncrossed with narrowband filters, will constrain the wavelength and transverse calibration of the ramps filters relative to the narrow band filters. Comparison with similar Cycle 4 data will allow us to evaluate whether the filter properties have evolved with time due to annealing / shrinkage of the thin film materials. In addition, to provide an absolute test for changes in the ramp filters, four external orbits will be used for observations of an extended line emission source (planetary nebula) through the ramp filters.

Planning has also started for the health and safety monitoring, as well as calibration verification, during and following the up-coming Service Mission 3b which is nominally scheduled for June 2001. The Servicing Mission plans, however, will be developed separately from Cycle 9, and details posted at a later date.

2. Format

Table 1 summarizes the Cycle 9 calibration programs for WFPC2; the remainder of this report contains details for each proposal, including purpose, observing description, and estimates of the accuracy goals and resources required. The proposal pages are intentionally in landscape format, to facilitate reporting of the results at the end of Cycle 9. Phase II versions of the proposals can be viewed at http://www.stsci.edu/public/propinfo.html.

WFPC2 Cycle 9 Calibration Plan

ID	Proposal Title	Frequency	Estimated Time (orbits)		Scheduling Required	Products	Accuracy Required	Notes
			"External"	"Internal"				
Routine Monitoring Programs								
8822 - 8824	WFPC2 Decons & Associated Observations	1-2/4 wks	30	82	every 28 d	Synphot, CDBS	1-2%	Decons, phot. & focus monitor, internals, UV throughput, VISFLATs, and UV FLATs
8811	Standard Darks	weekly		366	every 7 d	CDBS	1 e^-/hr	Also hot pixel lists on WWW.
8826 - 8828	Supplemental Darks	0-3/day		1282	anytime		n/a	For archive only, no analysis provided
8812	Internal Monitor	weekly		76	every 7d	CDBS	0.8e/pixel	Includes INTFLAT monitor, for possible future preflashed observations.
8815	Earth Flats	continuous		210	mid-cycle	CDBS	0.3%	
8816	UV Earth Flats	continuous		400	mid-cycle	CDBS	3-10%	Outsourcing candidate.
8813	Astrometric Monitor	2/cycle	2		early & late	ISR	0.05"	Omega Cen as well as K-spots.
8817	Intflat Sweep and Linearity Test	1/cycle		21	mid-cycle	TIR	0.3%	
Special Calibration Programs								
8818	Photometric Characterization	1	2		mid-cycle	ISR	2-3%	GRW+70D5824; nonstandard filters.
8819	PSF Characterization	1	6		late in cycle	CDBS	10%	Omega Cen; standard broadband filters.
8814	Redleak Check	1	2		mid-cycle	Synphot, CDBS	2%	Solar analogs used to measure UV filter redleaks.
8821	CTE - Monitor and Absolute Calibration	1	15		mid/late	ISR	0.01 mag	Includes monitor as well as followup to groundbased observations. Outsourcing candidate.
8820	Wavelength Stability of Narrow-band and Linear Ramp Filters	1	4	15	mid/late	CDBS, ISR	2Å	Check of wavelength/aperture mapping and test for changes in LRFs.
	~10% reserve		6					Placeholder.
TOTAL TIME (including all executions)			**67**	**2452**				

Proposal ID : WFPC2 Cycle 8822-8825: WFPC2 Decontaminations and Associated Observations

Plan

Purpose Monthly WFPC2 decons. Other programs tied to decons are also included: photometric stability check, focus monitor, pre- and post-decon internals, UV throughput checks, VISFLAT sweep, and internal UV flat check.

Description *Decontamination:*UV-blocking contaminants removed and hot pixels annealed by warming the CCDs to +20C for 6 hours.
Internals: intflats, biases, darks & kspots, before/after decons.
Photometric Monitor: GRW+70d5824 is observed after each decon and before every other decon: (1) F170W in all chips to monitor far UV contamination. (2) As many as possible of F160BW, F218W, F255W, F336W, F439W, F555W, F814W will be observed in a different chip each month.
Focus Monitor: two PC, F555W observations of GRW+70d5824 will be taken during every photometric monitoring orbit (one at orbit start, one near orbit end).
UV Throughput: PC & WF3 UV observations in most UV filters, popular UV filters in all chips, to verify that the UV spectral response curve is unchanged. In addition, two PC, F555W observations will be included as an extra focus monitor.
Internal UV flatfields: obtained with the CAL channel's ultraviolet lamp (UVFLAT) using the UV filters F122M, F170W, F160BW, F185W, & F336W. The UV flats are used to monitor UV flatfield stability and the stability of the F160BW filter by using F170W as the control. The F336W ratio of VISFLAT to UVFLAT provides a diagnostic of the UV flatfield degradation & ties the UVFLAT and VISFLAT flatfield patterns. Two supplemental dark frames must be obtained immediately after each use of the lamp to check for possible after-images.

Fraction GO/GTO Programs Supported 100%

Plan

Resources Required: Observation	Total of 30 external and 82 internal orbits. Request covers thirteen decons plus three extra decons. External orbits needed: 24 orbits for photometric monitoring, 4 orbits for UV throughput, 2 orbits for UV flats monitor (non-pointed, but displaces WFPC2 science because of timing requirements) plus occultation periods before and after each orbit, 2 internal orbits for VISFLAT sweep and 80 internal orbits for INTFLAT monitoring.
Products	SYNPHOT, CDBS, Instr. Handbook, TIPS meetings, WWW reports,TIR, ISR; new UV flatfields if changes are detected.
Accuracy Goals	*Photometry*: less than 2% discrepancy between results, 1% rms expected. *Focus measurement:* 1.5 mic accuracy with a goal of 1 mic. *UV throughput:* better than 3%. *Flatfield:* temporal variations monitored at 1% level. *Gain ratios:* stable to better than 0.1%. *UV flats*:About 2-8% pixel-to-pixel expected (filter dependent). *VISFLATs:* stable to better than 1% in overall level and spatial variations (after correcting for lamp degradation). Contamination effects should be < 1%.
Scheduling& Special Requirements	Upon request, all timing requirements have been hardcoded via GROUP-WITHIN and BETWEEN special requirements *Decons*: every 4 weeks. *Photometry:* Observations are tied to within +/- 1 week of decons. *Darks*: around decon, these are taken NON-INT to prevent residual image problems. *VISFLAT* sweep must be done with minimum number of lamp cycles to prevent further degradation of the lamp. *UV flats*: To prevent excessive degradation of the UV lamp, the SU duration for each UVFLAT visit should be kept the same as that in cycle 8 (prop. 8449); the lamp should not remain on for periods of time longer than those used in Cycles 7 & 8. Due to timing requirements, each visit covers a 2-hour time span--one visibility period and two occultation periods; other instruments can be used during this period.

Proposal ID 8811: WFPC2 Cycle 9 Standard Darks

Plan

Purpose	Measure dark current & identify of hot pixels.
Description	Six 1800s exp/week with the shutter closed, five with clocks off, one with clocks on. This frequency is required due to the high formation rate of new hot pixels (several tens/CCD/day). Five darks per week are required for cosmic ray rejection, counter-balancing losses due to residual images, & improving the noise of individual measurements. Sometimes, no usable darks are available for a given week due to residual images, resulting in a longer-than-usual gap in the hot pixel lists, but in a decon week, information on hot pixels that became hot and then annealed would be lost irretrievably. As a result, pre-decon darks (see Decon proposal) are executed NON-INT and at least 30 min after any WFPC2 activity.
Fraction GO/GTO Programs Supported	90%
Resources Required: Observation	366 internal orbits (occultation periods),
Products	Weekly darks delivered to CDBS and monthly tables of hot pixels on the WWW. Superdark reference files.
Accuracy Goals	Require ~1 e^-/hr (single-pixel rms) accuracy for most science applications. Expected accuracy in a typical superdark is 0.05 e-/hour for normal pixels. The need for regular darks is driven by systematic effects, such as dark glow (a spatially and temporally variable component of dark signal) and hot pixels, which cause errors that may exceed these limits significantly.
Scheduling& Special Requirements	These darks are *not* run during decon weeks; decon week darks are in decon proposal. As requested, timing requirements have been hardcoded with GROUP-WITHIN and BETWEENs.

Proposal ID 8826-8828: WFPC2 Cycle 9 Supplemental Darks

Plan

Purpose	Images will allow for frequent monitoring of hot pixels.
Description	This program is designed to provide up to three short (1000s) darks per day, to be used primarily for the identification of hot pixels. Shorter darks are used so that the observations can fit into almost any occultation period, making automatic scheduling feasible. These supplemental darks are low priority, and should be taken only when there is no other requirement for that specific occultation period. This program complements the higher priority Standard Darks proposal that has longer individual observations for producing high-quality pipeline darks and superdarks. Hot pixels are often a cause of concern for relatively short science programs, since they can mimic stars or mask key features of the observations: about 400 new hot pixels/CCD are formed between executions of the Standard Darks program. The supplemental darks are available to the GO community from the archive; there is no plan to use them in our standard analysis and products.
Fraction GO/GTO Programs Supported	30%
Resources Required: Observation	Total of 1282 internal orbits (occultation periods), which allows for a maximum of 3 darks per day.
Products	None.
Accuracy Goals	For archive only, no STScI analysis provided.
Scheduling& Special Requirements	Scheduled at low priority, non-interference basis, maximum of 3/day. Will require multiple proposal IDs due to large number of visits (1 dark/visit to maximize scheduling flexibility).

Proposal ID 8812: WFPC2 Cycle 9 Internal Monitor

Plan

Purpose	Verify the short-term instrument stability at both gain settings and provide INTFLATs for calibrating preflashed observations.
Description	Each set of internal observations consists of 8 biases (4 at each gain) and 4 INTFLATs (2 at each gain). The entire set should be run once per week, except for decon weeks, on a non-interference basis. During the decon week, INTFLATs in F502N will be taken, with each shutterblade and at a variety of exposure times to test for linearity. The F502N filter is likely to be the recommended filter for preflashing observations.
Fraction GO/GTO Programs Supported	100%
Resources Required: Observation	76 internal orbits (occultation periods); 46 will be needed for the usual monitor while 30 will be required for the new F502N intflat monitoring.
Products	Superbiases delivered annually to CDBS; TIPS reports on possible buildup of contaminants on the CCD windows (worms) as well as gain ratio stability, based on INTFLATs. A Technical Instrument Report will be issued if significant changes occur. Possible preflash correction images will be generated.
Accuracy Goals	Approximately 120 bias frames are used for each superbias pipeline reference file, generated once a year; accuracy is required to be better than 1.5 e-/pixel, and is expected to be 0.8 e-/pixel.
Scheduling& Special Requirements	Regular internals to be scheduled on non-decon weeks, F502N INTFLATs during decon weeks though they are not linked to the decon itself. As requested, timing requirements have been hardcoded with GROUP-WITHIN and BETWEENs.

Proposal ID 8815: WFPC2 Cycle 9 Earth Flats

Plan

Purpose	Monitor flatfield stability. This proposal obtains sequences of Earth streak flats to construct high quality flat fields for the WFPC2 filter set. These flat fields will allow mapping of the OTA illumination pattern and will be used in conjunction with previous internal and external flats to generate new pipeline superflats. These Earth flats will complement the Earth flat data obtained during SMOV and Cycles 4-8.
Description	Observations of the bright Earth (earthcals) are obtained in a variety of filters. Approximately 200 exposures in each of four narrowband filters (F375N, F502N, F656N, F953N) are required, as well as about 50 exposures in other filters (F160BW, F336W, F343N, F390N, F437N, F469N, F487N, F631N, F658N, F673N -- the F160BW filter is included to provide pinhole information). In addition, if dark-earth pointing becomes available, some of the broadband filters are requested (F336W, F439W, F555W, F675W, and F814W; all marked as on-hold for now), 10 exposures in each filter.
Fraction GO/GTO Programs Supported	100%
Resources Required: Observation	210 internal orbits (occultation periods).
Products	New flatfields generated and delivered to CDBS if changes detected.
Accuracy Goals	The single-pixel signal-to-noise ratio expected in the flatfield is 0.3%.
Scheduling& Special Requirements	None.

Proposal ID 8816: WFPC2 Cycle 9 UV Earth Flats

Plan

Purpose	Monitor flatfield stability. This proposal obtains sequences of earth streak flats to improve the quality of pipeline flat fields for the WFPC2 UV filter set. These Earth flats will complement the UV earth flat data obtained during Cycle 8.
Description	Earth streak-flats are taken in UV filters (F170W, F185W, F218W, F255W, F300W, F336W, and F343N). Those UV filters with significant redleak will also be observed crossed with selected broadband filters (F450W, F606W, F675W, and F814W), in order to assess and remove the redleak contribution. Earthflats required: 100 for each of the 7 UV filters plus 20 with each of the crossed filter sets (16 combinations). The entire proposal should be done within 7 months, with the observations evenly distributed over that period of time. The observations are divided into 10 batches, with each batch done 21 days apart.
Fraction GO/GTO Programs Supported	~10%
Resources Required: Observation	400 occultation periods.
Products	Updated flatfields for pipeline via CDBS.
Accuracy Goals	3-10%. Outsourcing candidate.
Scheduling& Special Requirements	None.

Proposal ID 8813: WFPC2 Cycle 9 Astrometric Monitor

Plan

Purpose	Verify relative positions of WFPC2 chips with respect to one another.
Description	The positions of the WFPC2 chips with respect to each other appear to be shifting slowly (by about 1 pixel, since 1994). The rich field in ω Cen (same positions as cycle 8 proposal 7627) is observed with large shifts (35'') in F555W only, every ~six months. This will allow monitoring of shifts in the relative positions of the chips or changes in the astrometric solution at the sub-pixel level. Kelsall spot images will be taken in conjunction with each execution.
Fraction GO/GTO Programs Supported	<20%. Also supports WFPC2-assisted target acquisitions for other instruments.
Resources Required: Observation	2 pointed orbits and 2 occultation periods need for this program, each separated by 6 months.
Products	Products: TIPS reports, ISR, update of chip positions in PDB and of geometric solution in STSDAS tasks metric and wmosaic if significant changes are found.
Accuracy Goals	At least 0.01'' in relative shifts; 0.05" or better for absolute.
Scheduling& Special Requirements	

Proposal ID 8817: WFPC2 Cycle 9 Intflat Sweeps and Linearity Test

Plan

Purpose	Using INTFLAT observations, this WFPC2 proposal is designed to monitor the pixel to pixel flatfield response and provide a linearity check. The INTFLAT sequences, to be done once during the year, are similar to those from the Cycle 8 program 8448. The images will provide a backup database in the event of complete failure of the VISFLAT lamp as well as allow monitoring of the gain ratios. The sweep is a complete set of internal flats, cycling through both shutter blades and both gains. The linearity test consists of a series of INTFLATs in F555W, in each gain and each shutter.
Description	*Intflat sweep* -- flatfields are obtained with a variety of filters (F336W, F439W, F547M, F555W, F569W, F606W, F622W, F631N, F502N, F656N, F675W, F673N, F702W, F785LP, F814W, F1042M) using shutters A and B, and gains 7 and 15; the BLADE optional parameter is used throughout. A smaller set is obtained only at gain 7 using any shutter blade (F160BW, F300W, F380W, F390N, F410M, F437N, F450W, F469N, F487N, F467M, F588N, F658N, F791W, F850LP, F953N). *Linearity test* -- flatfields are taken with F555W at a variety of exposure times, using shutters A & B, and gains 7 & 15. In addition, a set is done with clocks=YES (only gain 7, shutter A; gain 7 shutter B set was taken during Cycle 8). Since the INTFLATs have significant spatial structure, any non-linearity should appear as a non-uniform ratio of INTFLATs with different exposure times.
Fraction GO/GTO Programs Supported	100%
Resources Required: Observation	21 internal orbits (occultation periods)
Products	TIPS, TIR if any significant variations are observed.

Plan

Accuracy Goals	*INTFLATs:* Stable to better than 1%. (INTFLATs will provide a baseline comparison of INTFLAT vs VISFLAT (taken in decon proposal) if the CAL channel system fails.)
Scheduling& Special Requirements	Intflat sweeps should be scheduled within a 2-week period. To minimize filter wheel usage, each filter will be cycled through the two shutters and two gains. Each visit will contain just a few filters, in order to allow flexibility in scheduling, however, the sweep INTFLATs should be done over as short a time period as possible (2 weeks) and in the same month as the VISFLATs (~March/ early April 2001). VISFLATs, as well as the small monthly INTFLAT sets (5 broadband filters), which must be tied to a decon, will be included in the Cycle 9 decon proposals. Upon request, to facilitate implementation and scheduling, these timing requirements are hardcoded as the specified GROUP-WITHIN and BETWEEN special requirements.

Proposal ID 8818: WFPC2 Cycle 9 Photometric Characterization

Plan

Purpose	Provide a check of the zeropoints and contamination rates in non-standard WFPC2 filters.
Description	Observations of the standard star GRW+70D5824 in PC1 and WF3 will be made using filters that are not routinely monitored (F380W, F410M, F450W, F467M, F547M, F569W, F606W, F622W, F702W, F785LP, F791W, F850LP, and F1042M). Images should be taken within 7 days after a decon, to minimize any contamination effects. Results from this program will be compared with data from the cycle 7 program 7628 and cycle 8 program 8451.
Fraction GO/GTO Programs Supported	100%
Resources Required: Observation	2 orbits.
Products	TIR, SYNPHOT update if necessary.
Accuracy Goals	2% photometry.
Scheduling& Special Requirements	Execute within 7 days of decon. Upon request, to facilitate implementation and scheduling, these timing requirements are hardcoded as the specified GROUP-WITHIN and BETWEEN special requirements.

Proposal ID 8819: WFPC2 Cycle 9 PSF Characterization

Plan

Purpose	Provide a subsampled PSF over the full WFPC2 field of view in order to support PSF fitting photometry and provide data to test PSF subtraction as well as dithering techniques (e.g., effects of OTA breathing and gain).
Description	Measure PSF over full field in photometric filters in order to update the TIM and TINYTIM models and to allow accurate empirical PSFs to be derived for PSF fitting photometry. These observations will also be useful in order to test PSF subtraction and dithering techniques at various locations on the CCD chips. With ~1 orbit per photometric filter, each star is measured 16 times per filter at different pixel phase, providing a high S/N, critically sampled PSF. This will improve the quality of PSF fitting photometry. The step size is 0.125 arcseconds, very close to 1.25 pixels in the WFs and 2.75 pixels in the PC - so that fractional steps of 0.25, 0.5, and 0.75 pixels are used in each camera. This provides a critically sampled PSF over most of the visible range. The crowded ω Cen field is used, with 40 sec (gain = 15) images taken through each of the wide standard photometric filters (F336W, F439W, F555W, F675W and F814W). The Cycle 9 observations use the same pointings as in Cycles 7 and 8. The proposal also allows a check for subpixel phase effects on the integrated photometry.
Fraction GO/GTO Programs Supported	15%
Resources Required: Observation	6 pointed orbits. This is slightly higher than last time (5 orbits) due to removal of scan capability.
Products	PSF library (WWW). Updates for TIM and TINYTIM. Accurate empirical PSFs to be derived for PSF fitting photometry.

Plan

Accuracy Goals

If breathing is less than 5 microns peak to peak, the resulting PSFs should be good to about 10% in each pixel. PSF fitting results using this calibration would of course be much more accurate. In addition, the test gives a direct measurement of sub-pixel phase effects on photometry, which should be measured to better than 1%.

Scheduling& Special Requirements

Same pointing and orientation as Cycle 7 observations for proposal 7629 and Cycle 8 proposal 8451. Visits should be completed within 2 week timeframe to minimize spacecraft temperature differences.

Proposal ID 8814: WFPC2 Cycle 9 Redleak Check

Plan

Purpose	Obtain an on-orbit verification of the red leak in WFPC2 UV filters by observing solar analog standards in the UV.
Description	Two targets, for which FOS spectrophotometry is available, will be chosen from those used in the solar analog photometric verification program (P041-C, P177-D, or P330-E; Cycle 6 proposal 6934 and 6179). Observed countrates will be compared to SYNPHOT predictions of the expected count rates from the UV proper and from the red leak. A robust verification of the red leak will benefit programs that rely on precision multicolor photometry and comparison with model spectra. Some discrepancies seen thus far could be explained by a significant (> 10%) error in the estimated red leak.
Fraction GO/GTO Programs Supported	~10%
Resources Required: Observation	2 orbits, one per target.
Products	TIR and SYNPHOT update if necessary.
Accuracy Goals	2% on the flux measurements; accuracy of redleak determination will vary by filter.
Scheduling& Special Requirements	None.

Proposal ID 8821: WFPC2 Cycle 9 CTE - Monitor and Absolute Calibration

Plan

Purpose Monitor CTE changes during Cycle 9 and provide complementary suite of observations to groundbased CTE proposal.

Description *Monitor*: Observations of ω Cen (NGC 5139) are taken every 6 months during cycle 9 to monitor changes in the CTE (charge transfer efficiency) of WFPC2. An extension of proposals 7629 and 8447, the principal observations will be at gain 7, in F814W and F555W, in WF2 and WF4, at a variety of preflash (background) levels (20 to 1000 electrons).

Absolute Calibration: Observations of three of the globular clusters Eridanus, NGC 2419, Pal 3, Pal 4, and Pal 14 are planned, to match the targets selected for a companion ground-based proposal - subject to approval of the latter. Direct comparison with ground-based observations permits a direct verification of the absolute photometric calibration of WFPC2 in observations that may be affected by CTE, and therefore a more robust determination of the zero point for many WFPC2 observations. While there is no evidence that the current WFPC2 zero point is inapplicable to faint sources, enough corrections need to be applied that a direct verification is extremely desirable. Comparison to a well-populated field observed from the ground can also yield a direct, independent determination of the CTE effect in such observations (Stetson 1998). Five suitable fields with existing WFPC2 observations have been selected (ω Cen and a WIYN 3.5m proposal (PI Whitmore) has been submitted for ground-based observations of these fields with exposure times sufficient to reach 1% photometric accuracy at V=22. The ground-based proposal asks for observations of three of these five fields, to be chosen on the basis of their RA and the time of the observations.

Fraction GO/GTO Programs Supported 30 - 50%

Plan

Resources Required: Observation	15 orbits total. Six for ω Cen (3 per execution, done twice during cycle) plus 9 orbits for the followup to ground based observations (3 orbits per target, 3 targets).
Products	Instrument Science Report. Outsourcing candidate?
Accuracy Goals	0.01 magnitudes.
Scheduling& Special Requirements	For each monitoring visit, observations will be done in single guide star mode.

Proposal ID 8820: WFPC2 Cycle 9 Wavelength Stability of Narrowband and Linear Ramp Filters

Plan

Purpose	Verify the mapping of wavelength as a function of CCD position on LRFs; check for changes in central wavelengths of narrow band filters.
Description	On-orbit VISFLATs taken through the ramps crossed with the narrow band filters will constrain the wavelength calibration of the ramps filters relative to the narrow band filters. Comparison with similar Cycle 4 data will show whether the filter properties have evolved with time due to annealing / shrinkage of the thin film materials. The uncrossed VISFLATs can also be used to contrain the transverse (cross-wavelength) placement of the ramp filters. In addition, 4 external orbits are required for external observations of an extended line emission source (planetary nebula) through ramp filters. These will provide an absolute test for changes in the ramp filters.
Fraction GO/GTO Programs Supported	11%
Resources Required: Observation	4 external orbits and 15 internal orbits (12 for Earth flats and 3 for VISFLATs).
Products	New aperture locations if necessary. Updated wavelengths / throughput curves for both ramp and narrow band filters in SYNPHOT.
Accuracy Goals	Central wavelengths to 2Å.
Scheduling& Special Requirements	Number of VISFLAT lamp cycles must be minimized, to reduce amount of lamp throughput degradation.