WFC3:
Cycle 19 Calibration Program

E. Sabbi[1], J. MacKenty[1], S. Deustua[1], & the WFC3 Team
[1]STScI

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ABSTRACT

The WFC3 Cycle 19 calibration program has been designed to measure and monitor the behavior of both the UVIS and IR channels.
The program was designed with the actual usage of WFC3 in mind, to provide the best calibration data for the approved scientific programs. During the cycle the WFC3 team is using a total of 125 external (pointed observations) and 1587 internal orbits (data are acquired during occultation), divided in 29 different programs, which can be divided in 6 categories: Monitor, Photometry, Spectroscopy, Detectors, Flatfields and Image Quality.

BACKGROUND

The Wide Field Camera 3 (WFC3) is a panchromatic (wavelength range from 200nm to 1700 nm) 4th generation HST instrument, that has replaced the Wide Field Planetary Camera 2 (WFPC2) during the last servicing mission (SM4). WFC3 consists of a UV-optical (UVIS) and an IR channel that allow multiple observing modes (imaging, spectroscopy, variety of readout modes, 80 different filters – narrow, medium, broadband, and grisms).

Both channels have been very popular in the past two cycles (Table 1).
During Cycle 19, 50% of the UVIS exposures will be acquired with a UV filter, 25% will be obtained with the filters F606W or F814W, and 13 of the UVIS filters Will each acquire more than 100 exposures. Another ~100 exposures will be acquired with the UVIS grism G280. During Cycle 19, 42 out of the 62 UVIS filters will be utilized. In the IR channel, 12 of 15 IR filters will be used, with more than 200 exposures in each of 8 filters (Figure 1).

PERCENTAGE OF EXPOSURES FOR WFC3 CHANNEL

	UVIS	IR	IMAGING	GRISMS
Cycle 17	49%	51%	92%	8%
Cycle 18	22%	78%	40%	60%
Cycle 19	44%	56%	77%	23%

Table 1: Percentage for total WFC3 time of the WFC3 UVIS and IR channels usage during these last 3 cycles.

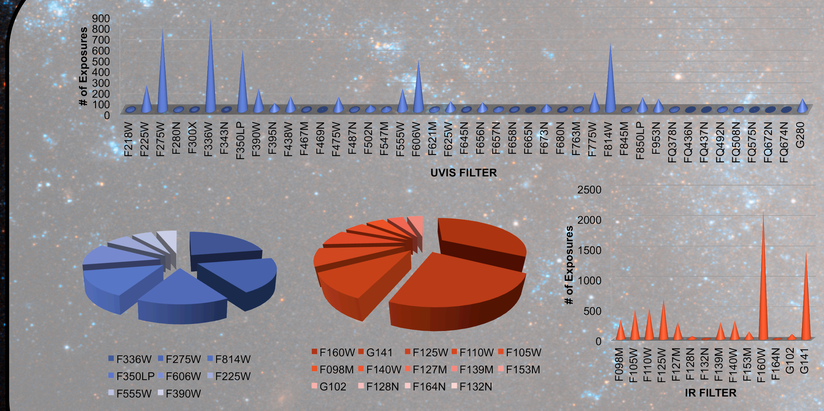

Figure 1: WFC3 filter usage (GO+MCT) during Cycle 19. The UVIS channel is shown in blue, and the IR channel in red.

Program ID	Description	# of Orbits	Program ID	Description	# of Orbits
12687	UVIS Anneal	91 I	12702	IR Grisms: Flux/Trace Calibration & Stability	8 E
12688	UVIS Bowtie Monitor	130 I	12703	IR Grisms: Wavelength Calibration & Stability	8 E
12689	UVIS CCD Daily Monitor	730 I	12704	UVIS Grism: Flux Calibration	3 E
12690	UVIS CCD Gain Stability	13 I	12705	UVIS Grism: Wavelength Calibration & Stability	3 E
12691	UVIS CTI Monitor (EPER)	24 I	12706	UVIS Flare Wavelength Dependence	2 E
12692	UVIS CTE Monitor (Star Clusters)	14 E	12707	UVIS Spatial Sensitivity	10 E
12693	UVIS Charge Injection	6 E + 50 I	12708	IR Spatial Sensitivity	4 5
12694	IR Persistence Strength	9 E + 67 I	12709	UVIS & IR Moonlit Flats	50 I
12695	IR Dark Monitor	235 I	12710	UVIS Bright Earth Flats	20 I
12696	IR Linearity Monitor	6 E + 18 I	12711	UVIS Internal Flats	20 I
12697	IR Gain Monitor	16 I	12712	IR Internal Flats	33 I
12698	WFC3 Contamination & Stability Monitor	17 E	12713	Spatial Scanned L-flat Validation Pathfinder	8 E
12699	WFC3 Photometric Calibration & Calibration Flux Ladder	16 E	12714	UVIS & IR Geometric Distortion	2 E
12700	Extending the Range & Precision of the Count Rate non Linearity	4 E	12784	Characterization of UVIS Traps Via Charge-Injected Biases	90 I
12702	WFC3 PSF Wings	5 E			

Table 2: List of approved WFC3 calibration programs during Cycle 19. Columns 1 and 4 provide the proposal identification number, names of programs are listed in columns 2 and 5, while columns 3 and 6 show the number of assigned external (E) and internal (I) orbits.

Calibration Requirements

To calibrate the observational modes used by WFC3 GOs and to monitor WFC3's performance and capability during Cycle19 the WFC3 team will:

- Continue to maintain and update the standard reference files (biases, darks, IR non-linearity table, UVIS and IR geometric distortion tables);
- Monitor the pixel-to-pixel response of both the channels and the hysteresis (QE) offset;
- Validate the temporal and spatial photometric performances of the WFC3 channels;
- Characterize and model IR detector persistence effects, and verify its temporal behavior;
- Characterize and model the charge transfer efficiency (CTE) in the UVIS channel;
- Improve UVIS and IR grism wavelength and flux calibration over the entire area of the detectors;
- Validate inflight correction of the flatfields;
- Improve the accuracy of the absolute photometric calibration.

A detailed description of each calibration proposal executed during Cycle 19 can be found at the webpage:
http://www.stsci.edu/hst/wfc3/calibration/CY19

What's new in Cycle 19

1. Charge injection to mitigate the impact of CTE degradation in the UVIS CCDs. Results of on-orbit data acquired during Cycle 18 are presented in Bushouse et al 2011, WFC3-ISR 2011-12.
2. High-contrast imaging capability in the UVIS and IR channels enables detection of faint companions at close angular separation from very bright stars. Results from Cycle 18 data are presented in Gilliland & Rajan 2011, WFC3-ISR 2011-03 and Rajan et al 011, WFC3-ISR 2011-07.
3. Correction for persistence in the IR channel: preliminary results are presented in Knox at el. 2011, WFC3-ISR 2011-09.
4. Description of geometry of UVIS ghosts and how to minimize their impact when planning UVIS observations are described by McCullough 2011, WFC3-ISR 2011-16.

Details and update on the performances and capabilities of WFC3 can be found at:
http://www.stsci.edu/hst/wfc3/ & http://www.stsci.edu/hst/wfc3/documents/ISRs/