17693 - WFC3 Astrometric Scale Monitoring

Cycle: 32, Proposal Category: CAL/WFC3

(Availability Mode: RESTRICTED)

INVESTIGATORS

Name	*Institution*
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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) OMEGACEN	WFC3/UVIS	1	17-Apr-2025 12:00:11.0	yes
02	(1) OMEGACEN	WFC3/UVIS	1	17-Apr-2025 12:00:11.0	yes
03	(1) OMEGACEN	WFC3/UVIS	1	17-Apr-2025 12:00:12.0	yes
04	(1) OMEGACEN	WFC3/IR	1	17-Apr-2025 12:00:12.0	yes
05	(1) OMEGACEN	WFC3/IR WFC3/UVIS	1	17-Apr-2025 12:00:12.0	yes
06	(1) OMEGACEN	WFC3/IR WFC3/UVIS	1	17-Apr-2025 12:00:13.0	yes

6 Total Orbits Used

ABSTRACT

The standard astrometric catalog in the field of globular cluster Omega Cen has been used to examine the geometric distortion of WFC3 UVIS and IR as function of wavelength in multi-cycle calibration programs over last 11 years of WFC3 on HST board. All observations from these programs have been reduced and provided the multi-wavelength geometric distortion in UVIS and IR detector. The derived geometric distortion coefficients implemented in the IDCTAB format are used in the HST pipe-line to correct for a ~7% distortion in WFC3/UVIS and IR images down to <1%.

Additional to multi-wavelength WFC3 geometric distortion, all observations of Omega Cen taken through F606W and F160W UVIS and IR filters, respectively, during the last 11 years (all together 12 epochs) were used to look for time dependency of UVIS and IR geometric distortion and the effect of the scale change due to the thermal breathing. The results of the stability WFC3 geometric distortion published in WFC3-ISR-2015-02 (Kozhurina-Platais & Anderson, 2015), WFC3-ISR-2019-09 (Martlin, Kozhurina-Platais), have show that the UVIS geometric distortion is stable over 10 years on-orbit within 0.05 pixels or 2 mas in UVIS. The results of WFC3/IR published in WFC3-ISR-09-19 (M. McKay, Kozhurina-Platais, et al) have show that the IR geometric distortion is stable over 10 years on orbits within 0.1 pixel or 2 mas. The same observations were used to examine the WFC3/UVIS and IR photometric changes with time (WFC3-ISR-2020-05, Kozhurina-Platais, Bagget).

The purpose of this calibration proposal is to continue the monitor of the stability of the WFC3 geometric distortion over time. The observations of Omega Cen through the UVIS F606W filter and the F160W IR filter will be used to derive the skew and scale terms of the geometric distortion and look for any secular changes over time. In addition, several UVIS and IR filters have been appended for the purposes of generating new PSF models for the community.

OBSERVING DESCRIPTION

The observation of Omega Cen through F606W and F160W is used as a standard filter in UVIS and IR, respectively. They are observed with the same pointing but with different roll-angle of the OTA at a single epoch between Jan -April 2026 at an orient of ~290 degrees.

The 3 exposures in UVIS have steps of roll-angles -1.5, 0, +1.5 degrees requiring 3 orbits. The same 3 exposures in IR with the steps of roll-angles -1.5, 0, +1.5 degrees also require 3 orbits. To maintain accurate pointing control, 2-guide star acquisitions are used. If suitable guide stars can be found, the same pair of guide stars are used for all exposures.

This cycle, additional filters are added for UVIS and IR for the purposes of building additional PSF models, based on usage statistics in GO science programs.

---Calibration Goals---

The geometric distortion of WFC3 in 13 UVIS and 8 IR filters were calibrated using the standard astrometric catalog of Omega Cen (Anderson & van der Marel, 2010). An update set of updated distortions were obtained for 20 UVIS filters using the same standard astrometric catalog of Omega Cen (Kozhurina-Platais, WFC3-ISR-2014-12; Martlin et al. WFC3-ISR-2018-11).

The goal of this proposal is to monitor the geometric distortion of both the UVIS and IR detectors. The skew parameter in the ACS/WFC case, is changing with time in the level of 40 mas over 15 years on board of HST. The skew parameter is the non-perpendicularity of coordinate axes and is the major parameter in the geometric distortion model.

Visit

Proposal 17693, Visit 01 F606W (01), implementation Thu Apr 17 16:00:13 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 284D TO 284 D; BETWEEN 01-JAN-2026:00:00:00 AND 31-MAR-2026:00:00:00

Diagnostics

(F606W (01.001)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Fixed Targets

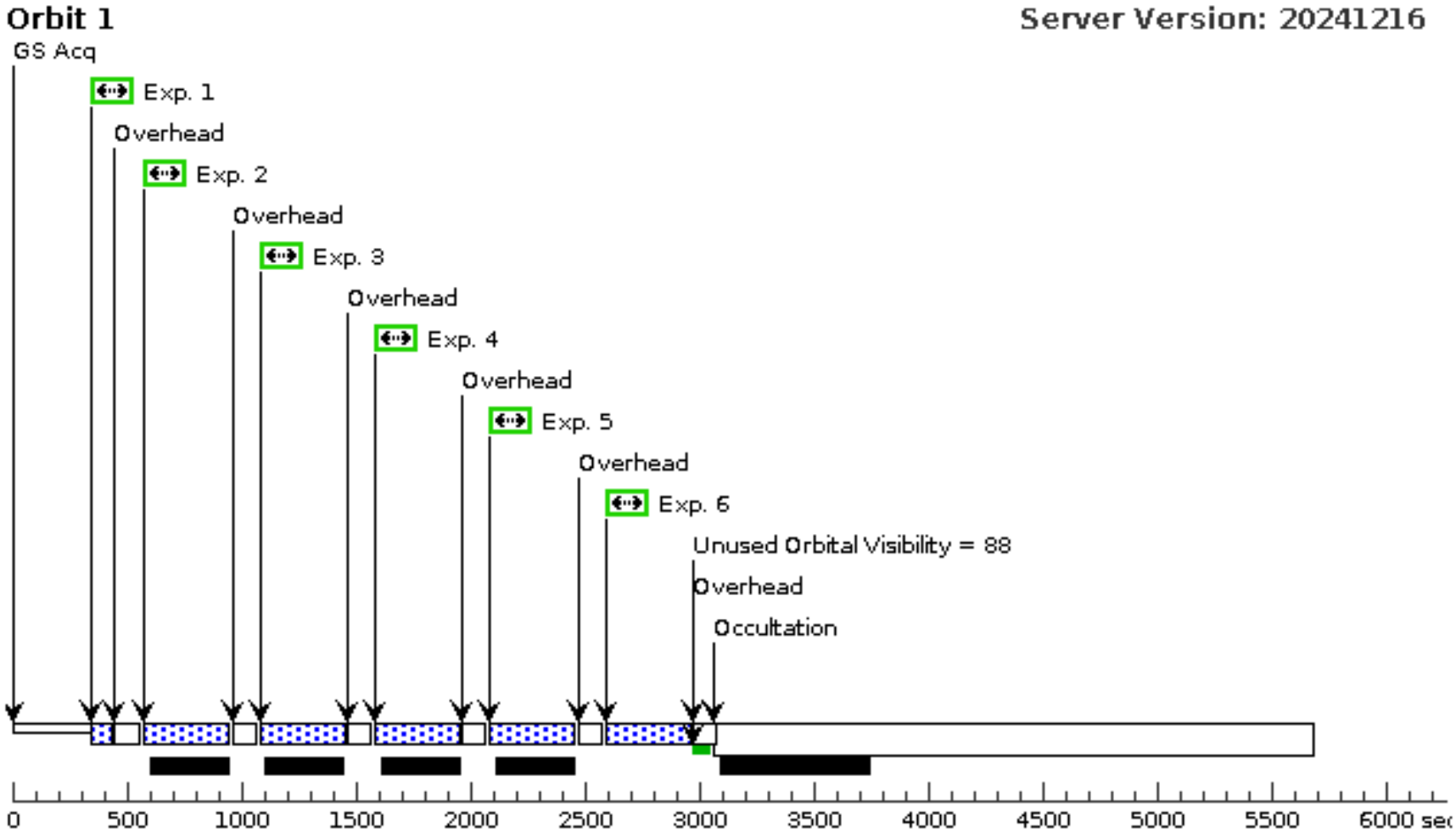
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OMEGACEN	RA: 13 26 46.2800 (201.6928333d) Dec: -47 28 44.60 (-47.47906d) Equinox: J2000		V=16.8+/-0.1	Reference Frame: ICRS

Comments: This is the same target (and coordinates) as used in CAL/WFC3 11911, UVIS L-Flats and Geometric Distortion and in other multi-cycles calibration proposals
Category=CALIBRATION
Description=[ASTROMETRIC, SPATIAL DISTORTION TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F606W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F606W	FLASH=12			60.0 Secs (60 Secs)	
								[==>]	***[1]***
2	F555W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F555W	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***
3	F475W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F475W	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***
4	F225W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F225W	FLASH=21			350 Secs (350 Secs)	
								[==>]	***[1]***
5	F625W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F625W	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***
6	F775W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F775W	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***

Orbit Structure



Visit

Proposal 17693, Visit 02 F606W (02), implementation Thu Apr 17 16:00:13 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 285.5D TO 285.5 D; BETWEEN 01-JAN-2026:00:00:00 AND 31-MAR-2026:00:00:00

Diagnostics

(F606W (02.001)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Fixed Targets

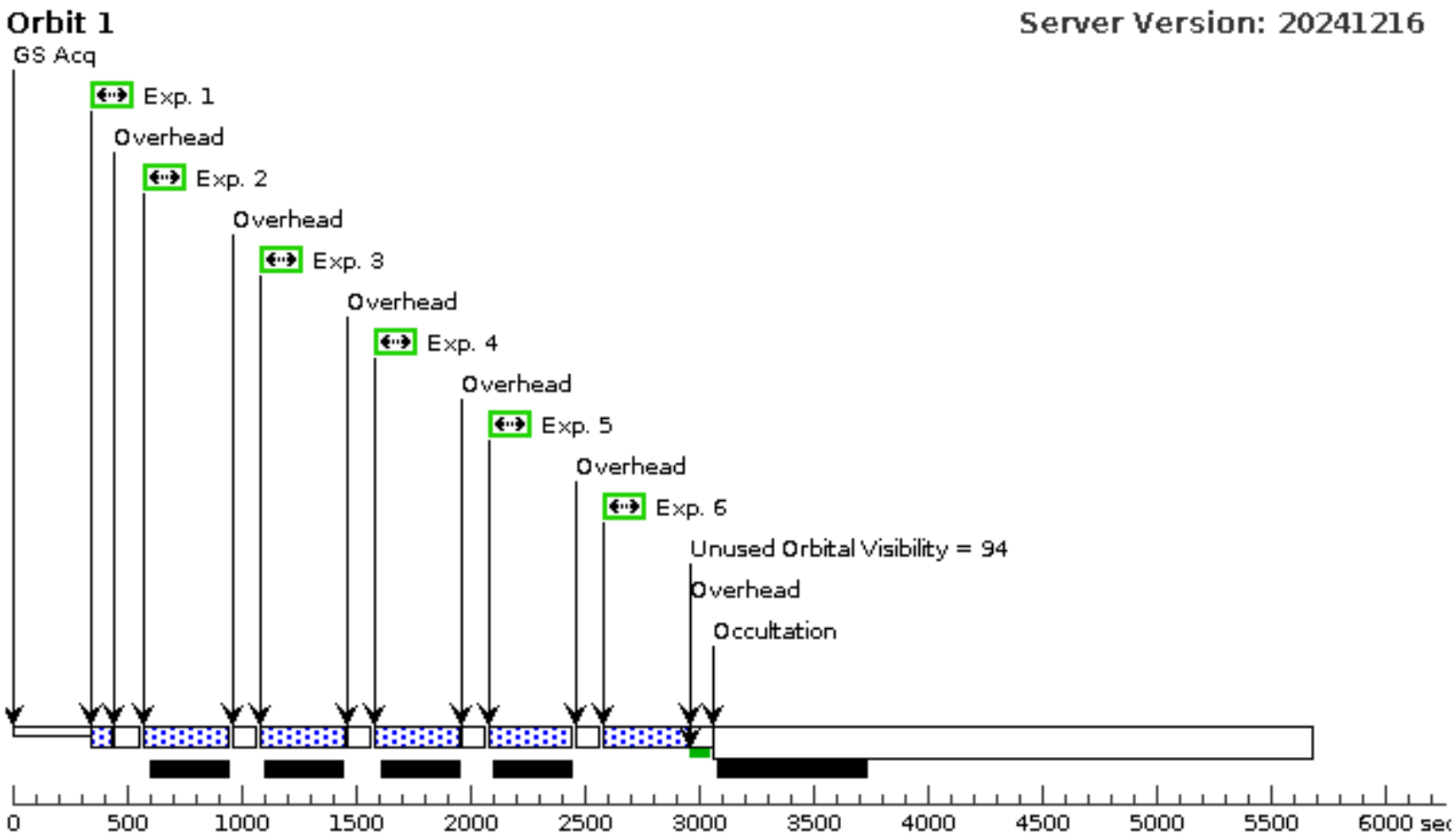
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OMEGACEN	RA: 13 26 46.2800 (201.6928333d) Dec: -47 28 44.60 (-47.47906d) Equinox: J2000		V=16.8+/-0.1	Reference Frame: ICRS

Comments: This is the same target (and coordinates) as used in CAL/WFC3 11911, UVIS L-Flats and Geometric Distortion and in other multi-cycles calibration proposals
Category=CALIBRATION
Description=[ASTROMETRIC, SPATIAL DISTORTION TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F606W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F606W	FLASH=12			60.0 Secs (60 Secs)	
								[==>]	***[1]***
2	F390W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F390W	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***
3	F218W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F218W	FLASH=21			350 Secs (350 Secs)	
								[==>]	***[1]***
4	F547M	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F547M	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***
5	F845M	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F845M	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***
6	F763M	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F763M	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***

Orbit Structure



Visit

Proposal 17693, Visit 03 F606W (03), implementation Thu Apr 17 16:00:13 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 287D TO 287 D; BETWEEN 01-JAN-2026:00:00:00 AND 30-MAR-2026:00:00:00

Diagnostics

(F606W (03.001)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Fixed Targets

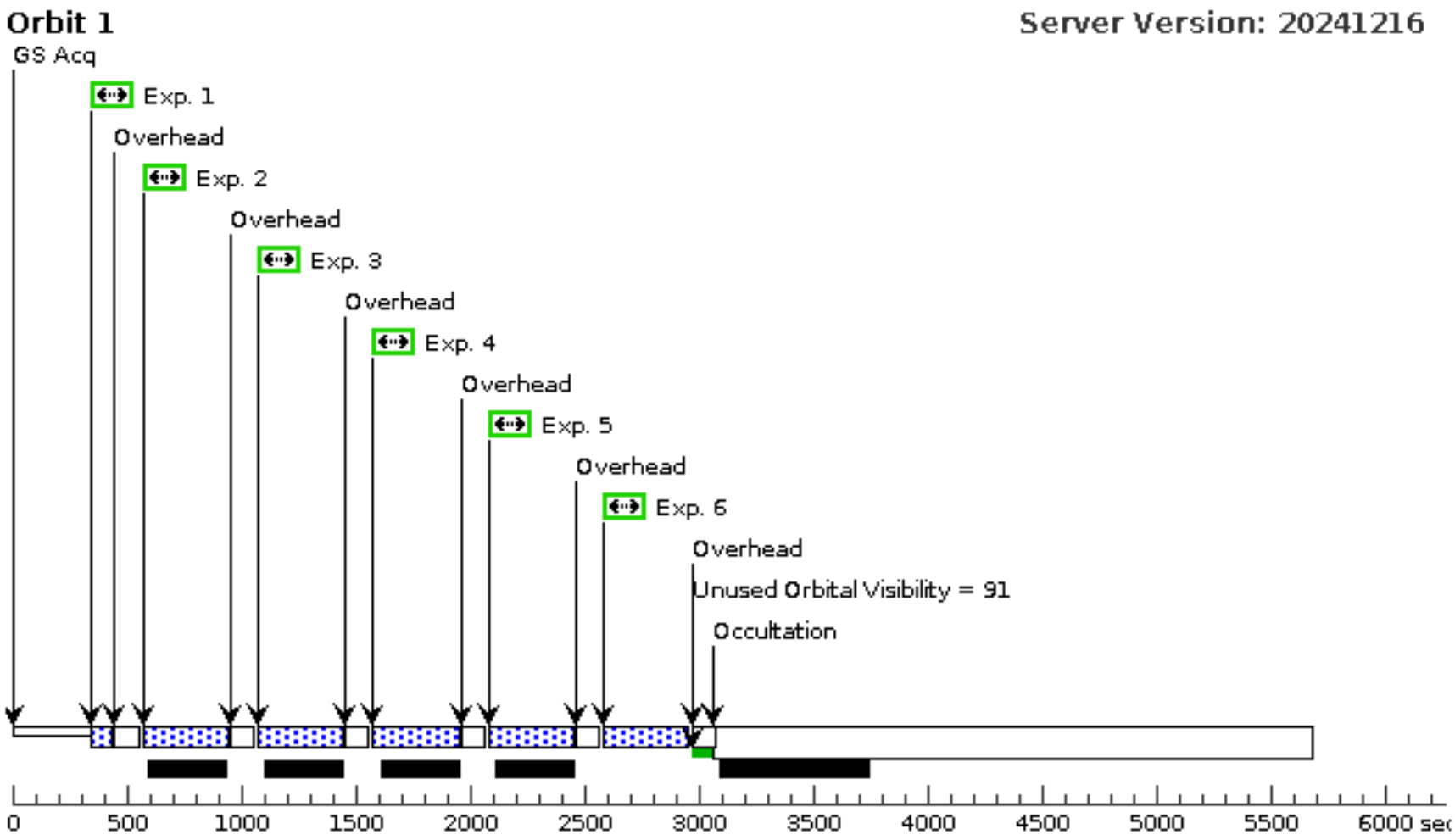
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OMEGACEN	RA: 13 26 46.2800 (201.6928333d) Dec: -47 28 44.60 (-47.47906d) Equinox: J2000		V=16.8+/-0.1	Reference Frame: ICRS

Comments: This is the same target (and coordinates) as used in CAL/WFC3 11911, UVIS L-Flats and Geometric Distortion and in other multi-cycles calibration proposals
Category=CALIBRATION
Description=[ASTROMETRIC, SPATIAL DISTORTION TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F606W	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F606W	FLASH=12			60.0 Secs (60 Secs)	
								[==>]	***[1]***
2	F621M	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F621M	FLASH=14			350 Secs (350 Secs)	
								[==>]	***[1]***
3	F656N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F656N	FLASH=21			350 Secs (350 Secs)	
								[==>]	***[1]***
4	F502N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F502N	FLASH=21			350 Secs (350 Secs)	
								[==>]	***[1]***
5	F657N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F657N	FLASH=21			350 Secs (350 Secs)	
								[==>]	***[1]***
6	F631N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F631N	FLASH=21			350 Secs (350 Secs)	
								[==>]	***[1]***

Orbit Structure



Visit

Proposal 17693, Visit 04 F160W (04), implementation Thu Apr 17 16:00:13 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: PCS MODE FINE; ORIENT 291.5D TO 291.5 D; BETWEEN 01-JAN-2026:00:00:00 AND 30-MAR-2026:00:00:00

Fixed Targets

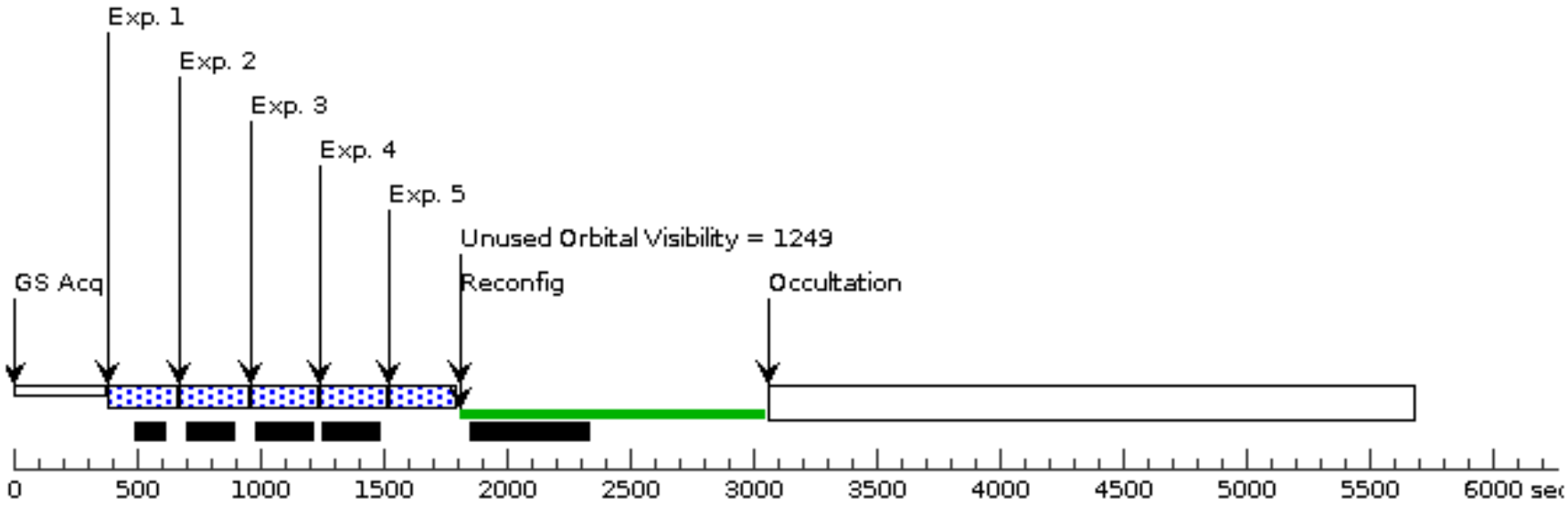
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OMEGACEN	RA: 13 26 46.2800 (201.6928333d) Dec: -47 28 44.60 (-47.47906d) Equinox: J2000		V=16.8+/-0.1	Reference Frame: ICRS

Comments: This is the same target (and coordinates) as used in CAL/WFC3 11911, UVIS L-Flats and Geometric Distortion and in other multi-cycles calibration proposals
Category=CALIBRATION
Description=[ASTROMETRIC, SPATIAL DISTORTION TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
2	F130N	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F130N	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
3	F132N	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F132N	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
4	F126N	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F126N	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
5	F139M	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F139M	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17693, Visit 05 F160W (05), implementation Thu Apr 17 16:00:13 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: PCS MODE FINE; ORIENT 293D TO 293 D; BETWEEN 01-JAN-2026:00:00:00 AND 31-MAR-2026:00:00:00

Fixed Targets

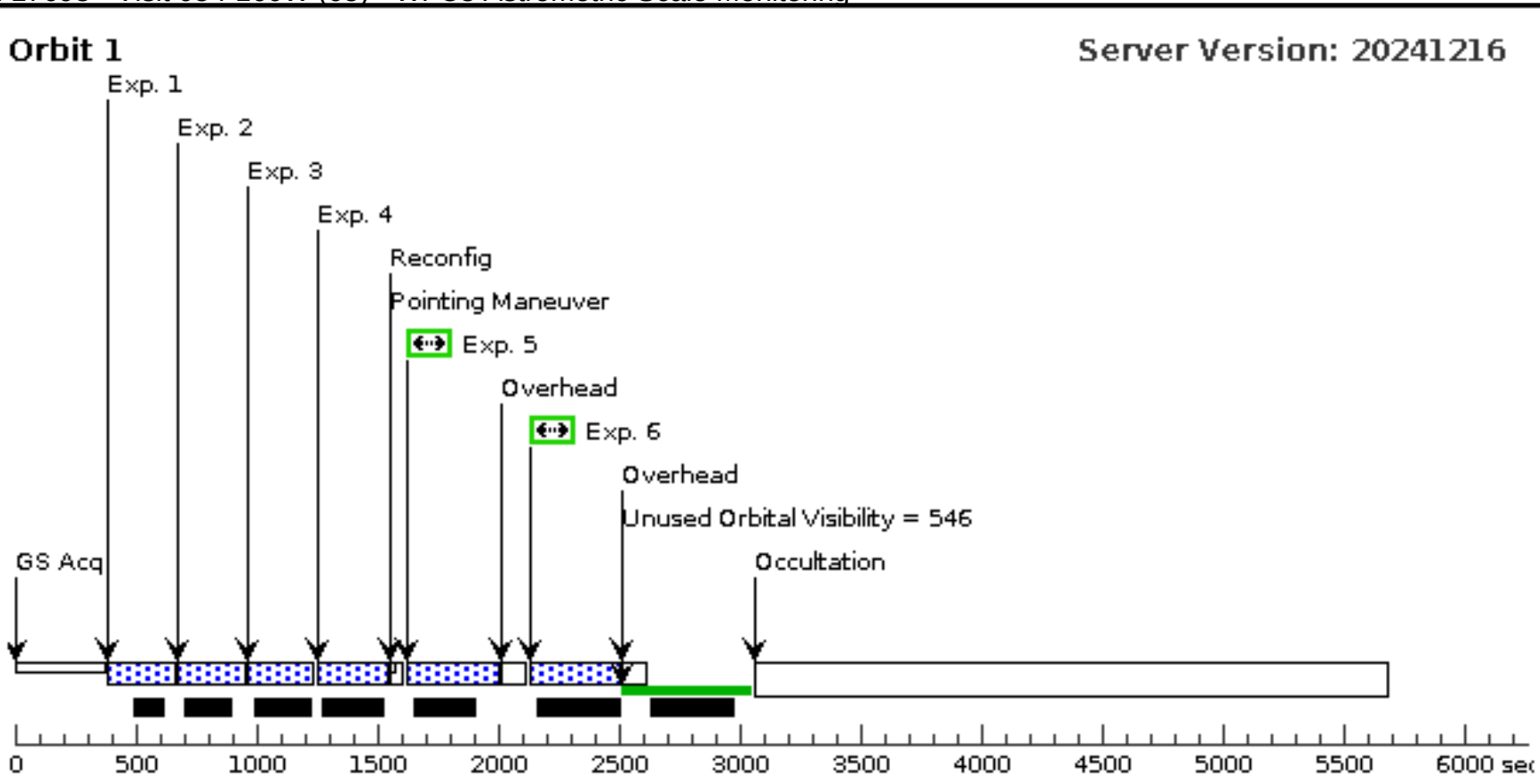
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OMEGACEN	RA: 13 26 46.2800 (201.6928333d) Dec: -47 28 44.60 (-47.47906d) Equinox: J2000		V=16.8+/-0.1	Reference Frame: ICRS

Comments: This is the same target (and coordinates) as used in CAL/WFC3 11911, UVIS L-Flats and Geometric Distortion and in other multi-cycles calibration proposals
Category=CALIBRATION
Description=[ASTROMETRIC, SPATIAL DISTORTION TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
2	F128N	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F128N	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
3	F167N	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F167N	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
4	F164N	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F164N	SAMP-SEQ=SPARS25; NSAMP=12	EXP PCS MODE FINE		277.937956 Secs (277.938 Secs) *[==>]*	*[1]*
5	F673N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F673N	FLASH=21			350 Secs (350 Secs) *[==>]*	*[1]*
6	F953N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F953N	FLASH=21			350 Secs (350 Secs) *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 17693, Visit 06 F160W (06), implementation Thu Apr 17 16:00:13 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: PCS MODE FINE; ORIENT 294.5D TO 294.5 D; BETWEEN 01-JAN-2026:00:00:00 AND 31-MAR-2026:00:00:00

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	OMEGACEN	RA: 13 26 46.2800 (201.6928333d) Dec: -47 28 44.60 (-47.47906d) Equinox: J2000		V=16.8+/-0.1	Reference Frame: ICRS

Comments: This is the same target (and coordinates) as used in CAL/WFC3 11911, UVIS L-Flats and Geometric Distortion and in other multi-cycles calibration proposals
Category=CALIBRATION
Description=[ASTROMETRIC, SPATIAL DISTORTION TEST]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) OMEGACEN	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS25; NSAMP=11	EXP PCS MODE FINE		252.937441 Secs (252.937 Secs) *[==>]*	*[1]*
2	F395N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F395N	FLASH=21			350 Secs (350 Secs) *[==>]*	*[1]*
3	F658N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F658N	FLASH=21			350 Secs (350 Secs) *[==>]*	*[1]*
4	F343N	(1) OMEGACEN	WFC3/UVIS, ACCUM, UVIS	F343N	FLASH=21			350 Secs (350 Secs) *[==>]*	*[1]*

Orbit Structure