18027 - Securing the HST Surface Brightness Fluctuation Legacy with a Robust JWST Calibration

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Joseph Jensen (PI) (Contact)	**Utah Valley University**
Dr. R. Brent Tully (CoI)	University of Hawaii
Dr. John P. Blakeslee (CoI)	NOIRLab - (AZ)
Dr. Michele Cantiello (CoI) (ESA Member)	INAF - Osservatorio Astronomico d'Abruzzo
Dr. Ehsan Kourkchi (CoI)	University of Hawaii
Dr. Gagandeep Singh Anand (CoI)	Space Telescope Science Institute

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) NGC-1549	WFC3/IR	1	07-Aug-2026 12:00:16.0	yes
02	(2) MESSIER-084	WFC3/IR	1	07-Aug-2026 12:00:16.0	yes
03	(3) MESSIER-086	WFC3/IR	1	07-Aug-2026 12:00:17.0	yes
04	(4) MESSIER-059	WFC3/IR	1	07-Aug-2026 12:00:18.0	yes
05	(5) MESSIER-087	WFC3/IR	1	07-Aug-2026 12:00:19.0	yes
06	(6) MESSIER-105	WFC3/IR	1	07-Aug-2026 12:00:19.0	yes

6 Total Orbits Used

ABSTRACT

Addressing the "Hubble tension" is a top priority for JWST, and several programs have been awarded time to construct a completely independent distance ladder based on old populations in elliptical galaxies instead of Cepheid variable stars in spiral galaxies. In particular, tip of the red giant branch (TRGB) stars have been measured in 14 early-type galaxies with JWST for the purpose of calibrating the surface brightness fluctuation (SBF) method. However, thus far only 8 of these galaxies have SBF measurements with HST WFC3/IR. We propose to complete the calibration linkage between HST and JWST by using HST WFC3/IR to observe the remaining 6 galaxies with established JWST TRGB distances. The result will be a higher precision zero point for the HST SBF sample, expanding the calibration from 8 to 14 galaxies. The TRGB calibration of SBF decouples the large archival sample of over 230 HST IR SBF measurements from the Cepheid-SN Ia ladder. The HST SBF sample, spanning the sky and extending to 100 Mpc, provides an independent estimate of the Hubble constant based solely on old stellar populations.

OBSERVING DESCRIPTION

Imaging observations of six elliptical galaxies closer than 20 Mpc in WFC3/IR basic imaging mode, using the default dither pattern with N=4 steps to correct for bad pixels. One orbit per galaxy.

Two filters will be used (F110W and F160W) with observations split into four dither positions in each filter.

The readout mode of SPARS50 and NSAMP=6 provides 1012 sec in each filter.

Visit

Proposal 18027, NGC-1549 (01), implementation Fri Aug 07 16:00:20 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 90%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.144 Line Spacing=0.73	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)

Fixed Targets

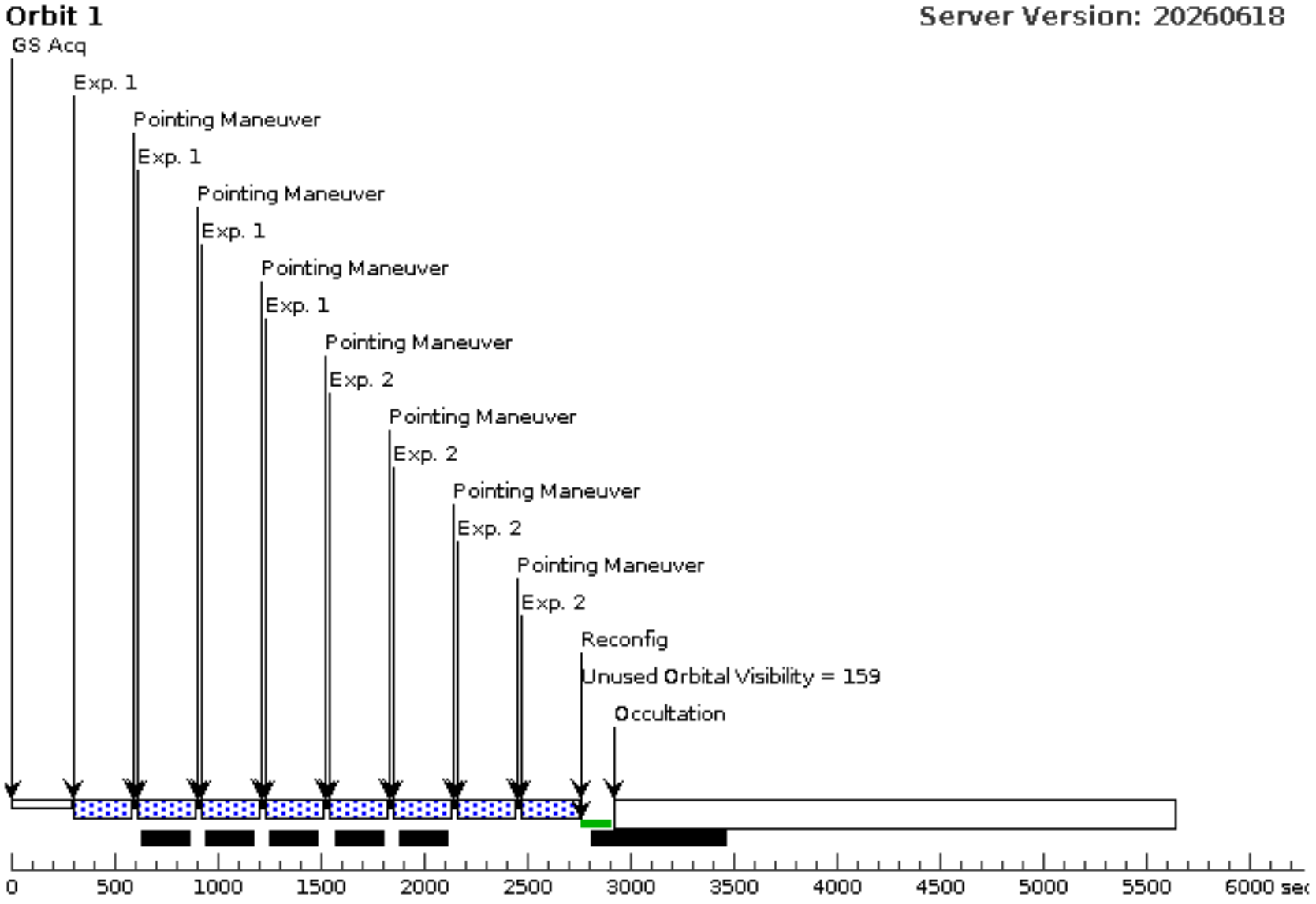
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-1549	RA: 04 15 45.1056 (63.9379400d) Dec: -55 35 31.85 (-55.59218d) Equinox: J2000	Radial Velocity: 1243 km/sec	V=9.8 J=9.1	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[ELLIPTICAL]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC-1549	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=10	GS ACQ SCENARIO ONEB1OR	Pattern 2, Exps 1-1 in NGC-1549 (01) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) NGC-1549	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=10		Pattern 2, Exps 2-2 in NGC-1549 (01) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 18027, MESSIER-084 (02), completed Fri Aug 07 16:00:20 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 80%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=4 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true		(1), (2)

Fixed Targets

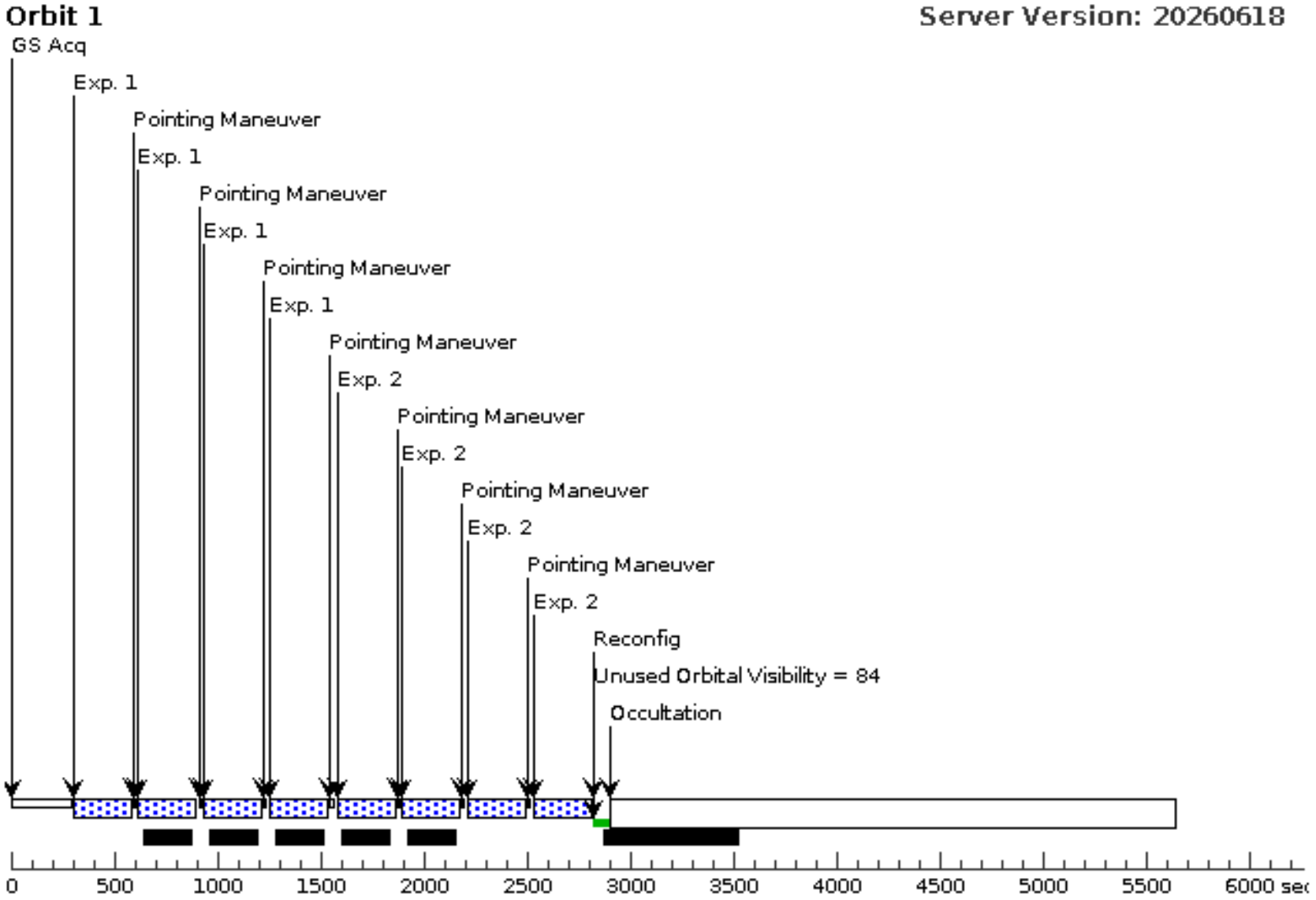
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	MESSIER-084 Alt Name1: NGC-4374	RA: 12 25 3.7440 (186.2656000d) Dec: +12 53 13.13 (12.88698d) Equinox: J2000	Radial Velocity: 1017 km/sec	V=9.07	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[ELLIPTICAL]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) MESSIER-084	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=10	GS ACQ SCENARIO ONEB1OR	Pattern 1, Exps 1-1 in MESSIER-084 (02) (1)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(2) MESSIER-084	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=10		Pattern 1, Exps 2-2 in MESSIER-084 (02) (1)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 18027, MESSIER-086 (03), implementation Fri Aug 07 16:00:20 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 80%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.144 Line Spacing=0.73	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)

Fixed Targets

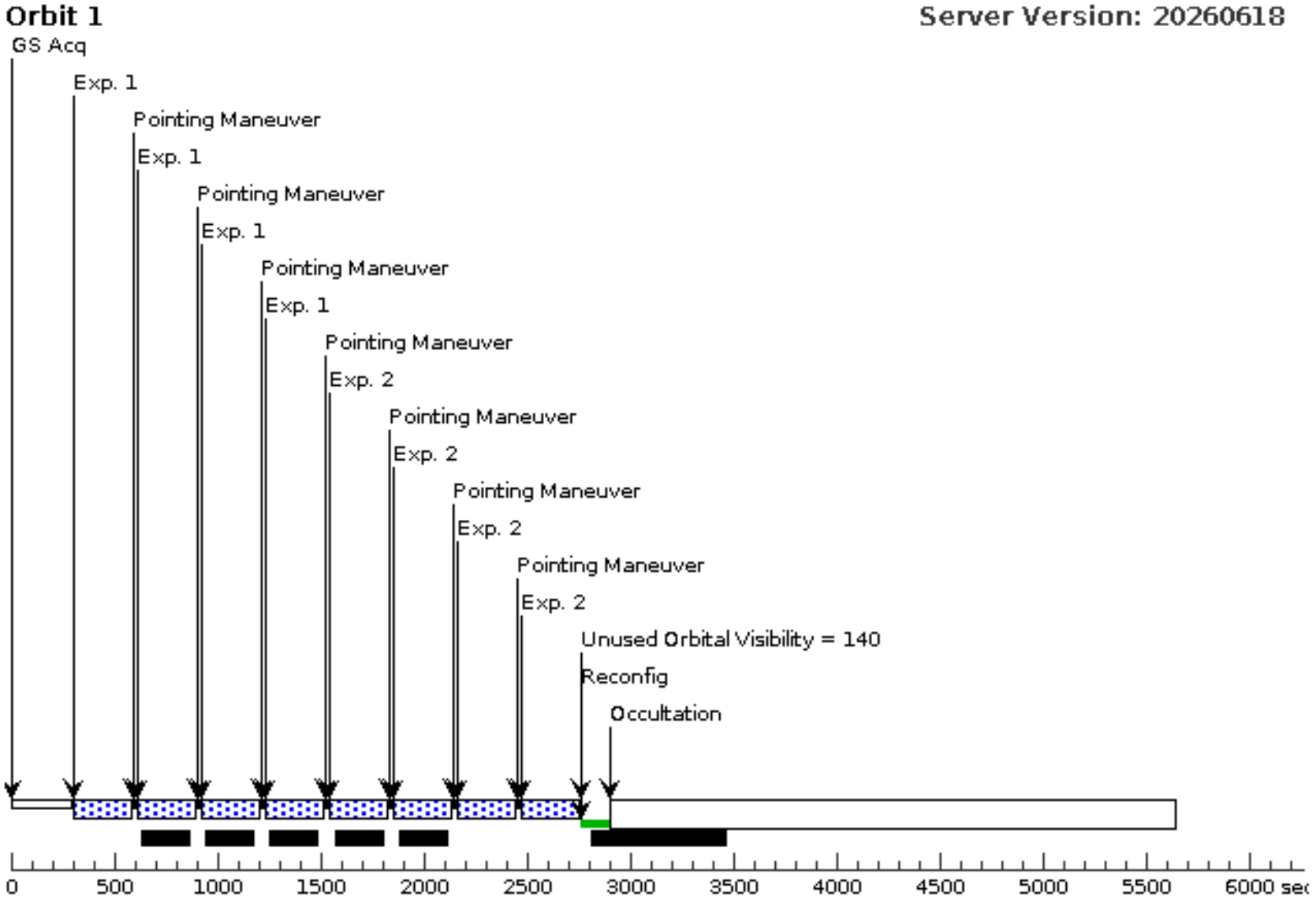
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	MESSIER-086 Alt Name1: NGC-4406	RA: 12 26 11.7432 (186.5489300d) Dec: +12 56 46.39 (12.94622d) Equinox: J2000	Radial Velocity: -224 km/sec	V=8.84	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[ELLIPTICAL]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) MESSIER-086	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=10	GS ACQ SCENARIO ONEB1OR	Pattern 2, Exps 1-1 in MESSIER-086 (03) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(3) MESSIER-086	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=10		Pattern 2, Exps 2-2 in MESSIER-086 (03) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 18027, MESSIER-059 (04), completed Fri Aug 07 16:00:20 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 80%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-BLOB Purpose=DITHER Number Of Points=4 Point Spacing=5.183 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.859 Angle Between Sides= Center Pattern=true		(1), (2)

Fixed Targets

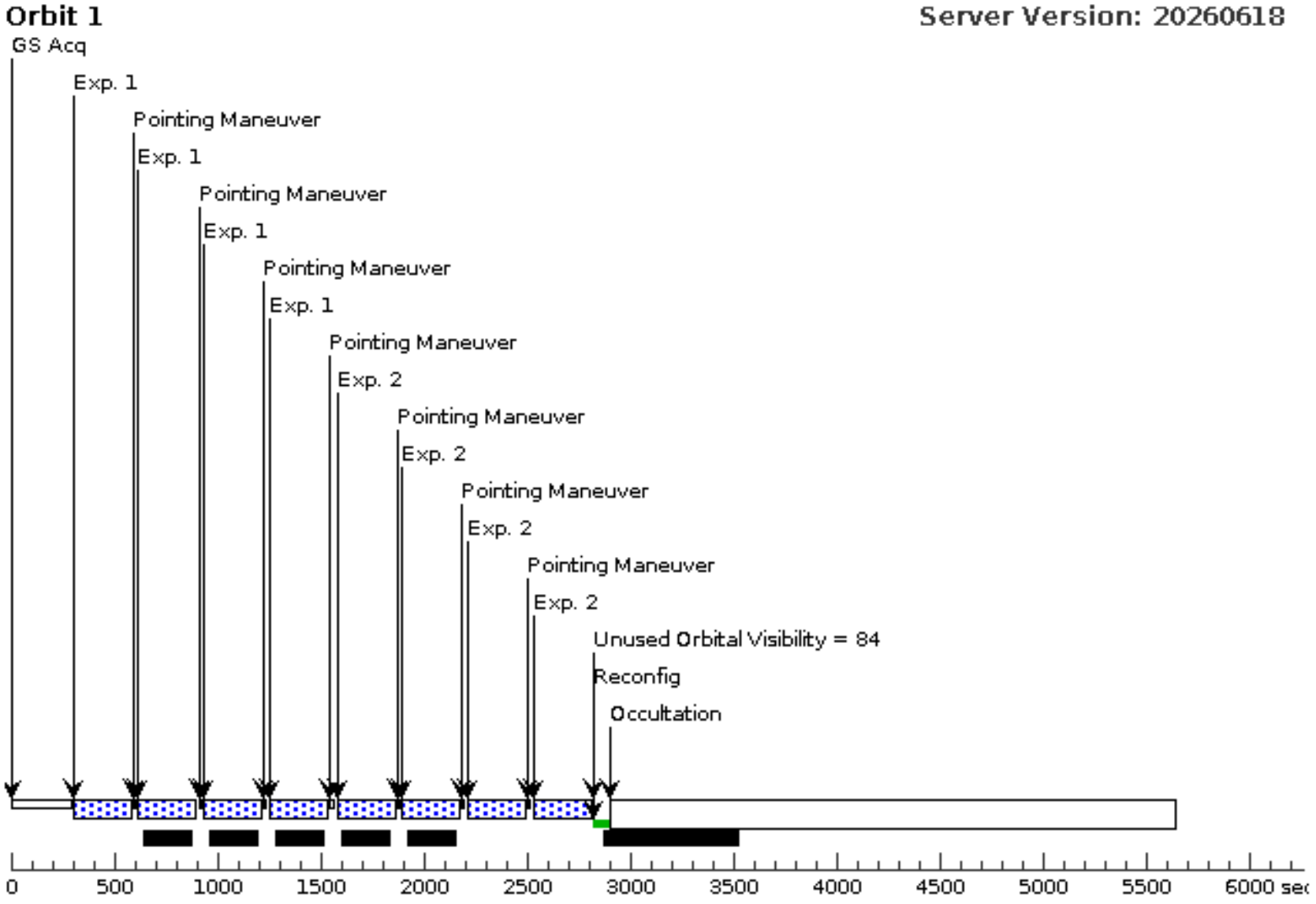
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	MESSIER-059 Alt Name1: NGC-4621	RA: 12 42 2.2440 (190.5093500d) Dec: +11 38 49.31 (11.64703d) Equinox: J2000	Radial Velocity: 467 km/sec	V=9.61	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[ELLIPTICAL]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) MESSIER-059	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=10	GS ACQ SCENARIO ONEB1OR	Pattern 1, Exps 1-1 in MESSIER-059 (04) (1)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(4) MESSIER-059	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=10		Pattern 1, Exps 2-2 in MESSIER-059 (04) (1)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 18027, MESSIER-087 (05), implementation Fri Aug 07 16:00:20 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 80%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.144 Line Spacing=0.73	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)

Fixed Targets

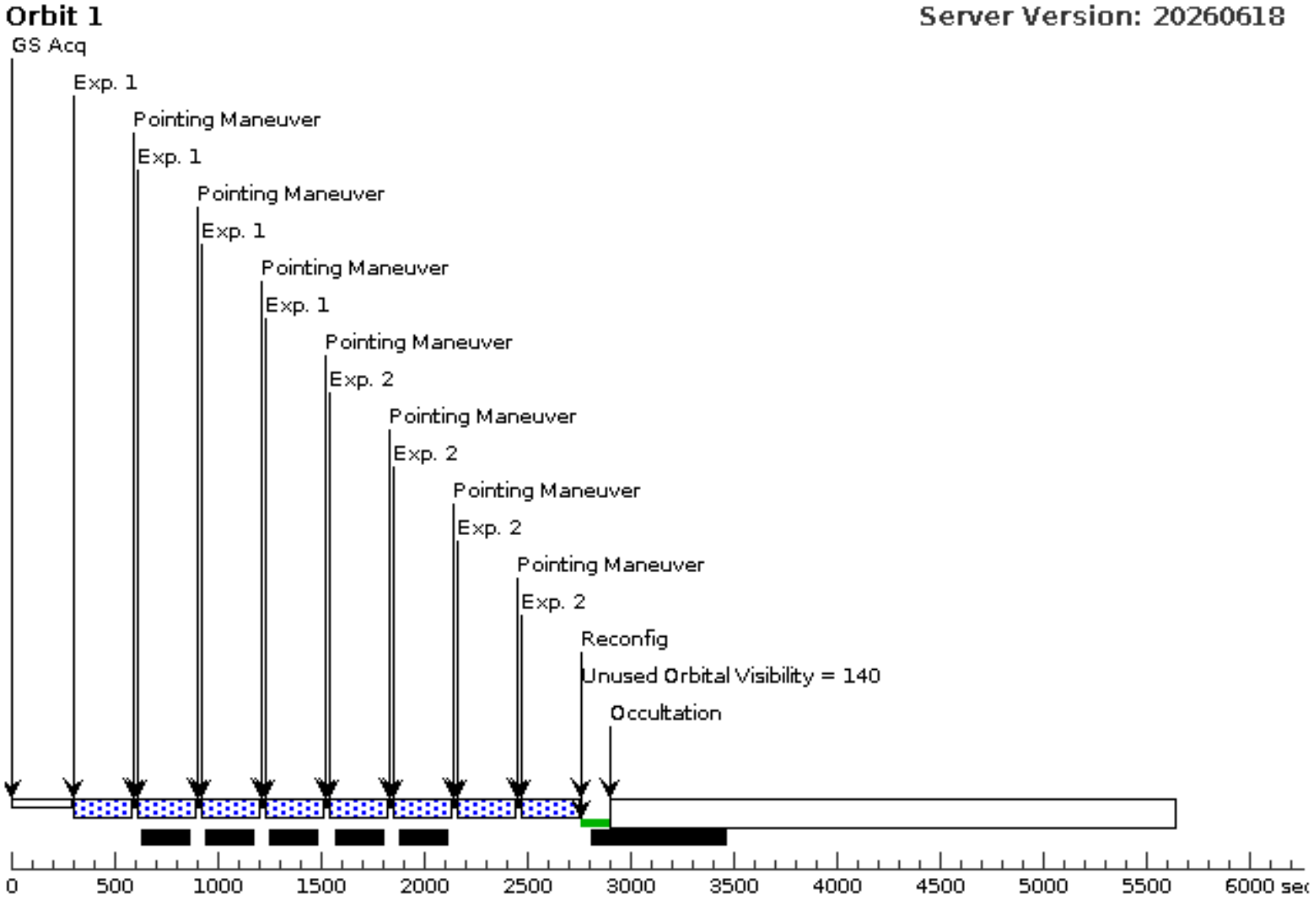
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	MESSIER-087 Alt Name1: NGC-4486	RA: 12 30 49.4232 (187.7059300d) Dec: +12 23 28.03 (12.39112d) Equinox: J2000	Radial Velocity: 1284 km/sec	V=8.56	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[ELLIPTICAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(5) MESSIER-087	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=10	GS ACQ SCENARIO ONEB1OR	Pattern 2, Exps 1-1 in MESSIER-087 (05) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***
2		(5) MESSIER-087	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=10		Pattern 2, Exps 2-2 in MESSIER-087 (05) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	 ***[1]***

Orbit Structure



Visit

Proposal 18027, MESSIER-105 (06), implementation Fri Aug 07 16:00:20 GMT 2026

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 80%

Patterns

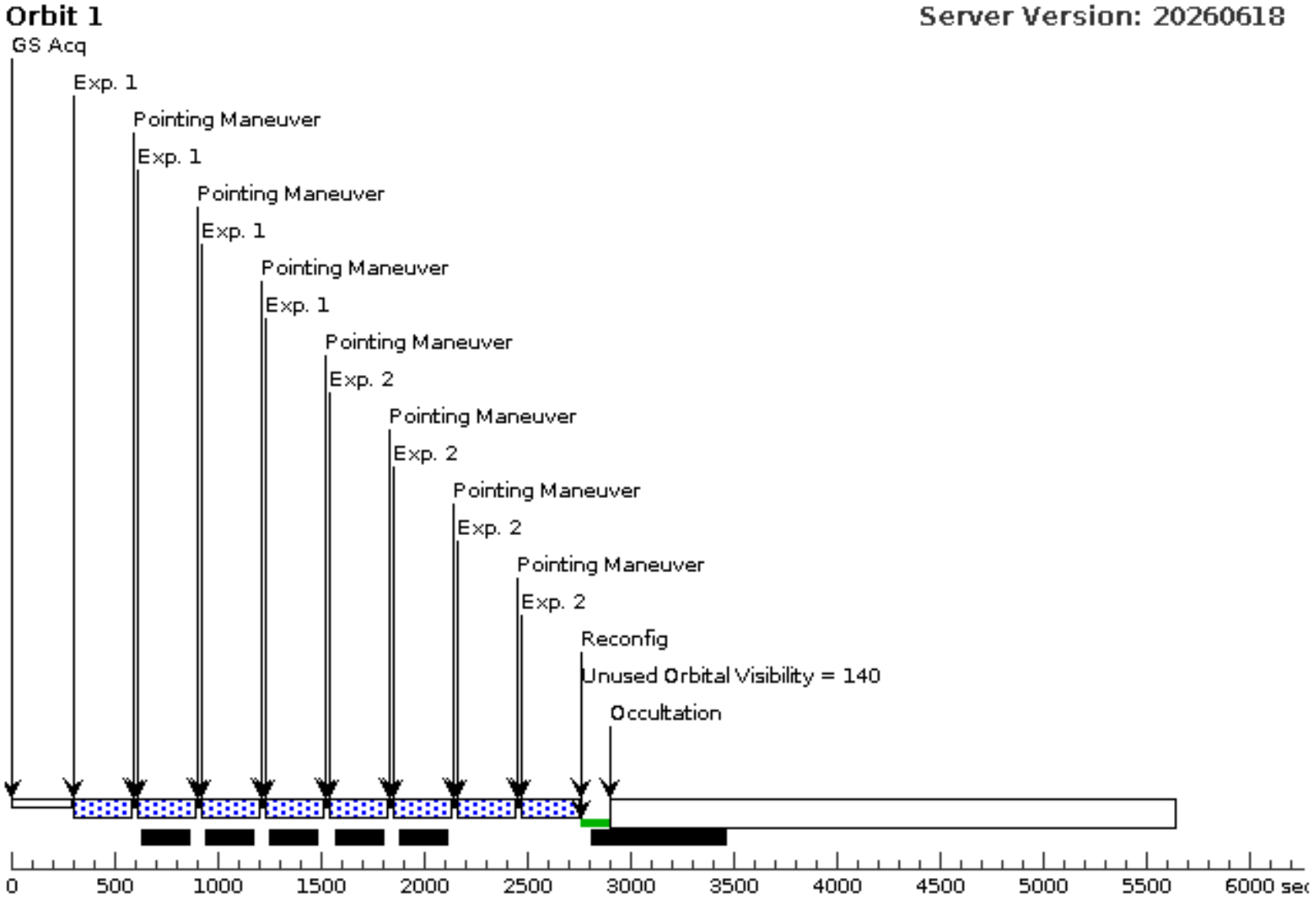
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=1.144 Line Spacing=0.73	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(1), (2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	MESSIER-105 Alt Name1: NGC-3379	RA: 10 47 49.5888 (161.9566200d) Dec: +12 34 53.83 (12.58162d) Equinox: J2000	Radial Velocity: 907 km/sec	V=9.28	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[ELLIPTICAL]
Extended=YES

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(6) MESSIER-105	WFC3/IR, MULTIACCUM, IR	F110W	SAMP-SEQ=STEP50; NSAMP=10	GS ACQ SCENARIO ONEB1OR	Pattern 2, Exps 1-1 in MESSIER-105 (06) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(6) MESSIER-105	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=STEP50; NSAMP=10		Pattern 2, Exps 2-2 in MESSIER-105 (06) (2)	249.23203 Secs (996.928 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure