



17223 - Far out in the SMC wing: the extraordinary cluster NGC 602

Cycle: 30, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
28	(11) O3V (14) B1.5IV-E (16) O9V-2.B0.7V	STIS/CCD STIS/FUV-MAMA	1	14-May-2026 08:00:14.0	yes
29	(11) O3V (17) O9V-3.B2.5V (19) B2V-1 (20) B2V-2 (21) B2V-3	STIS/CCD STIS/FUV-MAMA	3	14-May-2026 08:00:15.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
31	(11) O3V (12) O7V (13) O8.5V.O9V-1	STIS/CCD STIS/FUV-MAMA	1	14-May-2026 08:00:17.0	yes

5 Total Orbits Used

ABSTRACT

NGC 602 is a truly extraordinary young star cluster (YSC): located in a very low-density, low-metallicity region in the SMC Bridge it has formed a remarkable stellar content of 10^3 Solar masses and hosts many OB stars similar to Orion. Optical and infrared Hubble and Spitzer observations revealed a large number of disk-bearing, young stars in the cluster center and newly forming Young Stellar Objects embedded in the surrounding clouds. This suggests an age ladder for NGC 602 and that the massive OB stars drive star formation into the clouds. We are proposing to use the unique UV capabilities of Hubble to measure the far-ultra violet (FUV) fluxes and stellar winds of the 12 most massive cluster stars using STIS spectroscopy.

Only with HST, it is possible to directly access the FUV flux budget of the entire YSC, to quantify the stellar winds for the most massive O stars. Together with scheduled Cycle 1 Webb data we will establish how efficiently NGC 602 drives star formation outwards, which may lead to an extended star formation period, and how the close proximity to the OB stars influences protoplanetary disk and planet formation and evolution. Furthermore, scheduled VLT/MUSE integral field spectroscopy will enable us to directly study how the FUV fluxes shape the surrounding gas of the HII region. NGC 602, which has a mass budget similar to Orion but is located in a sub-solar metallicity environment, provides the link between star formation and feedback processes under Milky Way conditions, where YSCs are too heavily attenuated for FUV observations, and those in lower-metallicity environments like distant galaxies, where only the most massive stars can be resolved.

OBSERVING DESCRIPTION

We plan to observe 11 O and B stars in NGC 602 using STIS FUV MAMA spectroscopy.

To calculate the exposure times we used the SpTs of Ramachandran+2019 (obtained with optical VLT/FLAMES spectra). For the remaining two stars we estimated their SpTs using their F555W magnitudes in conjunction with the Castelli-Kurucz spectral atlas. We used the archival STIS data of Sk183 to verify our assumptions and to ensure that we do not exceed the safety limits of the MAMA detector (30,000 counts/s). To fulfill our science goals, we target a $S/N > 20$ at a reference wavelength of 1500 Angstrom under the condition of not using more than one orbit per star.

Proposal 17223 (STScI Edit Number: 1, Created: Thursday, May 14, 2026, 7:00:17AM Eastern Standard Time) - Overview

To avoid undersampling, hot pixels, and to minimize the effects of cosmic rays, we plan to use the STIS-ALONG-SLIT dither strategy with four pointings and a shift of 11 spectral pixels (0.267 arcsec) as recommended by the Cycle 30 STIS instrument handbook (Prichard+ 2022).

Where possible we plan to observe always two stars per pointing. We want to use the G140L grating with the 0.5 arcsec, which is a good compromise between spectral purity, defined by the slit width, and to ensure that the two sources fall into the same slit, despite the Hubble pointing inaccuracies. The cluster center is relatively crowded so we plan to do target acquisition on the O3V star (Sk183) with a relative offset to each source. We used the existing HST ACS/WFC photometry for the target coordinates in the Gaia system (ICRS). We also used these coordinates to calculate the orientations as well as the offsets needed to fit two stars in the same slit if applicable.

The visit packing will be the following:

STIS-OFFSET-A (visit 28) (1 orbit): The stars O9V-2 and B0.7V will be observed with the same slit. Their estimated combined global count rate is 3,464 counts/s. Star B1.5(IV)e will be observed in a separate exposure within this visit.

STIS-OFFSET-B (visit 29) (3 orbits): The stars O9V-3 and B2.5V will be observed with the same slit. Their estimated combined global count rate is 2,413 counts/s. The stars B2V-1, B2V-2, and B2V-3 will be observed in separate exposures within this visit.

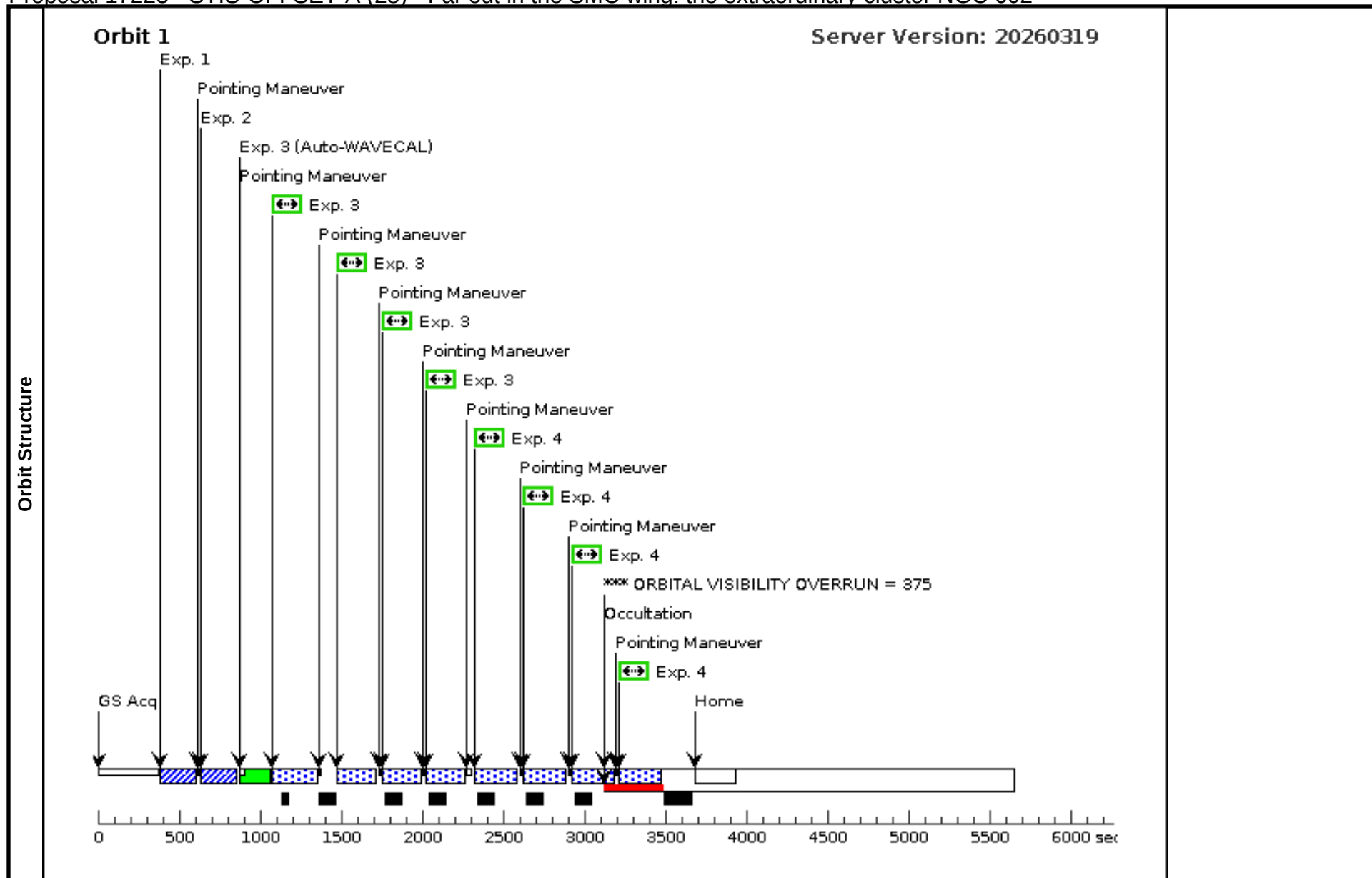
STIS-OFFSET-C (visit 31) (3 orbits): The stars O8.5V and O9V-1 will be observed with the same slit. Star O9V-2 may fall in the same slit. Their combined global count rate is 7,828 counts/s. The star O7V will be observed in separate exposures within this visit.

Proposal 17223 - STIS-OFFSET-A (28) - Far out in the SMC wing: the extraordinary cluster NGC 602

Visit	Proposal 17223, STIS-OFFSET-A (28), completed Thu May 14 12:00:17 GMT 2026				
	Diagnostic Status: Warning Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: ORIENT 315.189547D TO 315.189547 D <i>Comments: The fixed orient is necessary tp fit two stars simulatniously in one slit. This method saves more 5 orbits in total</i>				
Diagnostics	(STIS-OFFSET-A (28)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (STIS-OFFSET-A (28)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN				
Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
	(2)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=4 Angle Between Sides= Point Spacing=0.27 Center Pattern=false Line Spacing=		(3), (4)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(11)	O3V	RA: 01 29 24.5515 (22.3522979d) Dec: -73 33 16.37 (-73.55455d) Equinox: J2000	Epoch of Position: 2016.0	V=13.78+/-0.01
			<i>Comments: The coordinates are in the Gaia reference frame</i> Category=STAR Description=[MAIN SEQUENCE O] Extended=NO		
	(14)	B1.5IV-E	Offset from O3V RA Offset: 3.1896 Secs Dec Offset: 16.7029 Arcsec		V=15.368
Fixed Targets			<i>Comments: The coordinates are as offsets from the O3V star and the distance is calulated using the GaiaDR3 coordinates and in the Gaia reference frame</i> Category=STAR Description=[MAIN SEQUENCE O] Extended=NO		
	(16)	O9V-2.B0.7V	Offset from O3V RA Offset: 8.2545 Secs Dec Offset: -22.7938 Arcsec		V=15.359
Fixed Targets			<i>Comments: The coordinates are as offsets from the O3V star and the distance is calulated using the GaiaDR3 coordinates and in the Gaia reference frame</i> Category=STAR Description=[MAIN SEQUENCE O] Extended=NO		
			Offset Position (O9V-2.B0.7V)		

Proposal 17223 - STIS-OFFSET-A (28) - Far out in the SMC wing: the extraordinary cluster NGC 602

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.ta.186 4803)	(11) O3V	STIS/CCD, ACQ, F28X50LP	MIRROR				0.2 Secs (0.2 Secs) [==>]	 [1]
	2	ACQ/PEAK (STIS.ta.186 4805)	(11) O3V	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.2 Secs (0.2 Secs) [==>]	 [1]
	3	O9V-2/B0.7 V (STIS.sp.18 64807)	(16) O9V-2.B0.7V	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,-2	Pattern 2, Exps 3-3 i n STIS-OFFSET-A (28) (2)	225 Secs (900 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	 [1]
	Comments: The ETC Run # for the other star in the slit is: STIS.sp.1864808 The combined global count rate is: 4496 far below the safely limits.									
	4	B1.5IV_E (STIS.sp.33 2713)	(14) B1.5IV-E	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,3	Pattern 2, Exps 4-4 i n STIS-OFFSET-A (28) (2)	250 Secs (1000 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	 [1]



Proposal 17223 - STIS-OFFSET-B (29) - Far out in the SMC wing: the extraordinary cluster NGC 602

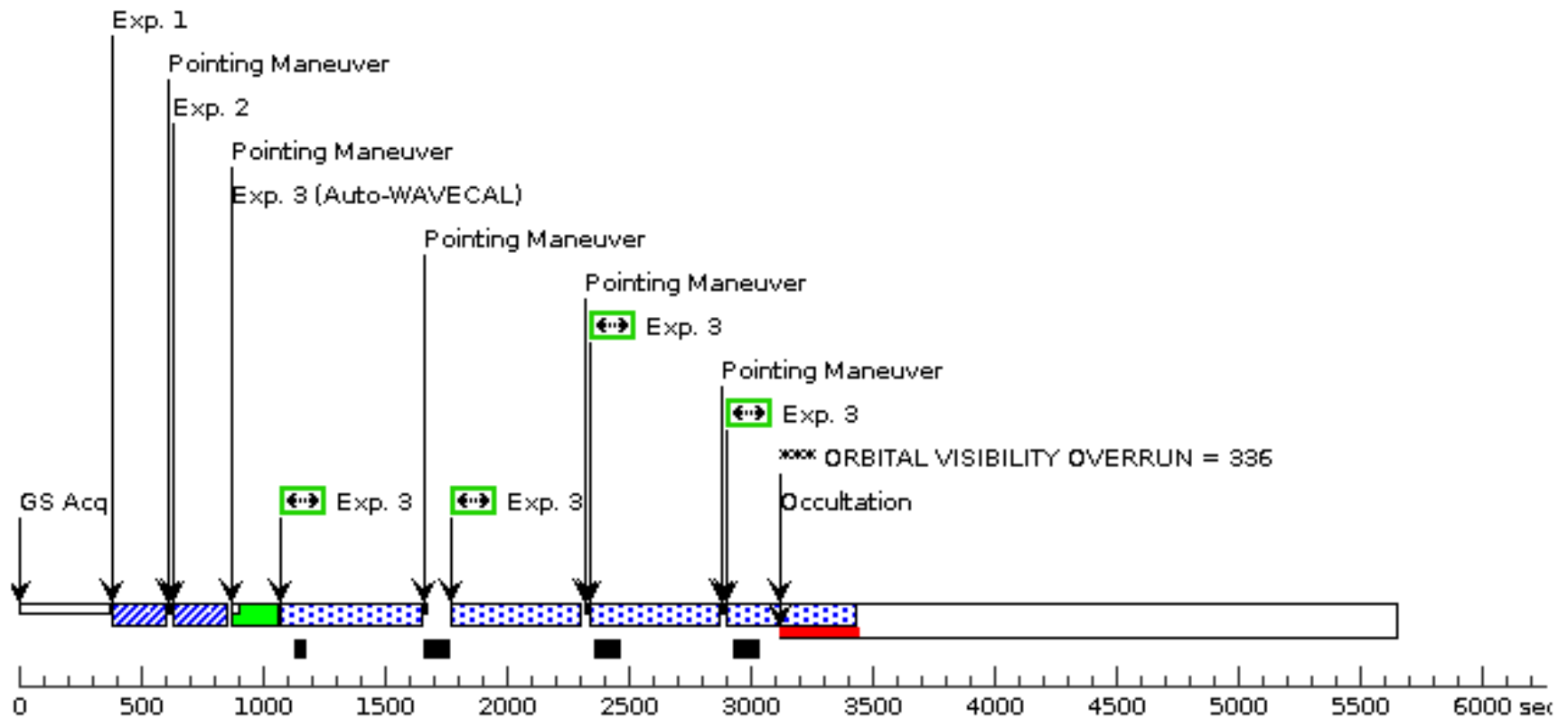
Visit	Proposal 17223, STIS-OFFSET-B (29), completed Diagnostic Status: Warning Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: ORIENT 340.089743D TO 340.089743 D <i>Comments: The fixed orient is necessary tp fit two stars simulatniously in one slit. This method saves more 5 orbits in total</i>				Thu May 14 12:00:17 GMT 2026
	(STIS-OFFSET-B (29)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (STIS-OFFSET-B (29)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN (STIS-OFFSET-B (29)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN				
Patterns	#	Primary Pattern		Secondary Pattern	Exposures
	(2)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=4 Angle Between Sides= Point Spacing=0.27 Center Pattern=false Line Spacing=			(3), (4), (5), (6)

Proposal 17223 - STIS-OFFSET-B (29) - Far out in the SMC wing: the extraordinary cluster NGC 602

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(11)	O3V	RA: 01 29 24.5515 (22.3522979d) Dec: -73 33 16.37 (-73.55455d) Equinox: J2000 <i>Comments: The coordinates are in the Gaia reference frame</i> Category=STAR Description=[MAIN SEQUENCE O] Extended=NO	Epoch of Position: 2016.0	V=13.78+/-0.01	Reference Frame: ICRS
	(17)	O9V-3.B2.5V	Offset from O3V RA Offset: 7.4078 Secs Dec Offset: -14.7179 Arcsec <i>Comments: The coordinates are as offsets from the O3V star and the distance is calculated using the GaiaDR3 coordinates and in the Gaia reference frame</i> Category=STAR Description=[MAIN SEQUENCE O] Extended=NO		V=15.543	Offset Position (O9V-3.B2.5V)
	(19)	B2V-1	Offset from O3V RA Offset: 8.3605 Secs Dec Offset: -54.742 Arcsec <i>Comments: The coordinates are as offsets from the O3V star and the distance is calculated using the GaiaDR3 coordinates and in the Gaia reference frame</i> Category=STAR Description=[B0-B2 V-IV] Extended=NO		V=16.136	Offset Position (B2V-1)
	(20)	B2V-2	Offset from O3V RA Offset: -3.4187 Secs Dec Offset: 10.3374 Arcsec <i>Comments: The coordinates are as offsets from the O3V star and the distance is calculated using the GaiaDR3 coordinates and in the Gaia reference frame</i> Category=STAR Description=[B0-B2 V-IV] Extended=NO		V=16.142	Offset Position (B2V-2)
	(21)	B2V-3	Offset from O3V RA Offset: 12.3233 Secs Dec Offset: -54.135 Arcsec <i>Comments: The coordinates are as offsets from the O3V star and the distance is calculated using the GaiaDR3 coordinates and in the Gaia reference frame</i> Category=STAR Description=[B0-B2 V-IV] Extended=NO		V=16.239	Offset Position (B2V-3)

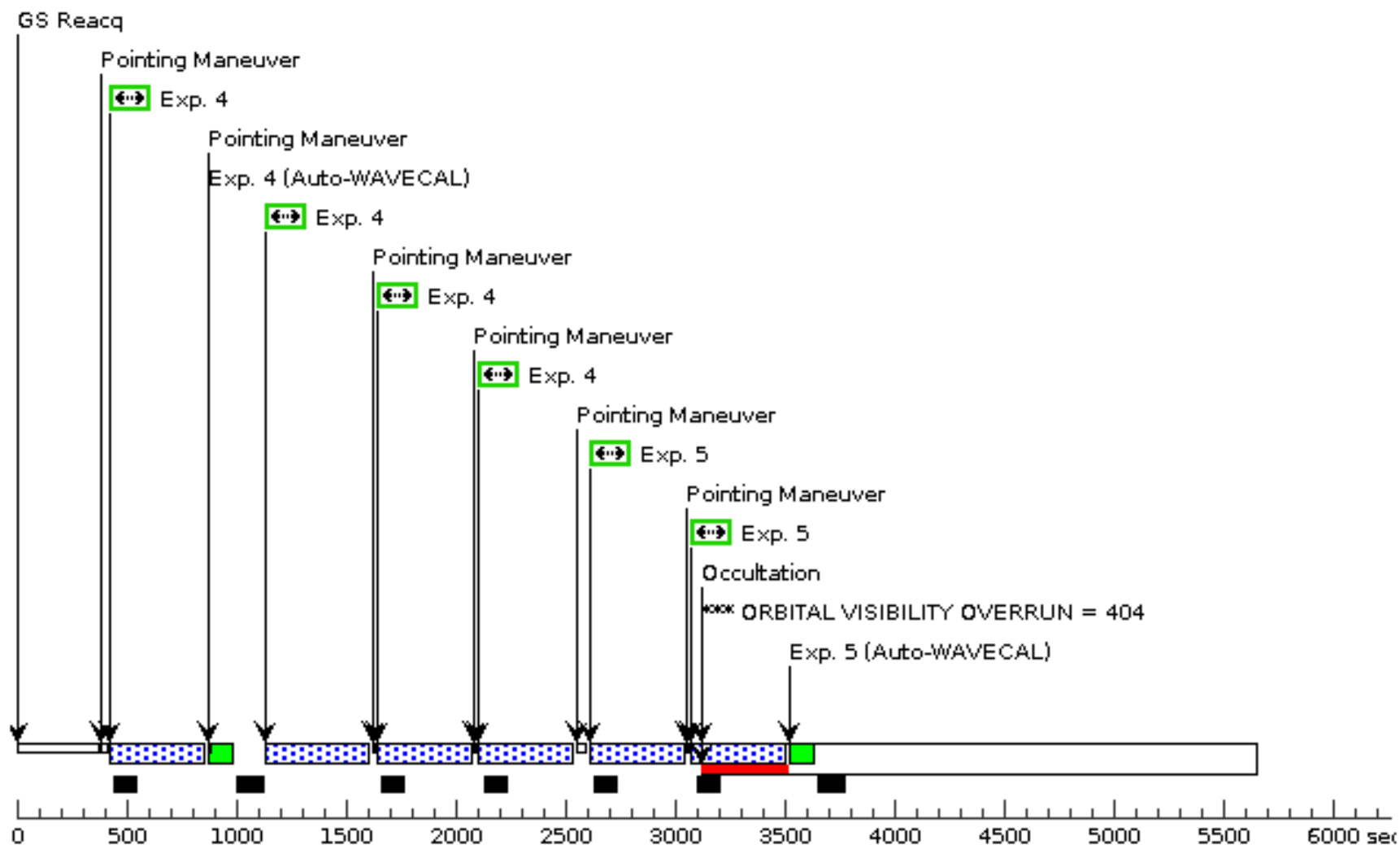
Proposal 17223 - STIS-OFFSET-B (29) - Far out in the SMC wing: the extraordinary cluster NGC 602

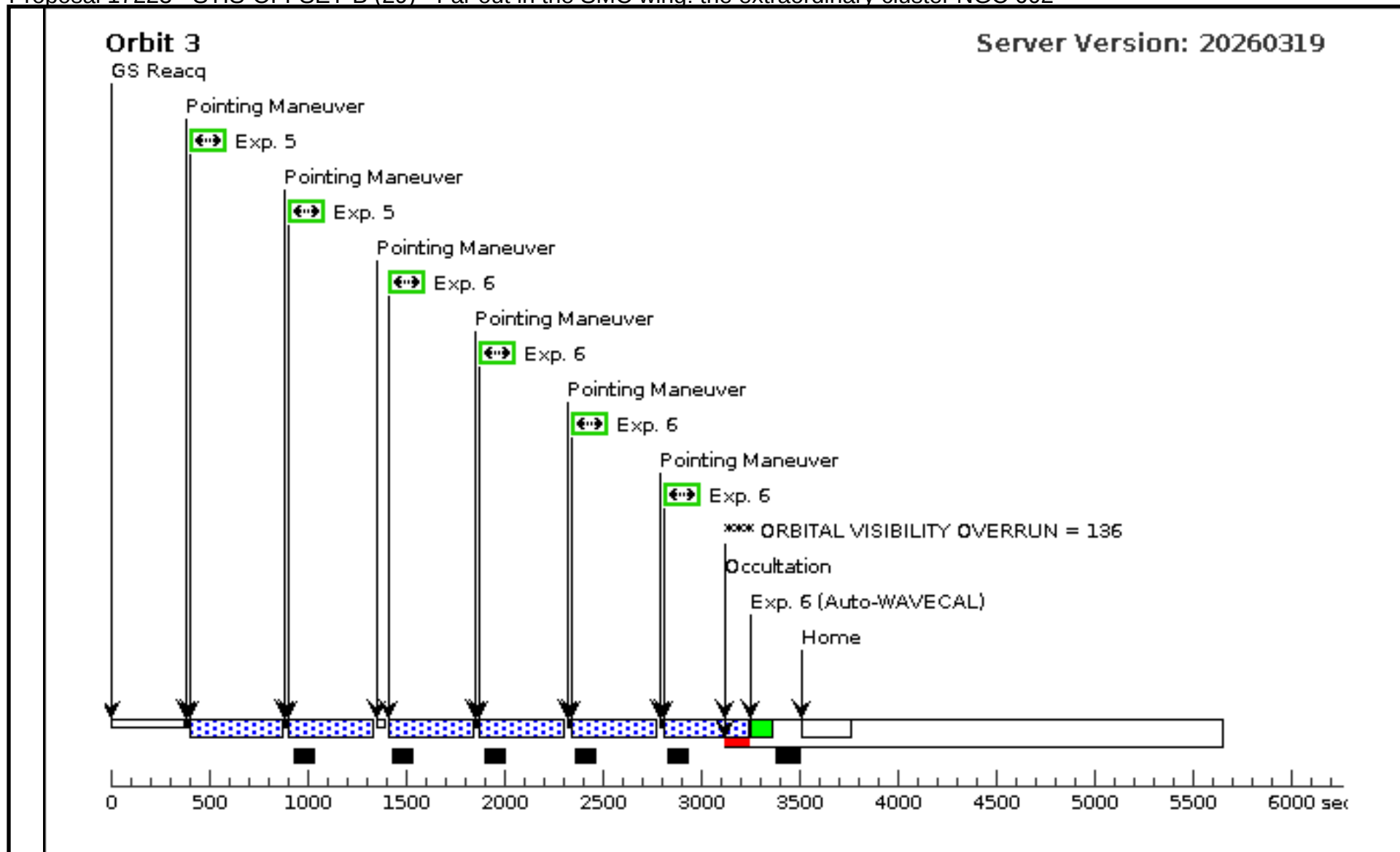
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.ta.186 4803)	(11) O3V	STIS/CCD, ACQ, F28X50LP	MIRROR				0.2 Secs (0.2 Secs)	
									[==>]	[1]
	2	ACQ/PEAK (STIS.ta.186 4805)	(11) O3V	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.2 Secs (0.2 Secs)	
									[==>]	[1]
	3	O9V-3/B2.5 V (STIS.sp.13 32778)	(17) O9V-3.B2.5V	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,-2	Pattern 2, Exps 3-3 i n STIS-OFFSET-B (29) (2)	520 Secs (2080 Secs)	
									[==>(Pattern 1)]	[1]
									[==>(Pattern 2)]	
									[==>(Pattern 3)]	
									[==>(Pattern 4)]	
	Comments: The ETC Run # for the other star in the slit is: STIS.sp.1332724 The combined global count rate is: 5735 far below the safty limits.									
4	B2V-1 (STIS.sp.13 32722)	(19) B2V-1	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,5	Pattern 2, Exps 4-4 i n STIS-OFFSET-B (29) (2)	419 Secs (1676 Secs)		
								[==>(Pattern 1)]	[2]	
								[==>(Pattern 2)]		
								[==>(Pattern 3)]		
								[==>(Pattern 4)]		
5	B2V-2 (STIS.sp.13 32721)	(20) B2V-2	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,1	Pattern 2, Exps 5-5 i n STIS-OFFSET-B (29) (2)	418 Secs (1672 Secs)		
								[==>(Pattern 1)]	[2]	
								[==>(Pattern 2)]		
								[==>(Pattern 3)]	[3]	
								[==>(Pattern 4)]		
6	B2V-3 (STIS.sp.13 32723)	(21) B2V-3	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,3	Pattern 2, Exps 6-6 i n STIS-OFFSET-B (29) (2)	418 Secs (1672 Secs)		
								[==>(Pattern 1)]	[3]	
								[==>(Pattern 2)]		
								[==>(Pattern 3)]		
								[==>(Pattern 4)]		



Orbit 2

Server Version: 20260319





Proposal 17223 - STIS-OFFSET-C (31) - Far out in the SMC wing: the extraordinary cluster NGC 602

Visit	Proposal 17223, STIS-OFFSET-C (31), completed Thu May 14 12:00:17 GMT 2026				
	Diagnostic Status: Warning Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: ORIENT 285.765083D TO 285.765083 D <i>Comments: The fixed orient is necessary tp fit two stars simulatniously in one slit. This method saves more 5 orbits in total</i>				
Diagnostics	(STIS-OFFSET-C (31)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN				
Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
	(2)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=4 Angle Between Sides= Point Spacing=0.27 Center Pattern=false Line Spacing=		(3), (4)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(11)	O3V	RA: 01 29 24.5515 (22.3522979d) Dec: -73 33 16.37 (-73.55455d) Equinox: J2000	Epoch of Position: 2016.0	V=13.78+/-0.01
			<i>Comments: The coordinates are in the Gaia reference frame</i> Category=STAR Description=[MAIN SEQUENCE O] Extended=NO		
	(12)	O7V	Offset from O3V RA Offset: 8.7283 Secs Dec Offset: -28.2791 Arcsec		V=14.143
			<i>Comments: The coordinates are as offsets from the O3V star and the distance is calulated using the GaiaDR3 coordinates and in the Gaia reference frame</i> Category=STAR Description=[MAIN SEQUENCE O] Extended=NO		
	(13)	O8.5V.O9V-1	Offset from O3V RA Offset: 6.8278 Secs Dec Offset: -26.1252 Arcsec		V=15.463+/-0.016
			<i>Comments: The coordinates are as offsets from the O3V star and the distance is calulated using the GaiaDR3 coordinates and in the Gaia reference frame.</i> Originally we used the O8.5V star for the ACQ/PEAK but we discovered that this stars is actually two sources. We call them for now O8.5V_a and O8.5V_b. Hence we decided to center on the O9V-1 source instead. We adjusted the POS TARG offset accordingly Category=STAR Description=[MAIN SEQUENCE O] Extended=NO		

Proposal 17223 - STIS-OFFSET-C (31) - Far out in the SMC wing: the extraordinary cluster NGC 602

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.ta.186 4803)	(11) O3V	STIS/CCD, ACQ, F28X50LP	MIRROR				0.2 Secs (0.2 Secs) [==>]	 [1]
	2	ACQ/PEAK (STIS.ta.186 4805)	(11) O3V	STIS/CCD, ACQ/PEAK, 52X0.1	MIRROR				0.2 Secs (0.2 Secs) [==>]	 [1]
	3	O7V (STIS.sp.13 32802)	(12) O7V	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,3	Pattern 2, Exps 3-3 i n STIS-OFFSET-C (31) (2)	103 Secs (412 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	 [1]
	Comments: The ETC Run # for the other star in the slit is: STIS.sp.1331332716 The combined global count rate is: 11421 far below the safety limits.									
	4	O8.5V-O9V -1 (STIS.sp.18 64809)	(13) O8.5V.O9V-1	STIS/FUV-MAMA, ACCUM, 52X0.5	G140L 1425 A		POS TARG 0,3	Pattern 2, Exps 4-4 i n STIS-OFFSET-C (31) (2)	295 Secs (1180 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	 [1]
	Comments: The other potential sources in the slit are: O8.5V_a (F555W=15.209): STIS.sp.1864812, 3449 O8.5V_b (F555W=15.645): STIS.sp.1864811, 2308 O9V-3 (F555W=15.543): STIS.sp.1864810, 2535 The total possible countrate is 11021 well below the safty limit									

