



18444 - Characterizing the hot companions of the first identified Yellow supergiant binary population

Cycle: 34, 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>
01	(1) 2MASS-J00563089-7146212	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	1	04-Aug-2026 12:00:31.0	yes
02	(2) 2MASS-J00480629-7306379	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	1	04-Aug-2026 12:00:32.0	yes
03	(3) 2MASS-J01050354-7206321	STIS/CCD STIS/FUV-MAMA	1	04-Aug-2026 12:00:32.0	yes

Visit	Targets used in Visit	Configurations used in Visit	Orbits Used	Last Orbit Planner Run	OP Current with Visit?
04	(4) 2MASS-J05370391-6910035	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	1	04-Aug-2026 12:00:33.0	yes
05	(5) 2MASS-J05263889-6925253	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	1	04-Aug-2026 12:00:34.0	yes
06	(6) 2MASS-J05390594-6916267	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	1	04-Aug-2026 12:00:34.0	yes

6 Total Orbits Used

ABSTRACT

Binary evolution theory predicts that the Hertzsprung Gap is home to multiple populations of binary systems with varied evolutionary histories. Recent works have constrained the binary fraction of evolved populations of massive stars in local galaxies such as red supergiants and Wolf-Rayet stars, but the binary fraction of yellow supergiants (YSGs) in the Hertzsprung Gap remains unconstrained. This is a critical gap in our knowledge of binary evolution, as YSGs in the Gap are expected to be the site of many post-main sequence binary interactions, the precise physical details of whose mechanisms are not well constrained. We have identified a population of likely YSG+OB star binary candidates in the Magellanic Clouds using UV/optical photometry, and confirmed the binary nature of a subset using optical spectroscopy. Here we propose to use HST/STIS to observe 6 of these YSG+OB binary systems in order to fully characterize the hot OB companion in the system. These observations will also us the constrain the the luminosity, temperature, and mass loss rates of the companions. These results will provide vital constraints on models of binary evolution, impacting our understanding of stellar populations, supernovae, and gravitational wave sources.

OBSERVING DESCRIPTION

In this study we will observe hot (F spectral type) yellow supergiants (YSGs) with OB main sequence binary companions in the Large and Small Magellanic Clouds (L/SMC) with the goal of characterizing the OB companion star. Targets were chosen through a combination of UV-optical photometry and optical spectroscopy.

Each target will be observed with the G140L grism on STIS/MAMA with the 52x0.2 slit. The wavelength coverage will allow us to access the

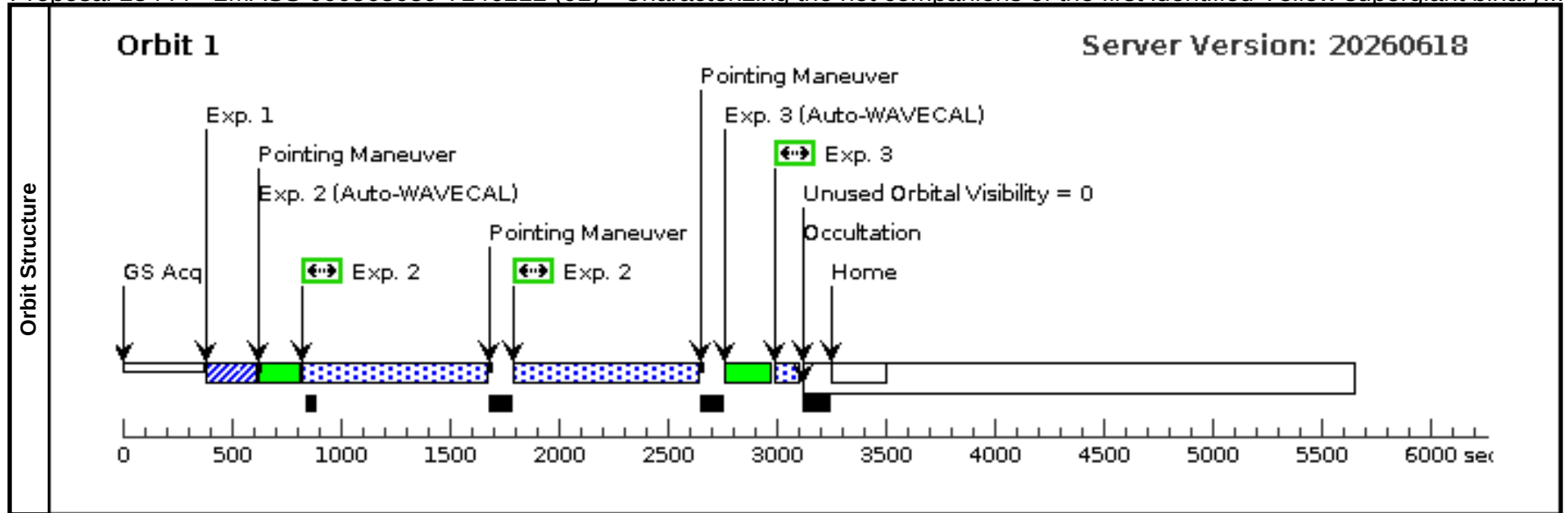
diversity of lines needed to fully characterize the OB companion. We aim for a SNR of at least 30 to ensure weaker UV lines have enough flux. We use the Swift-UVOT UVM2 band magnitude (effective wavelength of 2245 Angstroms) as a proxy for WFC3/F225W band magnitudes for the ETC, choosing a Kurucz OB model with an effective temperature closest to the best-fit OB model for each target system.

For 5 of our 6 targets, additional integration time is available beyond what is needed for good SNR in the G140L exposures. Here, we will additionally perform a short exposure with the G230L grism, which will provide an even better continuum fit for the OB companion. Here, a SNR of at least 10 is sufficient.

Each target requires 1 orbit to achieve these goals. Target acquisition will center on the YSG using the F28X50LP filter. The YSGs are bright, so the minimum exposure time for acquisition is sufficient. Any additional time left after meeting the minimum requirements for SNR will be added to the G140L exposures.

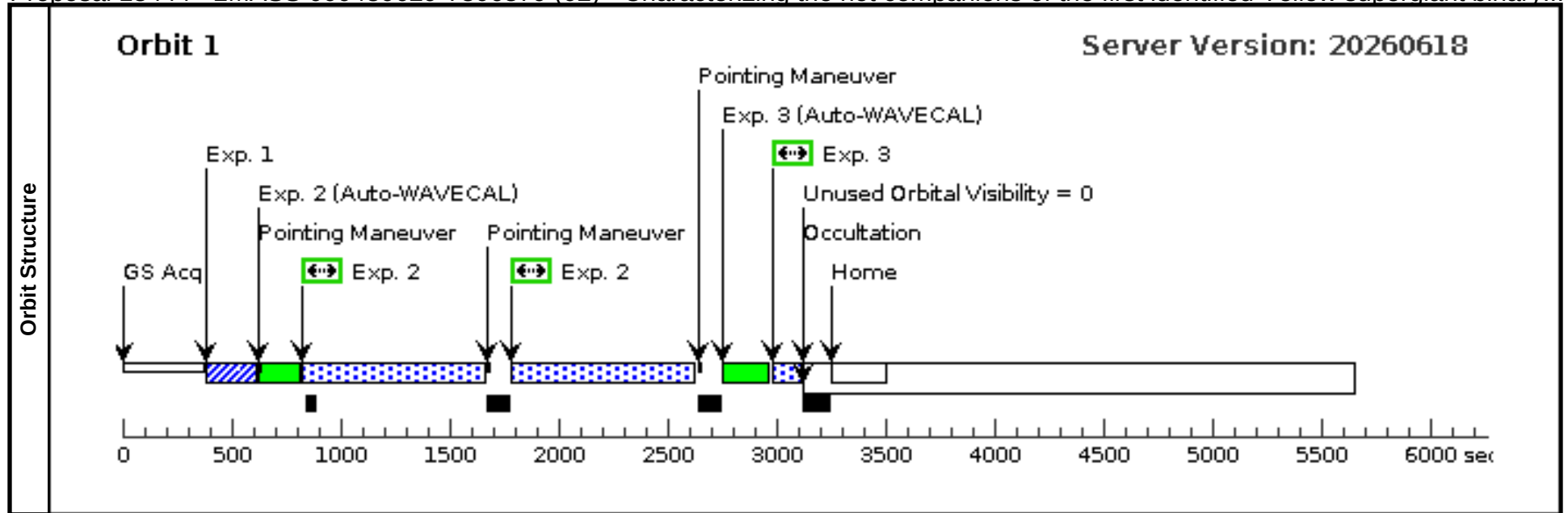
Proposal 18444 - 2MASS-J00563089-7146212 (01) - Characterizing the hot companions of the first identified Yellow supergiant binary...

Visit	Proposal 18444, 2MASS-J00563089-7146212 (01), implementation					Tue Aug 04 16:00:35 GMT 2026						
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD, STIS/FUV-MAMA											
	Special Requirements: (none)											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.35 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false						(2)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(1)	2MASS-J00563089-7146212 Alt Name1: GAIA-DR3-4689089820302699008 Alt Name2: SMC OBS14.12-71.77	RA: 00 56 30.8805 (14.1286687d) Dec: -71 46 21.23 (-71.77256d) Equinox: J2000		Proper Motion RA: 0.713 mas/yr Proper Motion Dec: -1.237000083165185 mas/yr Epoch of Position: 2000		V=14.04+/-0.07 Swift-UVM2(AB) = 15.93, E(B-V) = 0.08		Reference Frame: ICRS			
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
	SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.											
	Category=STAR Description=[F3-F9, MAIN SEQUENCE O] Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	2MASS-J00563089-7146212-ACQ (STIS.ta.2360278)	(1) 2MASS-J00563089-7146212	STIS/CCD, ACQ, F28X50LP		MIRROR				0.2 Secs (0.2 Secs)		
										[==>]	[1]	
	2	2MASS-J00563089-7146212-G140L (STIS.sp.2362186)	(1) 2MASS-J00563089-7146212	STIS/FUV-MAMA, ACCUM, 52X0.2		G140L 1425 A			Pattern 1, Exps 2-2 in 2MASS-J00563089-7146212 (01) (1)	707 Secs (1664 Secs)		
										[==>832.0 Secs (Pattern 1)] [==>832.0 Secs (Pattern 2)]	[1]	
	3	2MASS-J00563089-7146212-G230L (STIS.sp.2360279)	(1) 2MASS-J00563089-7146212	STIS/NUV-MAMA, ACCUM, 52X0.2		G230L 2376 A				100 Secs (100 Secs)		
										[==>]	[1]	



Proposal 18444 - 2MASS-J00480629-7306379 (02) - Characterizing the hot companions of the first identified Yellow supergiant binary...

Visit	Proposal 18444, 2MASS-J00480629-7306379 (02), implementation					Tue Aug 04 16:00:35 GMT 2026						
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD, STIS/FUV-MAMA											
	Special Requirements: ORIENT 20D TO 160 D; ORIENT 200D TO 340 D											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(1)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=2 Angle Between Sides= Point Spacing=0.35 Center Pattern=false Line Spacing=								(2)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(2)	2MASS-J00480629-7306379	RA: 00 48 6.3126 (12.0263025d) Dec: -73 06 37.99 (-73.11055d) Alt Name1: GAIA-DR3-4685948683034959232 Equinox: J2000 Alt Name2: SMC OBS12.02-73.11		Proper Motion RA: 0.798 mas/yr Proper Motion Dec: -1.3280000075610587 mas/yr Parallax: 3.04E-5" Epoch of Position: 2000		V=12.53+/-0.06 Swift-UV M2(AB) = 15.90, E(B-V) = 0.08		Reference Frame: ICRS			
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
	SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.											
	Category=STAR Description=[F3-F9, MAIN SEQUENCE O] Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	2MASS-J00480629-7306379-ACQ (STIS.ta.2360280)	(2) 2MASS-J00480629-7306379	STIS/CCD, ACQ, F28X50LP		MIRROR				0.1 Secs (0.1 Secs)		
										[==>]		[1]
	2	2MASS-J00480629-7306379-G140L (STIS.sp.2362187)	(2) 2MASS-J00480629-7306379	STIS/FUV-MAMA, ACCUM, 52X0.2		G140L 1425 A			Pattern 1, Exps 2-2 in 2MASS-J00480629-7306379 (02) (1)	686 Secs (1652 Secs)		
										[==>826.0 Secs (Pattern 1)] [==>826.0 Secs (Pattern 2)]		[1]
	3	2MASS-J00480629-7306379-G230L (STIS.sp.2360284)	(2) 2MASS-J00480629-7306379	STIS/NUV-MAMA, ACCUM, 52X0.2		G230L 2376 A				112 Secs (112 Secs)		
										[==>]		[1]

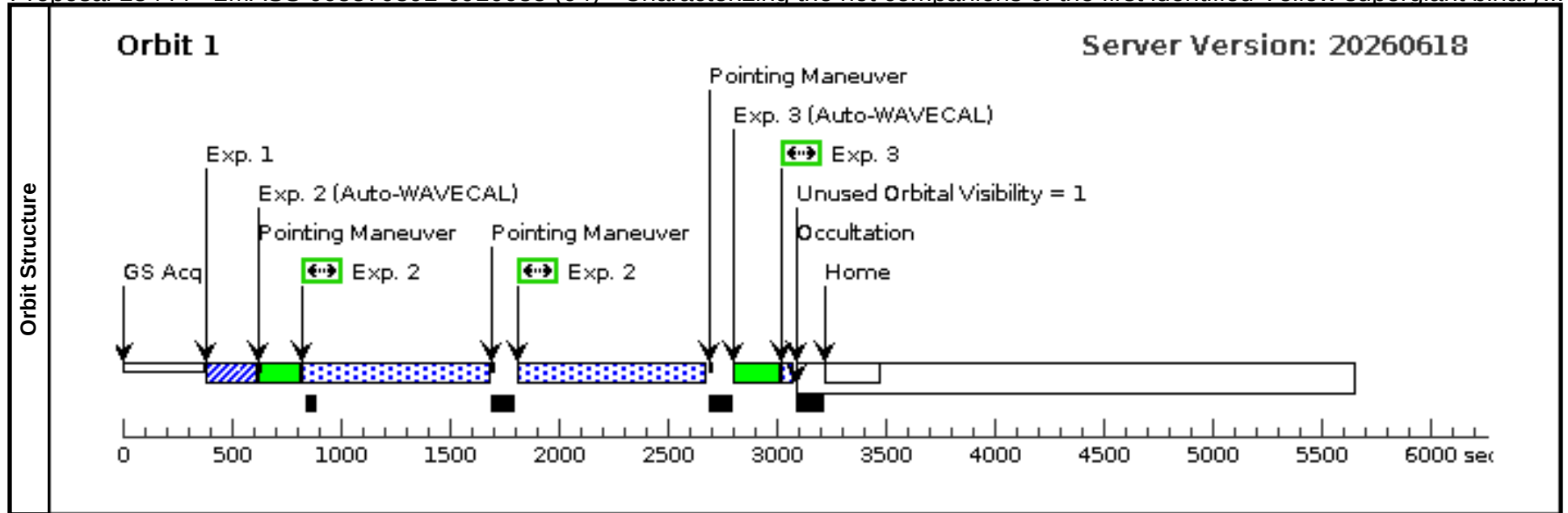


Proposal 18444 - 2MASS-J01050354-7206321 (03) - Characterizing the hot companions of the first identified Yellow supergiant binary...

Visit	Proposal 18444, 2MASS-J01050354-7206321 (03), implementation Tue Aug 04 16:00:35 GMT 2026				
	Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: ORIENT 310D TO 290 D				
Patterns	#	Primary Pattern		Secondary Pattern	Exposures
	(1)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=2 Angle Between Sides= Point Spacing=0.35 Center Pattern=false Line Spacing=			(2)
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(3)	2MASS-J01050354-7206321 Alt Name1: GAIA-DR3-4687507554334608128 Alt Name2: SMC OBS16.26-72.10	RA: 01 05 3.5496 (16.2647900d) Dec: -72 06 32.17 (-72.10894d) Equinox: J2000	Proper Motion RA: 0.7567 mas/yr Proper Motion Dec: -1.1780 mas/yr Epoch of Position: 2000	V=11.848 Swift-UVM2(AB) = 16.87, E(B-V) = 0.08
	Comments: This object was generated by the targetselector and retrieved from the 2MASS database; PI changed to Gaia DR3 coordinates. Category=STAR Description=[B3-B5 V-IV, F3-F9] Extended=NO				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.
	1	2MASS-J01050354-7206321-ACQ (STIS.ta.2360287)	(3) 2MASS-J01050354-7206321	STIS/CCD, ACQ, F28X50LP	MIRROR
	2	2MASS-J01050354-7206321-G140L (STIS.sp.2360564)	(3) 2MASS-J01050354-7206321	STIS/FUV-MAMA, ACCUM, 52X0.2	G140L 1425 A
					Pattern 1, Exps 2-2 in 2MASS-J01050354-7206321 (03) (1)
					Exp. Time (Total)/[Actual Dur.] 0.1 Secs (0.1 Secs) [= >] 1065 Secs (2130 Secs) [= > (Pattern 1)] [= > (Pattern 2)]
					Orbit [1] [1]
Orbit Structure	Orbit 1 Server Version: 20260618				
	GS Acq Exp. 1 Exp. 2 (Auto-WAVECAL) Pointing Maneuver Pointing Maneuver Home Occultation Exp. 2 Exp. 2 Exp. 2 Unused Orbital Visibility = 1 0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec				

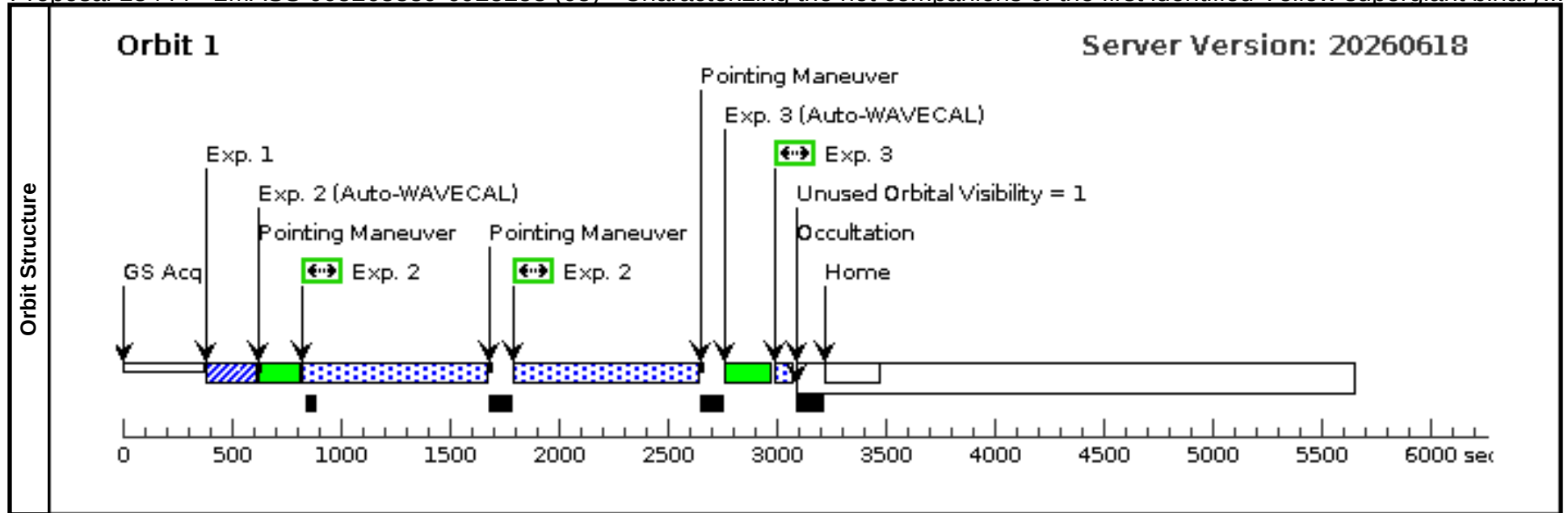
Proposal 18444 - 2MASS-J05370391-6910035 (04) - Characterizing the hot companions of the first identified Yellow supergiant binary...

Visit	Proposal 18444, 2MASS-J05370391-6910035 (04), implementation										Tue Aug 04 16:00:35 GMT 2026	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD, STIS/FUV-MAMA											
	Special Requirements: ORIENT 320D TO 100 D; ORIENT 140D TO 280 D											
Patterns	#	Primary Pattern					Secondary Pattern				Exposures	
	(1)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=2 Angle Between Sides= Point Spacing=0.35 Center Pattern=false Line Spacing=									(2)	
Fixed Targets	#	Name		Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(4)	2MASS-J05370391-6910035		RA: 05 37 3.9150 (84.2663125d)		Proper Motion RA: 1.513 mas/yr		V=12.95		Reference Frame: ICRS		
		Alt Name1: GAIA-DR3-4657690070314900224		Dec: -69 10 3.65 (-69.16768d)		Proper Motion Dec: 0.73 mas/yr		Swift-UVM2(AB) = 14.82,				
		Equinox: J2000		Epoch of Position: 2000		E(B-V) = 0.11						
		Alt Name2: LMC OBS84.26-69.16										
		Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
	SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.											
	Category=STAR											
	Description=[F3-F9, MAIN SEQUENCE O]											
	Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	2MASS-J05370391-6910035-ACQ (STIS.ta.2360292)	(4) 2MASS-J05370391-6910035	STIS/CCD, ACQ, F28X50LP		MIRROR				0.1 Secs (0.1 Secs)		
										[==>]		[1]
	2	2MASS-J05370391-6910035-G140L (STIS.sp.2362188)	(4) 2MASS-J05370391-6910035	STIS/FUV-MAMA, ACCUM, 52X0.2		G140L 1425 A			Pattern 1, Exps 2-2 in 2MASS-J05370391-6910035 (04) (1)	201 Secs (1700 Secs)		
										[==>850.0 Secs (Pattern 1)]		[1]
										[==>850.0 Secs (Pattern 2)]		
	3	2MASS-J05370391-6910035-G230L (STIS.sp.2360294)	(4) 2MASS-J05370391-6910035	STIS/NUV-MAMA, ACCUM, 52X0.2		G230L 2376 A				34 Secs (34 Secs)		
										[==>]		[1]



Proposal 18444 - 2MASS-J05263889-6925253 (05) - Characterizing the hot companions of the first identified Yellow supergiant binary...

Visit	Proposal 18444, 2MASS-J05263889-6925253 (05), implementation										Tue Aug 04 16:00:35 GMT 2026	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD, STIS/FUV-MAMA											
	Special Requirements: (none)											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(1)	Pattern Type=STIS-ALONG-SLIT Coordinate Frame=POS-TARG Purpose=DITHER Pattern Orientation=90.0 Number Of Points=2 Angle Between Sides= Point Spacing=0.35 Center Pattern=false Line Spacing=								(2)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(5)	2MASS-J05263889-6925253	RA: 05 26 38.8978 (81.6620742d) Dec: -69 25 25.37 (-69.42371d) Equinox: J2000		Proper Motion RA: 2.57 mas/yr Proper Motion Dec: -0.39100002595660044 mas/yr Parallax: 3.837E-4" Epoch of Position: 2000		V=13.3 Swift-UV M2(AB) = 15.58, E(B-V) = 0.11		Reference Frame: ICRS			
		Alt Name1: GAIA-DR3-4658071424714429824										
		Alt Name2: LMC OBS81.66-69.42										
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
	SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.											
	Category=STAR											
	Description=[F3-F9, MAIN SEQUENCE O]											
	Extended=NO											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	2MASS-J05263889-6925253-ACQ (STIS.ta.2360408)	(5) 2MASS-J05263889-6925253	STIS/CCD, ACQ, F28X50LP		MIRROR				0.1 Secs (0.1 Secs) [==>]		[1]
	2	2MASS-J05263889-6925253-G140L (STIS.sp.2362189)	(5) 2MASS-J05263889-6925253	STIS/FUV-MAMA, ACCUM, 52X0.2		G140L 1425 A			Pattern 1, Exps 2-2 in 2MASS-J05263889-6925253 (05) (1)	330 Secs (1666 Secs) [==>833.0 Secs (Pattern 1)] [==>833.0 Secs (Pattern 2)]		[1]
	3	2MASS-J05263889-6925253-G230L (STIS.sp.2360412)	(5) 2MASS-J05263889-6925253	STIS/NUV-MAMA, ACCUM, 52X0.2		G230L 2376 A				68 Secs (68 Secs) [==>]		[1]



Proposal 18444 - 2MASS-J05390594-6916267 (06) - Characterizing the hot companions of the first identified Yellow supergiant binary...

Visit	Proposal 18444, 2MASS-J05390594-6916267 (06), implementation										Tue Aug 04 16:00:35 GMT 2026	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: STIS/NUV-MAMA, STIS/CCD, STIS/FUV-MAMA											
	Special Requirements: (none)											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.35 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false						(2)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(6)	2MASS-J05390594-6916267	RA: 05 39 5.9300 (84.7747083d) Dec: -69 16 26.77 (-69.27410d)		Proper Motion RA: 1.934 mas/yr Proper Motion Dec: 0.746 mas/yr		V=12.14 Swift-UVM2(AB) = 15.64,		Reference Frame: ICRS			
		Alt Name1: GAIA-DR3-4657676944892556416	Equinox: J2000		Parallax: 1.66E-5"		E(B-V) = 0.11					
		Alt Name2: LMC OBS84.77-69.27			Epoch of Position: 2000							
		Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
		SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.										
Exposures		Category=STAR										
		Description=[F3-F9, MAIN SEQUENCE O]										
		Extended=NO										
	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	2MASS-J05390594-6916267-ACQ (STIS.ta.2360413)	(6) 2MASS-J05390594-6916267	STIS/CCD, ACQ, F28X50LP		MIRROR				0.1 Secs (0.1 Secs) [==>]	[1]	
2	2MASS-J05390594-6916267-G140L (STIS.sp.2362190)	(6) 2MASS-J05390594-6916267	STIS/FUV-MAMA, ACCUM, 52X0.2		G140L 1425 A			Pattern 1, Exps 2-2 in 2MASS-J05390594-6916267 (06) (1)	273 Secs (1668 Secs) [==>834.0 Secs (Pattern 1)] [==>834.0 Secs (Pattern 2)]	[1]		
3	2MASS-J05390594-6916267-G230L (STIS.sp.2360416)	(6) 2MASS-J05390594-6916267	STIS/NUV-MAMA, ACCUM, 52X0.2		G230L 2376 A				67 Secs (67 Secs) [==>]	[1]		

