



17123 - Characterizing four massive post-interaction binaries with HST/COS

Cycle: 30, Proposal Category: GO

(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) LMC-OBS45465-1066	COS/FUV COS/NUV	3	08-Dec-2022 10:00:29.0	yes
02	(2) LMC-OBS45522-795	COS/FUV COS/NUV	2	08-Dec-2022 10:00:30.0	yes
03	(3) LMC-OBS45570-572	COS/FUV COS/NUV	2	08-Dec-2022 10:00:31.0	yes
04	(4) LMC-OBS45473-3515 (5) ACQUISITION-STAR-3515	COS/FUV COS/NUV	2	08-Dec-2022 10:00:31.0	yes

9 Total Orbits Used

ABSTRACT

Massive stars stripped of their hydrogen-rich envelopes should be one of the most common types of binary products and the progenitors of stripped-envelope supernovae and binary neutron star mergers. Yet, no such system descending directly from stable mass transfer has been published. We propose to characterize a set of four binaries containing $\sim 2\text{-}5$ M_{sun} stripped stars (originating from stars with initial masses $\sim 7\text{-}20$ M_{sun}) that orbit B-type companions and that were recently discovered in the Large Magellanic Cloud. Because stripped stars are the exposed helium cores of their progenitors, they are very hot and emit most of their light in the ionizing extreme ultraviolet. As a result, their main-sequence companions dominate the optical output, making HST/COS UV spectroscopy necessary for characterizing the properties of the stripped stars. Using a set of HeII and HI lines combined with NIV and NV lines in the UV, we will be able to measure the effective temperature, surface gravity, surface hydrogen/helium content, and wind mass loss. In turn, these will lead to estimates for the bolometric luminosity, stellar radius, and mass. Combined with the properties of the companion star, we will provide the first stringent constraints on the outcomes of stable mass transfer in massive binary stars.

OBSERVING DESCRIPTION

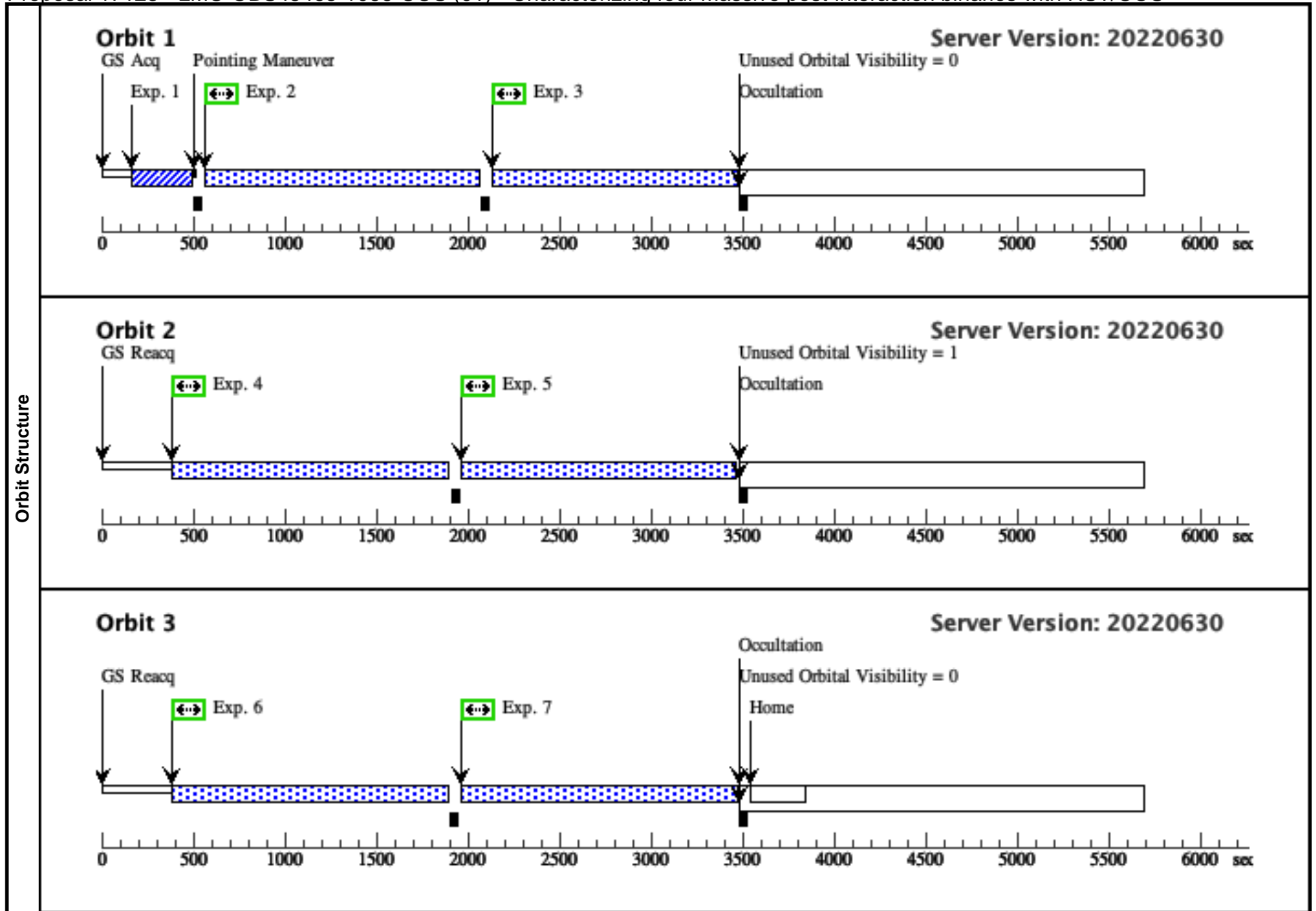
This program will obtain UV spectra for 4 targets in the LMC that are newly discovered double-lined spectroscopic binaries, where one of the components is an intermediate mass stripped helium star candidate. These stripped stars are hot stars that are more luminous than subdwarfs, but lack the wind emission lines of Wolf-Rayet stars. The goal is to obtain UV spectra that can be modeled to both obtain stellar parameters and to constrain their wind parameters. The UV is essential for this study both because the optical spectra are obscured by the companion main-sequence star and the UV contains valuable spectral lines sensitive to wind parameters. Spectra will be obtained in the FUV with the G140L grism and a center wavelength of 800 Angstrom, providing continuous wavelength coverage between $\sim 900\text{-}1950$ Angstrom. We use the maximum exposure time available in between 2-3 orbits allocated per star, using all four FP positions for each target.

The impacts of a reduced gyro operations on this program would primarily be reduced schedulability due to the smaller field of regard, as well as possible impacts of roll angle constraints when avoiding placement of bright field objects in the second COS aperture. Slightly longer acquisition times would have only a small effect on the S/N of our observations.

Proposal 17123 - LMC-OBS45465-1066-COS (01) - Characterizing four massive post-interaction binaries with HST/COS

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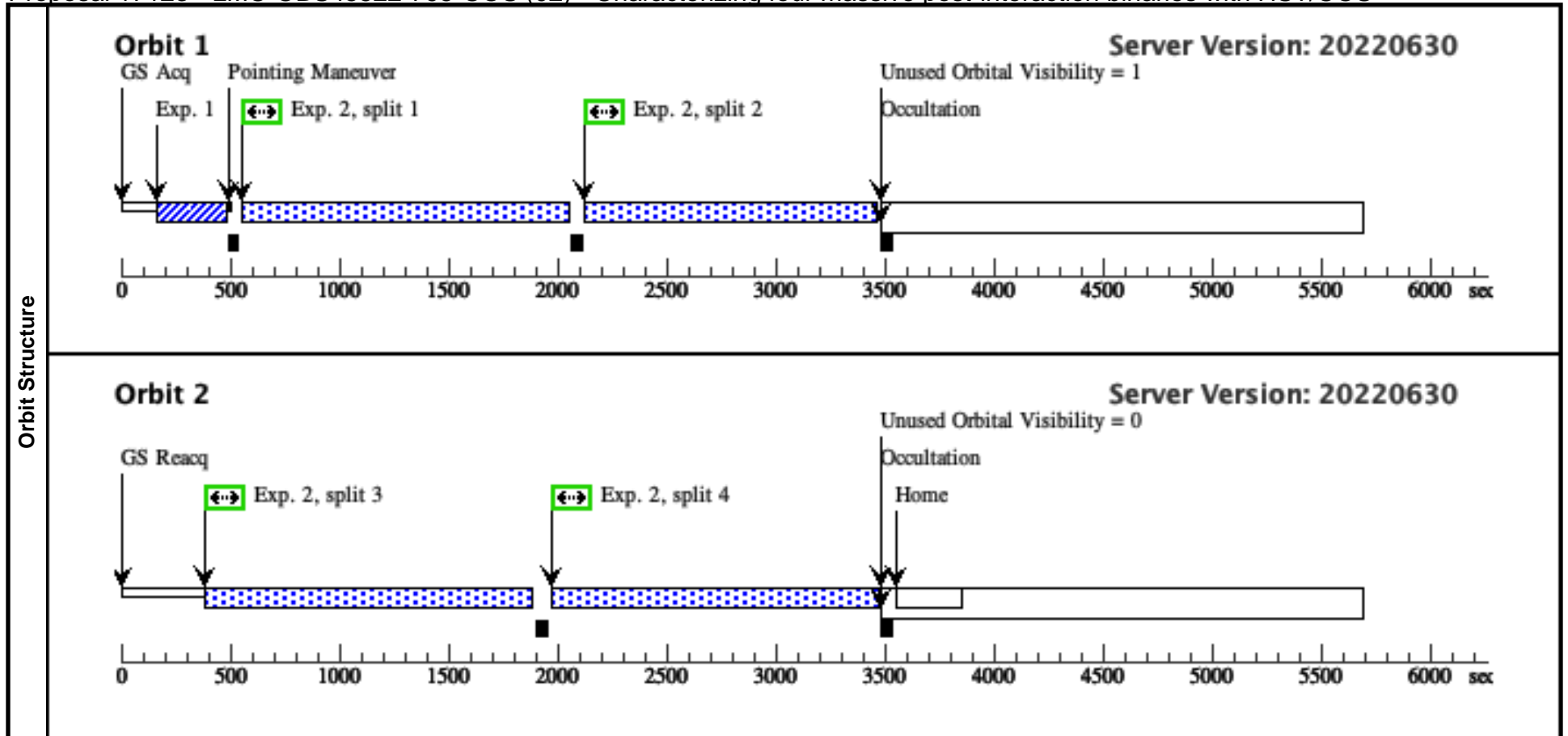
Visit	Proposal 17123, LMC-OBS45465-1066-COS (01), scheduling Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	LMC-OBS45465-1066	RA: 05 26 19.7633 (81.5823471d) Dec: -69 22 34.25 (-69.37618d) Equinox: J2000		V=18.66+/-0.11 UVW2: 17.87 (ABmag), UVM2: 17.93 (ABmag)	Reference Frame: ICRS				
	Comments: Category=EXT-STAR Description=[ALGOL SYSTEM, COMPOSITE SPECTRAL TYPE, INTERACTING BINARY, SDO] Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	LMC-OBS4 5465-1066- ACQ-IMAG E (COS.ta.181 2427)	(1) LMC-OBS45465 -1066	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				21 Secs (21 Secs) [==>]	[1]
	2	LMC-OBS4 5465-1066- FP1-1 (COS.sp.181 2441)	(1) LMC-OBS45465 -1066	COS/FUV, TIME-TAG, PSA	G140L 800 A	SEGMENT=A; FLASH=YES; FP-POS=1; BUFFER-TIME=46 73			1290 Secs (1290 Secs) [==>]	[1]
	3	LMC-OBS4 5465-1066- FP1-2 (COS.sp.181 2441)	(1) LMC-OBS45465 -1066	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=1; SEGMENT=A; FLASH=YES; BUFFER-TIME=46 73			1290 Secs (1290 Secs) [==>]	[1]
	4	LMC-OBS4 5465-1066- FP2-1 (COS.sp.181 2441)	(1) LMC-OBS45465 -1066	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=2; FLASH=YES; SEGMENT=A; BUFFER-TIME=46 73			1454 Secs (1454 Secs) [==>]	[2]
	5	LMC-OBS4 5465-1066- FP2-2 (COS.sp.181 2441)	(1) LMC-OBS45465 -1066	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=2; FLASH=YES; SEGMENT=A; BUFFER-TIME=46 73			1454 Secs (1454 Secs) [==>]	[2]
	6	LMC-OBS4 5465-1066- FP3-1 (COS.sp.181 2441)	(1) LMC-OBS45465 -1066	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=3; FLASH=YES; SEGMENT=A; BUFFER-TIME=46 73			1453 Secs (1453 Secs) [==>]	[3]
	7	LMC-OBS4 5465-1066- FP4-1 (COS.sp.181 2441)	(1) LMC-OBS45465 -1066	COS/FUV, TIME-TAG, PSA	G140L 800 A	FLASH=YES; FP-POS=4; SEGMENT=A; BUFFER-TIME=46 73			1453 Secs (1453 Secs) [==>]	[3]



Proposal 17123 - LMC-OBS45522-795-COS (02) - Characterizing four massive post-interaction binaries with HST/COS

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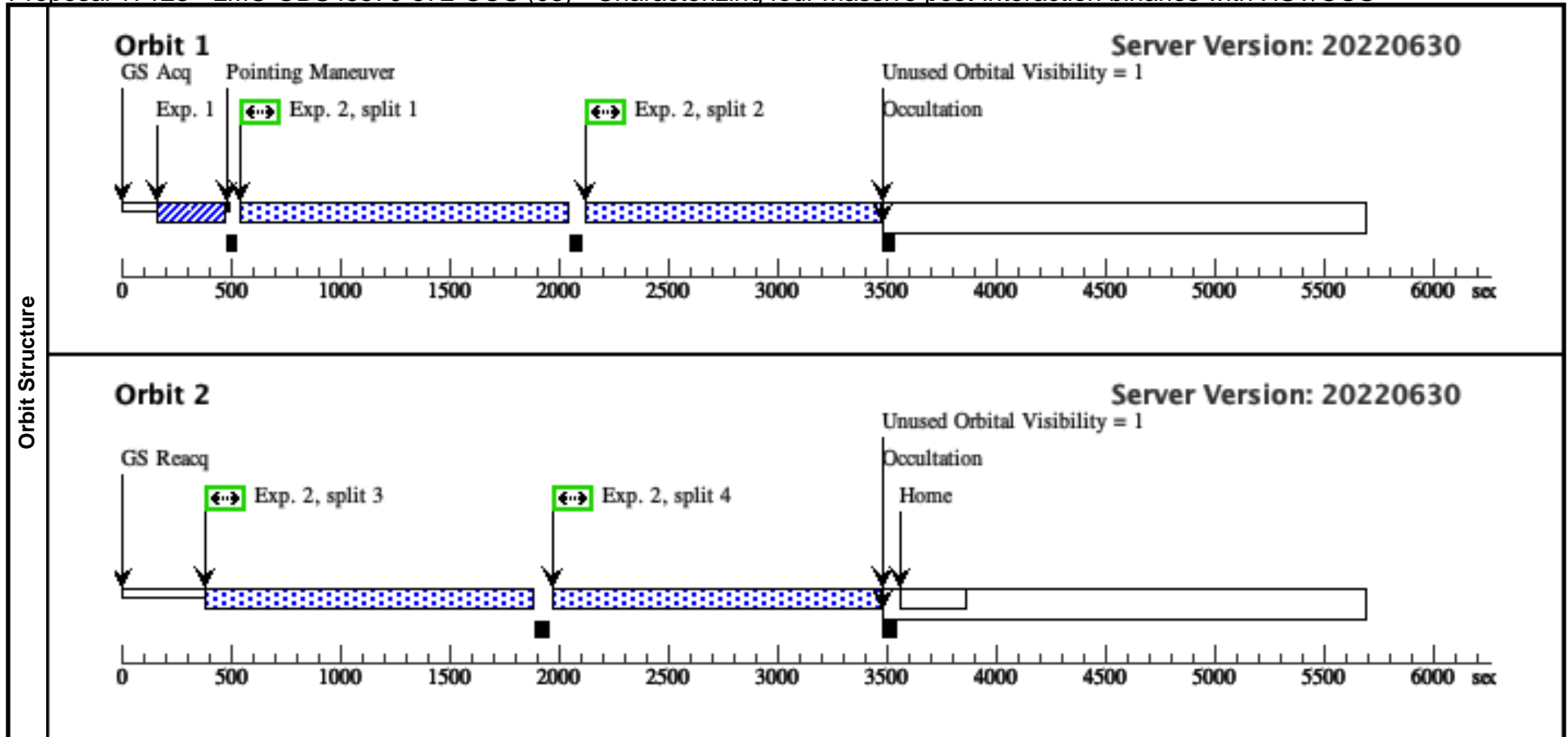
Visit	Proposal 17123, LMC-OBS45522-795-COS (02), scheduling Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(2)	LMC-OBS45522-795	RA: 05 11 23.1388 (77.8464117d) Dec: -69 53 53.59 (-69.89822d) Equinox: J2000		V=18.41+/-0.086 UVW2: 17.47 (ABmag), UVM2: 17.57 (ABmag)	Reference Frame: ICRS				
	Comments: Category=EXT-STAR Description=[ALGOL SYSTEM, COMPOSITE SPECTRAL TYPE, SDO] Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	LMC-OBS4 5522-795-A CQ-IMAGE (COS.ta.181 2444)	(2) LMC-OBS45522 -795	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				15 Secs (15 Secs) [==>]	[1]
	2	LMC-OBS4 5522-795-F PALL (COS.sp.181 2445)	(2) LMC-OBS45522 -795	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=ALL; SEGMENT=A; FLASH=YES; BUFFER-TIME=38 66			1276 Secs (5474 Secs) [==>1289.0 Secs (Split 1)]	[1]
									[==>1289.0 Secs (Split 2)] [==>1448.0 Secs (Split 3)] [==>1448.0 Secs (Split 4)]	[2]



Proposal 17123 - LMC-OBS45570-572-COS (03) - Characterizing four massive post-interaction binaries with HST/COS

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Visit	Proposal 17123, LMC-OBS45570-572-COS (03), scheduling Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(3)	LMC-OBS45570-572	RA: 05 23 39.8466 (80.9160275d) Dec: -68 36 41.02 (-68.61139d) Equinox: J2000		V=17.94+/-0.028 UVW2: 17.09 (ABmag), UVM2: 17.19 (ABmag)	Reference Frame: ICRS				
	Comments: Category=EXT-STAR Description=[ALGOL SYSTEM, COMPOSITE SPECTRAL TYPE, SDO] Extended=NO									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	LMC-OBS4 5570-572-A CQ-IMAGE (COS.ta.181 2446)	(3) LMC-OBS45570 -572	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				11 Secs (11 Secs) [==>]	[1]
2	LMC-OBS4 5570-572-F PALL (COS.sp.181 2447)	(3) LMC-OBS45570 -572	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=ALL; FLASH=YES; SEGMENT=A; BUFFER-TIME=30 77			1276 Secs (5472 Secs) [==>1293.0 Secs (Split 1)] [==>1293.0 Secs (Split 2)] [==>1443.0 Secs (Split 3)] [==>1443.0 Secs (Split 4)]	[1] [2]	



Proposal 17123 - LMC-OBS45473-3515-COS (04) - Characterizing four massive post-interaction binaries with HST/COS

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Visit	Proposal 17123, LMC-OBS45473-3515-COS (04), implementation Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
(4)		LMC-OBS45473-3515	RA: 05 36 33.0762 (84.1378175d) Dec: -69 26 27.16 (-69.44088d) Equinox: J2000		V=18.18+/-0.10 UVW2: 17.67 (ABmag), UVM2: 17.76 (ABmag)	Reference Frame: ICRS				
<i>Comments:</i> Category=EXT-STAR Description=[ALGOL SYSTEM, COMPOSITE SPECTRAL TYPE, SDO] Extended=NO										
(5)	ACQUISITION-STAR-3515	RA: 05 36 32.1513 (84.1339637d) Dec: -69 26 34.05 (-69.44279d) Equinox: J2000		V=17.09+/-0.082 UVW2: 17.73 (ABmag), UVM2: 17.49 (ABmag), UVW1: 17.61 (ABmag)	Reference Frame: ICRS					
<i>Comments: This star is to make the acquisition of target 4 easier. We aim to first point at this star, then offset the telescope to target 4 and obtain the spectrum of star 3.</i> Category=EXT-STAR Description=[UNDESIGNATED] Extended=NO										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	LMC-OBS4 5473-3515-ACQ-IMAG E (COS.ta.183 5853)	(5) ACQUISITION-STAR-3515	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				23 Secs (23 Secs) [==>]	[1]
	2	LMC-OBS4 5473-3515-FPALL (COS.sp.181 2451)	(4) LMC-OBS45473-3515	COS/FUV, TIME-TAG, PSA	G140L 800 A	FP-POS=ALL; SEGMENT=A; FLASH=YES; BUFFER-TIME=42 87			1276 Secs (5469 Secs) [==>1286.0 Secs (Split 1)] [==>1287.0 Secs (Split 2)] [==>1448.0 Secs (Split 3)] [==>1448.0 Secs (Split 4)]	[1] [2]

