



17714 - Understanding the Role of Massive Stars in Galaxies at Cosmic Noon in a Legacy Spectroscopic Field

Cycle: 32, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Tim Blake Miller (PI) (Contact)	Northwestern University
Prof. Allison L. Strom (CoI) (CoPI) (AdminUSPI)	Northwestern University
Prof. Ryan F Trainor (CoI)	Franklin and Marshall College
Dr. Gwen C. Rudie (CoI)	Carnegie Institution of Washington
Dr. Noah Sidney James Rogers (CoI)	Northwestern University
Caroline von Raesfeld (CoI)	Northwestern University
Dr. Guochao Sun (CoI)	Northwestern University

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) Q2343+125	ACS/WFC	2	24-Apr-2025 15:00:48.0	yes
02	(1) Q2343+125	ACS/WFC	2	24-Apr-2025 15:00:49.0	yes
03	(1) Q2343+125	ACS/WFC	2	24-Apr-2025 15:00:49.0	yes
04	(1) Q2343+125	ACS/WFC	2	24-Apr-2025 15:00:50.0	yes
05	(1) Q2343+125	ACS/WFC	3	24-Apr-2025 15:00:51.0	yes

11 Total Orbits Used

ABSTRACT

We propose to use new HST/ACS imaging in F606W and F814W to create high spatial resolution rest-UV maps for $z \sim 2$ star-forming galaxies in the field surrounding luminous quasar Q2343+125. This field stands out in terms of spectroscopic investment, with deep (~ 10 hr) rest-UV spectra from Keck/LRIS, deep (~ 2 -10 hr) rest-optical spectra from Keck/MOSFIRE, and ultra-deep (~ 30 hr) rest-optical and rest-NIR spectra from JWST/NIRSpec. This unique combination enables a detailed accounting of the ionizing spectra of massive stars using direct observations of their rest-UV continua and myriad HII emission lines spanning rest-frame ~ 0.3 -1.1 micron. The proposed imaging will allow us to study the rest-UV morphology of these galaxies for the first time, thereby addressing two outstanding questions related to the distribution of massive stars in high- z galaxies: First, we will investigate the connection between ionization conditions and galaxy morphology. This study will serve as a bridge to understanding this connection at even higher redshifts, where knowledge of how the clustering of massive stars affects galaxies' ionizing output is urgently needed to determine their contribution to cosmic reionization. Second, we will use these data to provide improved guidance to the community about how best to combine space- and ground-based spectroscopy, which are often observed at very different spatial scales. A comparatively small investment of HST time will significantly enhance the legacy value of one of richest spectroscopic datasets of distant galaxies ever assembled and provide novel constraints on the properties of massive stars--and their impact on galaxies--at Cosmic Noon and beyond.

OBSERVING DESCRIPTION

We propose to obtain rest-UV imaging in two filters (F606W and F814W) over the footprint of the CECILIA JWST NIRSpec/MSA observations. The principal scientific goals of these observations are to perform resolved SED fitting and determine the rest-UV morphologies of $z = 2$ galaxies (Sec. 2) and improve slit-loss corrections (Sec. 3). We choose the F606W and F814W filters as they sample the rest-UV continuum from rest wavelength = 1500- 3000 angstrom of the targeted galaxies at $z = 2$ (see Fig. 1). We require two bands, in addition to the rest-optical F140W observations obtained as part of HST C24 GO 14620, in order to perform resolved SED fitting and study the relationship between ionization conditions and the distribution of star formation with a galaxy. Multiple bands are needed to successfully break the degeneracy between dust attenuation and star formation in the rest-UV (e.g., Miller et al., 2022).

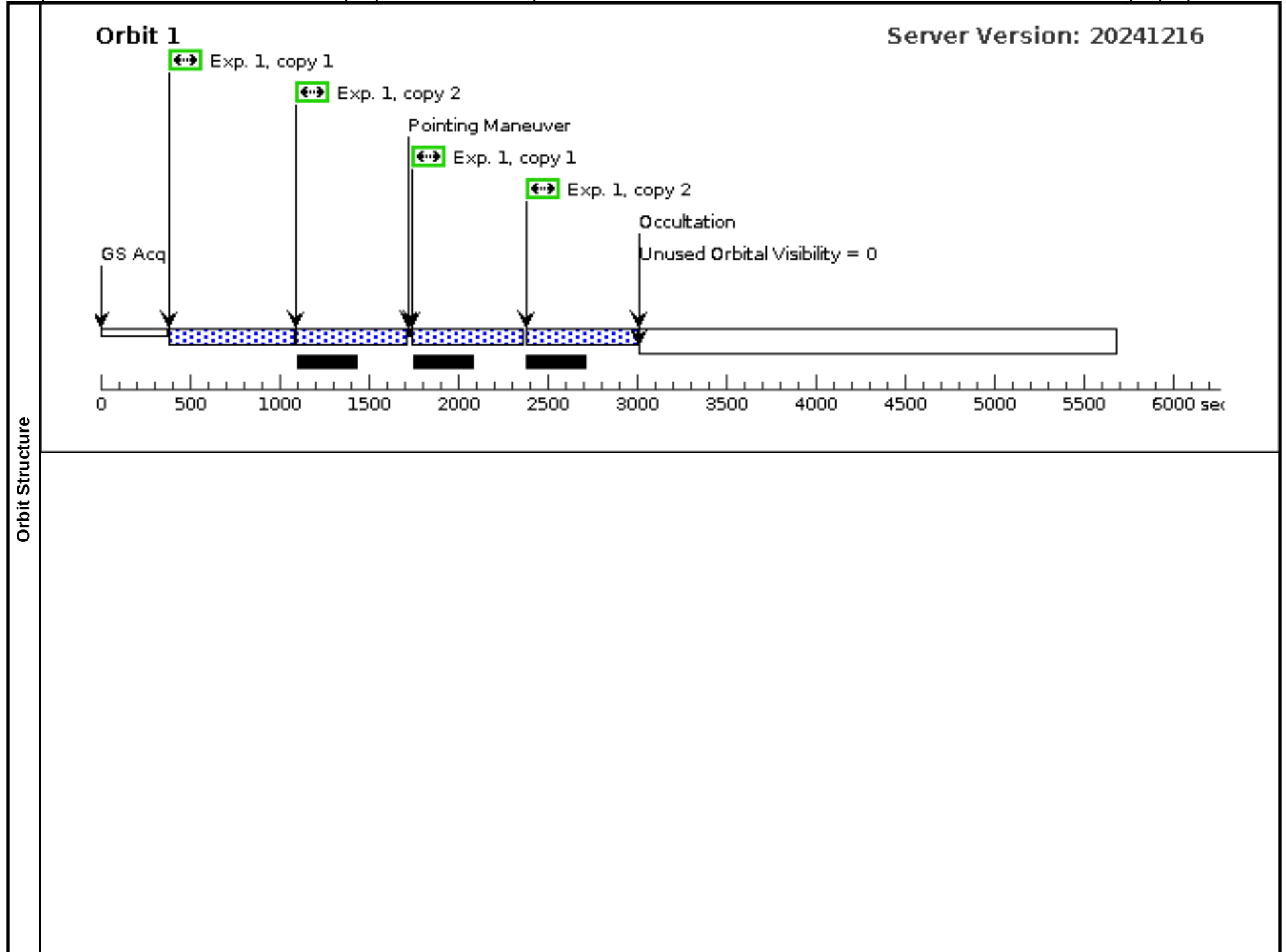
The parent galaxy sample has a median RAB = 24.58, with an interquartile range of R band mage = 24.12 - 25.01 at a median $z = 2.4$. The median semi-major (half-light) axis is 0.26 arcsec, with an axis ratio of $b/a = 0.6$. In order to perform resolved SED fitting and calculate

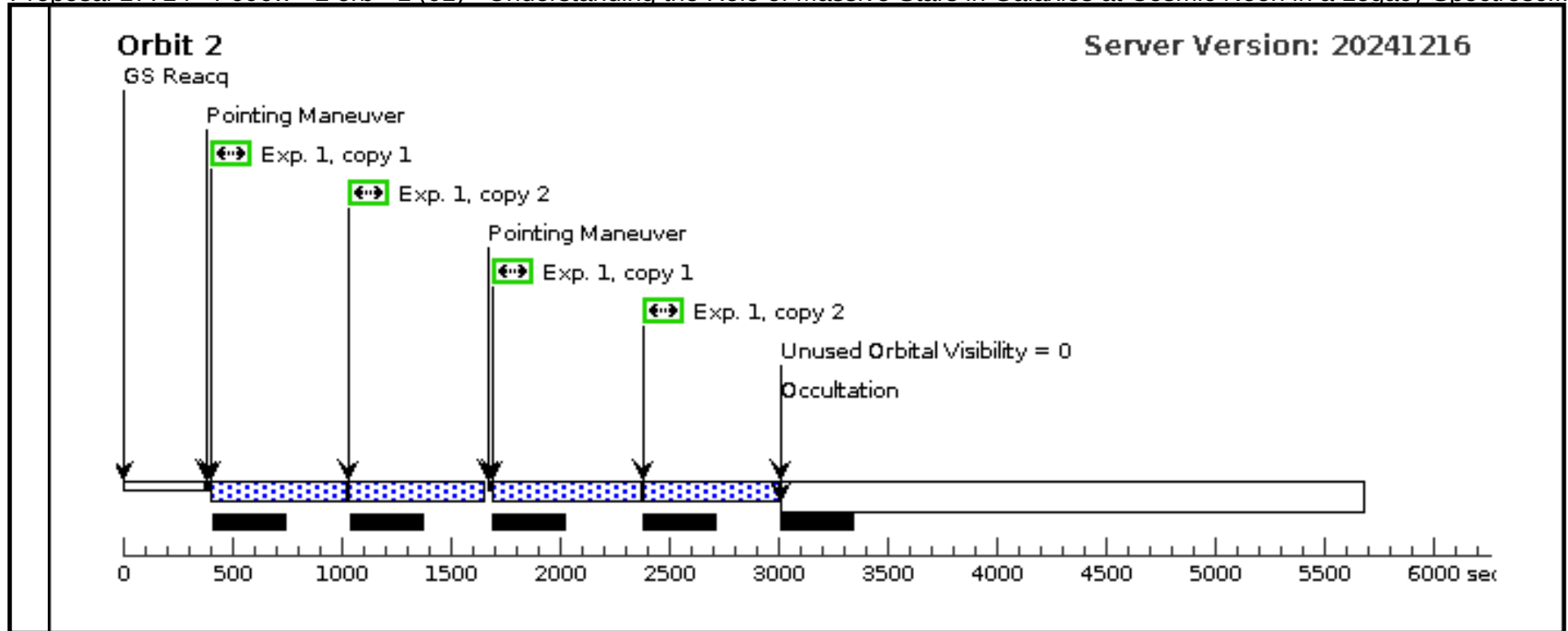
accurate slit-loss corrections, we require a S/N per pixel of > 5 out to the effective radius.

This corresponds to an integrated $S/N > 20$, above the suggested benchmark of $S/N = 15$ for traditional morphological analysis (e.g., Shibuya et al., 2015). Using the median properties of our sample and the HST/ACS ETC, we find that achieving this S/N requires 13 ks and 22 ks in the F606W and F814W filters, respectively. The orbital visibility of our target field is 52 min, so we request a total of 11 orbits: 4 in F606W and 7 in F814W

Proposal 17714 - F606w - 2 orb - 1 (01) - Understanding the Role of Massive Stars in Galaxies at Cosmic Noon in a Legacy Spectrosc...

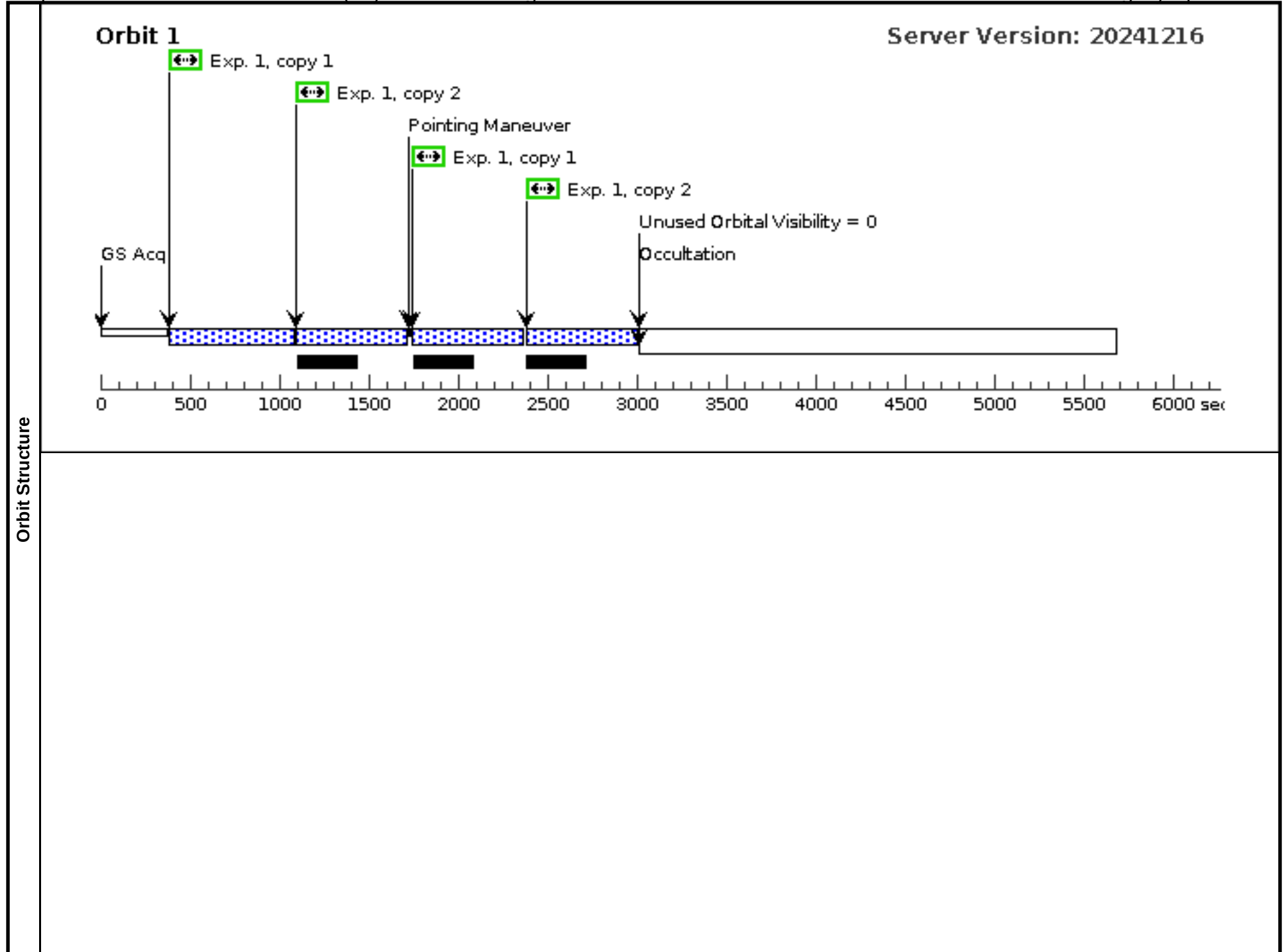
Visit	Proposal 17714, F606w - 2 orb - 1 (01), implementation										Thu Apr 24 19:00:51 GMT 2025	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: ACS/WFC											
	Special Requirements: ORIENT 198.5D TO 213.5 D											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false		Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(1)	Q2343+125	RA: 23 46 27.2890 (356.6137042d) Dec: +12 48 7.50 (12.80208d) Equinox: J2000		Epoch of Position: 2000		V=17.5		Reference Frame: SIMBAD			
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
	Category=GALAXY Description=[QUASAR]											
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F606w 2 orb it	(1) Q2343+125	ACS/WFC, ACCUM, WFC		F606W		POS TARG -1.5426 810976800902,-0.94 70887873046967	Pattern 2, Exps 1-1 i n F606w - 2 orb - 1 (01) (2)	548 Secs X 2 (4020 Secs)		
										[=>495.0 Secs (Pattern 1,1, Copy 1)] [=>495.0 Secs (Pattern 1,1, Copy 2)] [=>495.0 Secs (Pattern 1,2, Copy 1)] [=>496.0 Secs (Pattern 1,2, Copy 2)]		[1]
										[=>495.0 Secs (Pattern 2,1, Copy 1)] [=>495.0 Secs (Pattern 2,1, Copy 2)] [=>553.0 Secs (Pattern 2,2, Copy 1)] [=>496.0 Secs (Pattern 2,2, Copy 2)]		[2]

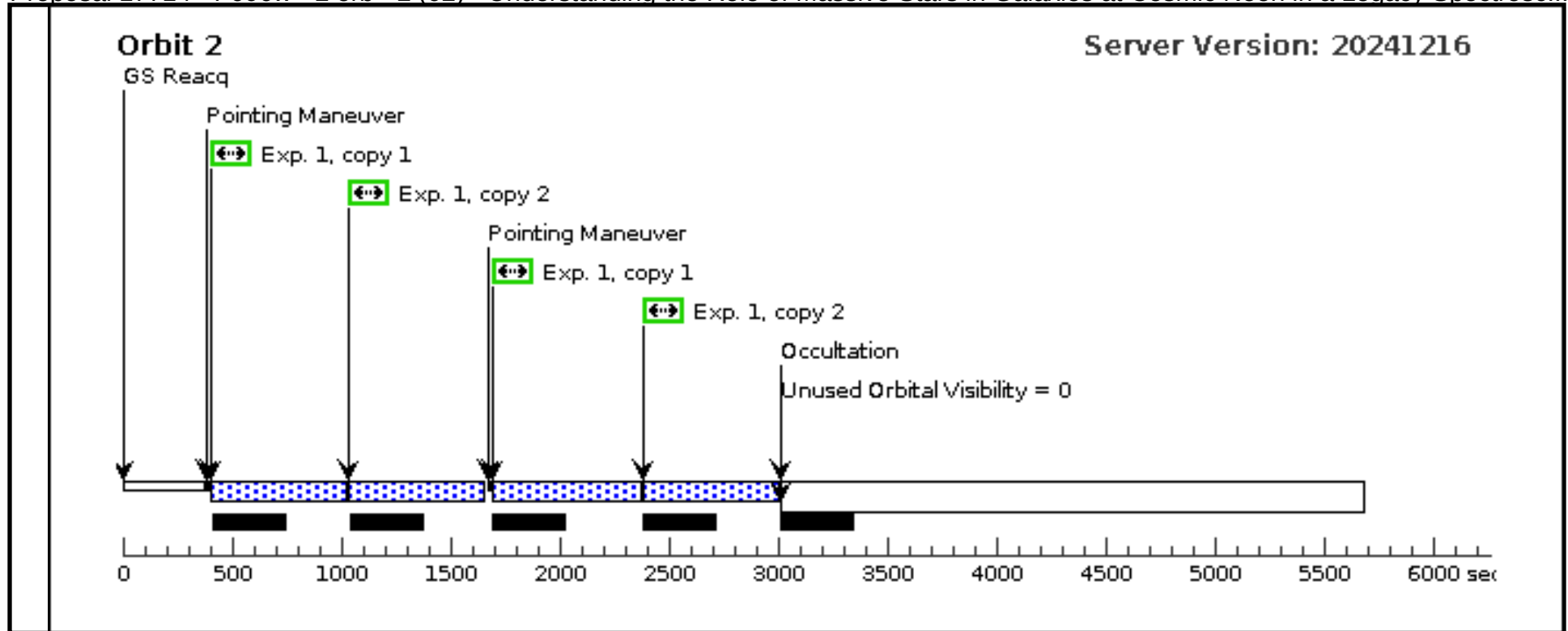




Proposal 17714 - F606w - 2 orb - 2 (02) - Understanding the Role of Massive Stars in Galaxies at Cosmic Noon in a Legacy Spectrosc...

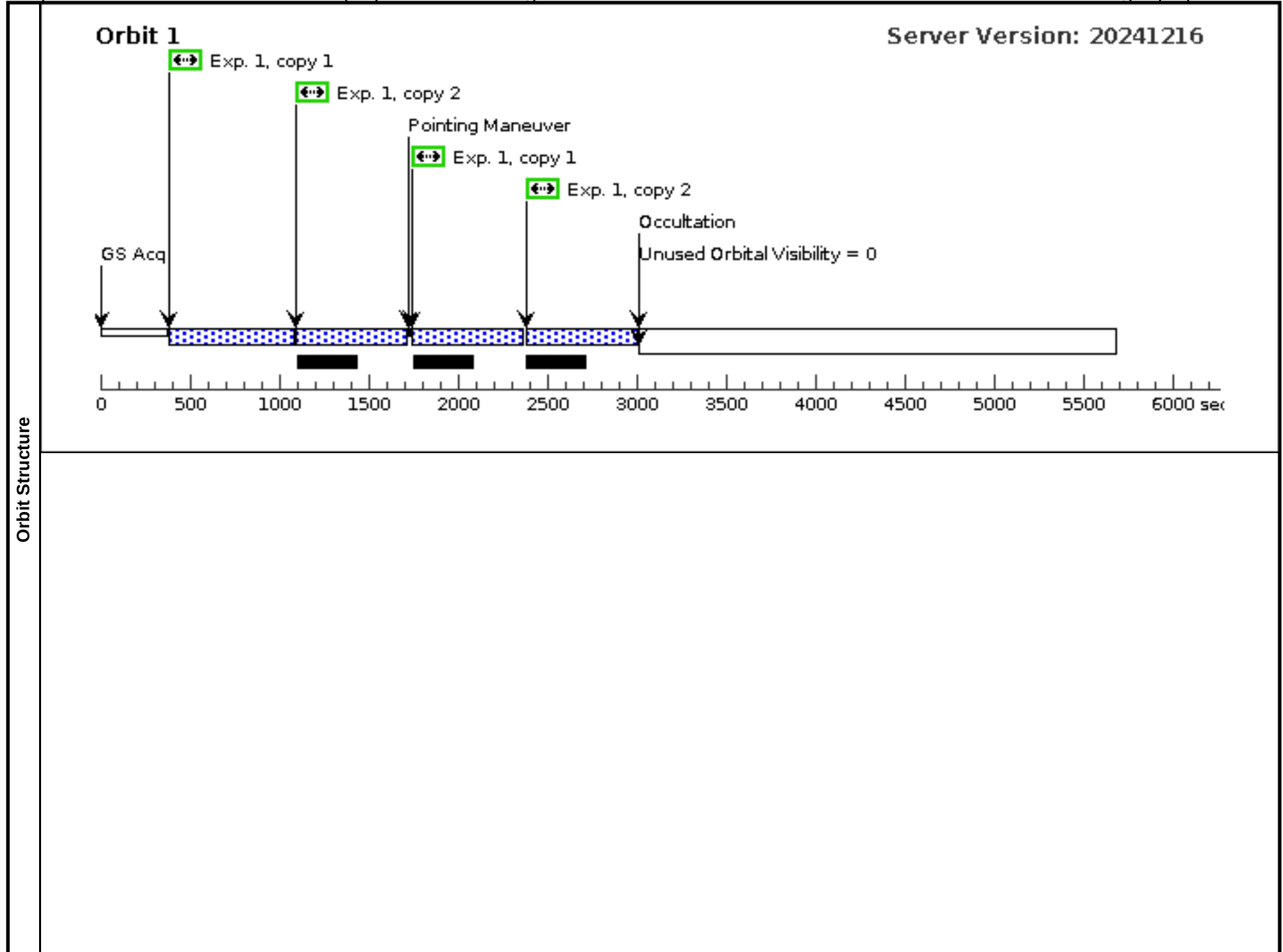
Visit	Proposal 17714, F606w - 2 orb - 2 (02), implementation										Thu Apr 24 19:00:52 GMT 2025
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: ACS/WFC										
	Special Requirements: ORIENT 198.5D TO 213.5 D										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false		Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	Q2343+125	RA: 23 46 27.2890 (356.6137042d) Dec: +12 48 7.50 (12.80208d) Equinox: J2000		Epoch of Position: 2000		V=17.5		Reference Frame: SIMBAD		
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
Category=GALAXY											
Description=[QUASAR]											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F606w 2 orb it	(1) Q2343+125	ACS/WFC, ACCUM, WFC	F606W		POS TARG -1.5426 810976800902,-0.94 70887873046967	Pattern 2, Exps 1-1 i n F606w - 2 orb - 2 (02) (2)	548 Secs X 2 (4020 Secs) [>=>495.0 Secs (Pattern 1,1, Copy 1)] [>=>495.0 Secs (Pattern 1,1, Copy 2)] [>=>495.0 Secs (Pattern 1,2, Copy 1)] [>=>496.0 Secs (Pattern 1,2, Copy 2)]		[1]
									[>=>495.0 Secs (Pattern 2,1, Copy 1)] [>=>495.0 Secs (Pattern 2,1, Copy 2)] [>=>553.0 Secs (Pattern 2,2, Copy 1)] [>=>496.0 Secs (Pattern 2,2, Copy 2)]		[2]

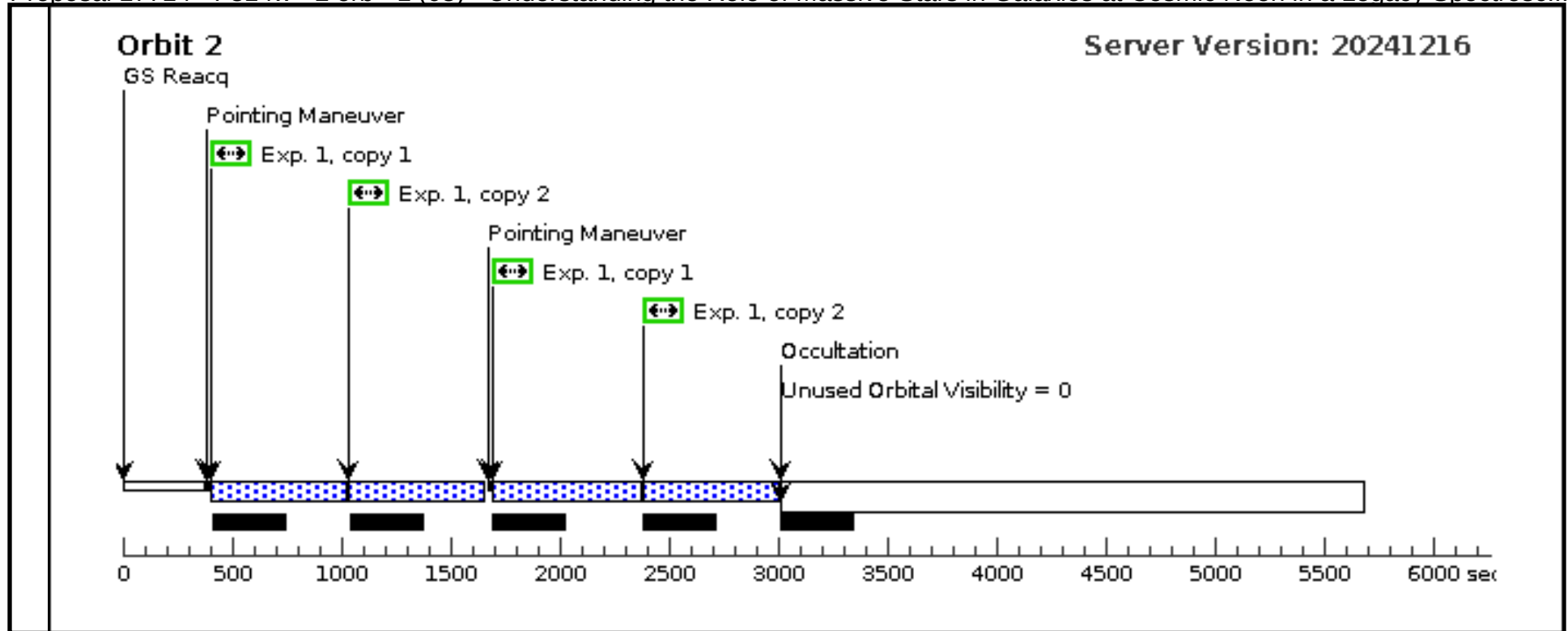




Proposal 17714 - F814w - 2 orb - 1 (03) - Understanding the Role of Massive Stars in Galaxies at Cosmic Noon in a Legacy Spectrosc...

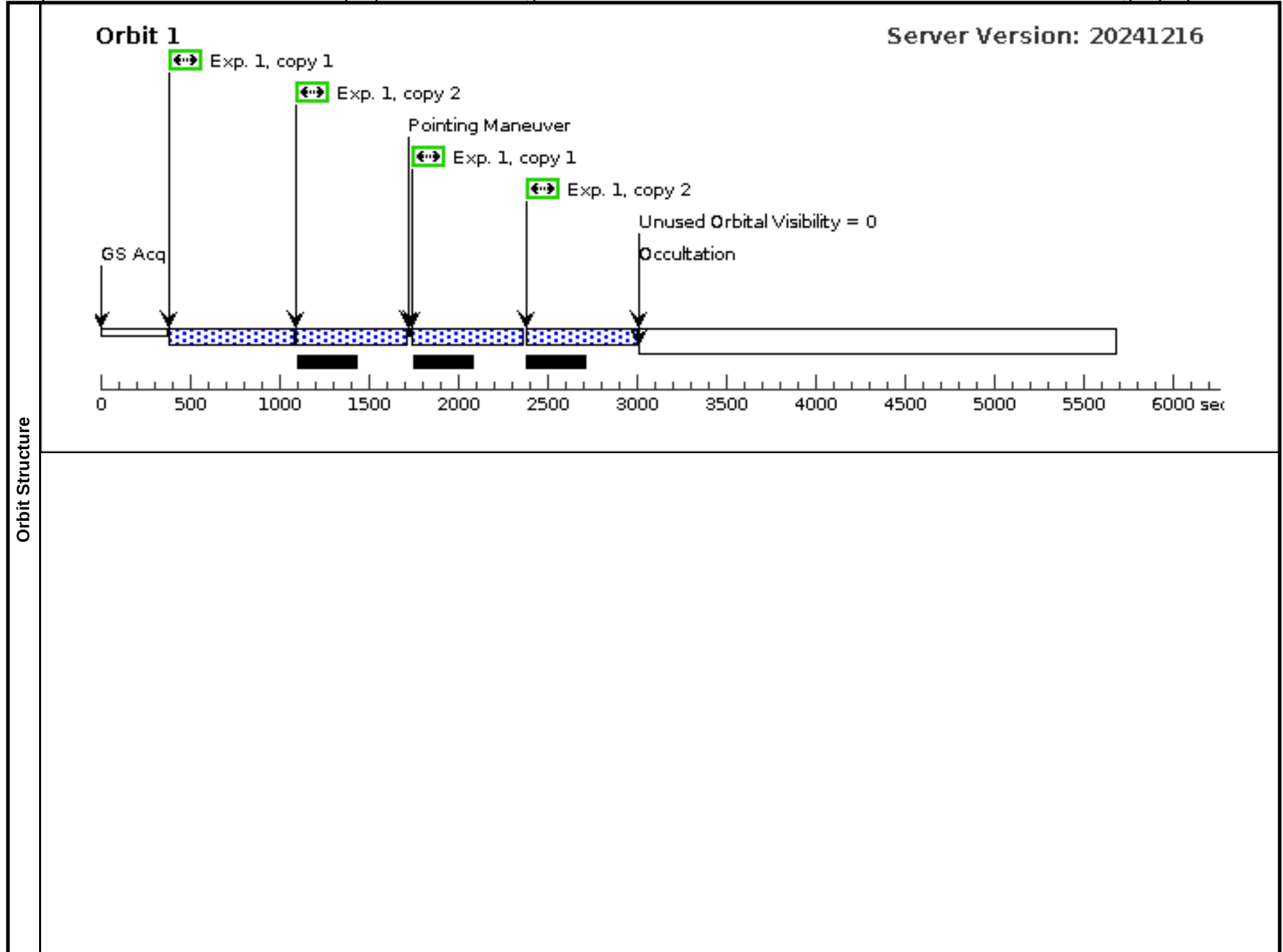
Visit	Proposal 17714, F814w - 2 orb - 1 (03), implementation										Thu Apr 24 19:00:52 GMT 2025
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: ACS/WFC										
	Special Requirements: ORIENT 198.5D TO 213.5 D										
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false		Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	Q2343+125	RA: 23 46 27.2890 (356.6137042d) Dec: +12 48 7.50 (12.80208d) Equinox: J2000		Epoch of Position: 2000		V=17.5		Reference Frame: SIMBAD		
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
	Category=GALAXY Description=[QUASAR]										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F606w 2 orb it	(1) Q2343+125	ACS/WFC, ACCUM, WFC	F814W		POS TARG -1.5426 810976800902,-0.94 70887873046967	Pattern 2, Exps 1-1 in F814w - 2 orb - 1 (03) (2)	548 Secs X 2 (4020 Secs)		
									[>=>495.0 Secs (Pattern 1,1, Copy 1)] [>=>495.0 Secs (Pattern 1,1, Copy 2)] [>=>495.0 Secs (Pattern 1,2, Copy 1)] [>=>496.0 Secs (Pattern 1,2, Copy 2)]		[1]
									[>=>495.0 Secs (Pattern 2,1, Copy 1)] [>=>495.0 Secs (Pattern 2,1, Copy 2)] [>=>553.0 Secs (Pattern 2,2, Copy 1)] [>=>496.0 Secs (Pattern 2,2, Copy 2)]		[2]

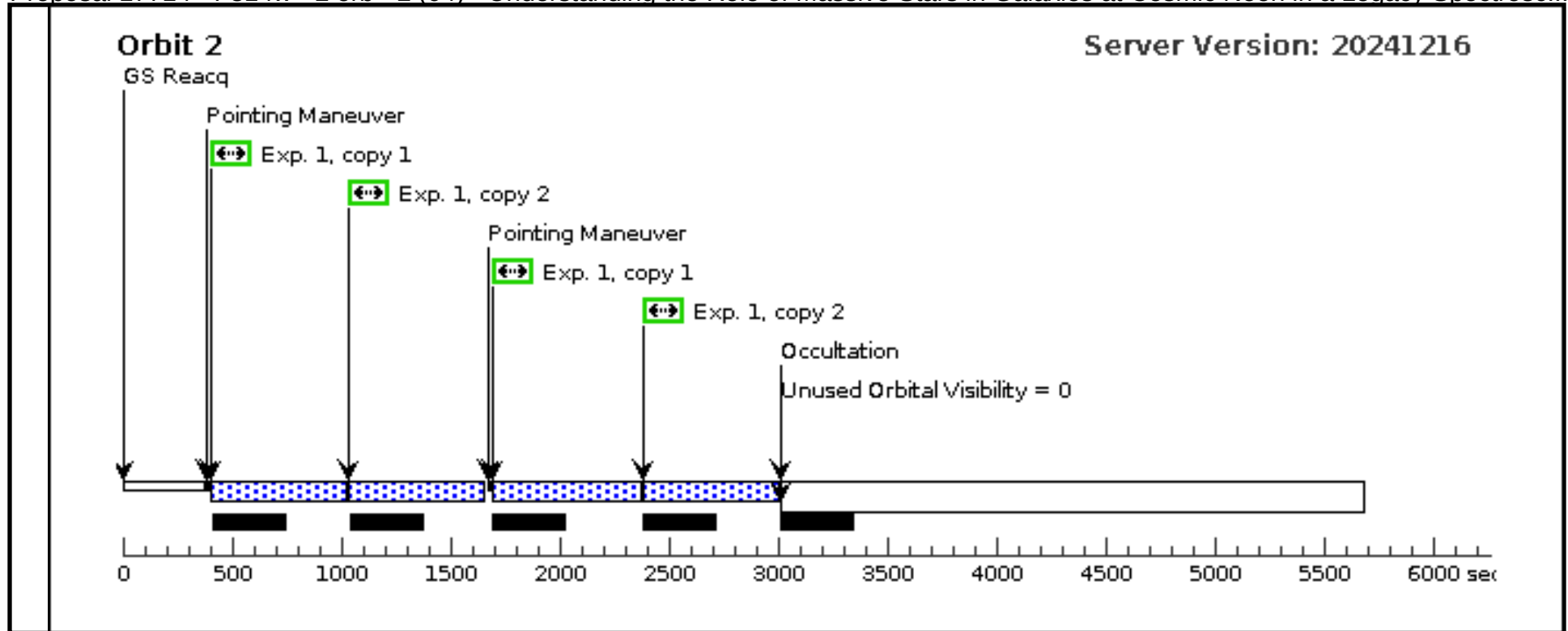




Proposal 17714 - F814w - 2 orb - 2 (04) - Understanding the Role of Massive Stars in Galaxies at Cosmic Noon in a Legacy Spectrosc...

Visit	Proposal 17714, F814w - 2 orb - 2 (04), implementation										Thu Apr 24 19:00:52 GMT 2025	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: ACS/WFC											
	Special Requirements: ORIENT 198.5D TO 213.5 D											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false		Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(1)	Q2343+125	RA: 23 46 27.2890 (356.6137042d) Dec: +12 48 7.50 (12.80208d) Equinox: J2000		Epoch of Position: 2000		V=17.5		Reference Frame: SIMBAD			
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
	Category=GALAXY Description=[QUASAR]											
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F606w 2 orb it	(1) Q2343+125	ACS/WFC, ACCUM, WFC		F814W		POS TARG -1.5426 810976800902,-0.94 70887873046967	Pattern 2, Exps 1-1 i n F814w - 2 orb - 2 (04) (2)	548 Secs X 2 (4020 Secs)		
										[>=>495.0 Secs (Pattern 1,1, Copy 1)] [>=>495.0 Secs (Pattern 1,1, Copy 2)] [>=>495.0 Secs (Pattern 1,2, Copy 1)] [>=>496.0 Secs (Pattern 1,2, Copy 2)]		[1]
										[>=>495.0 Secs (Pattern 2,1, Copy 1)] [>=>495.0 Secs (Pattern 2,1, Copy 2)] [>=>553.0 Secs (Pattern 2,2, Copy 1)] [>=>496.0 Secs (Pattern 2,2, Copy 2)]		[2]



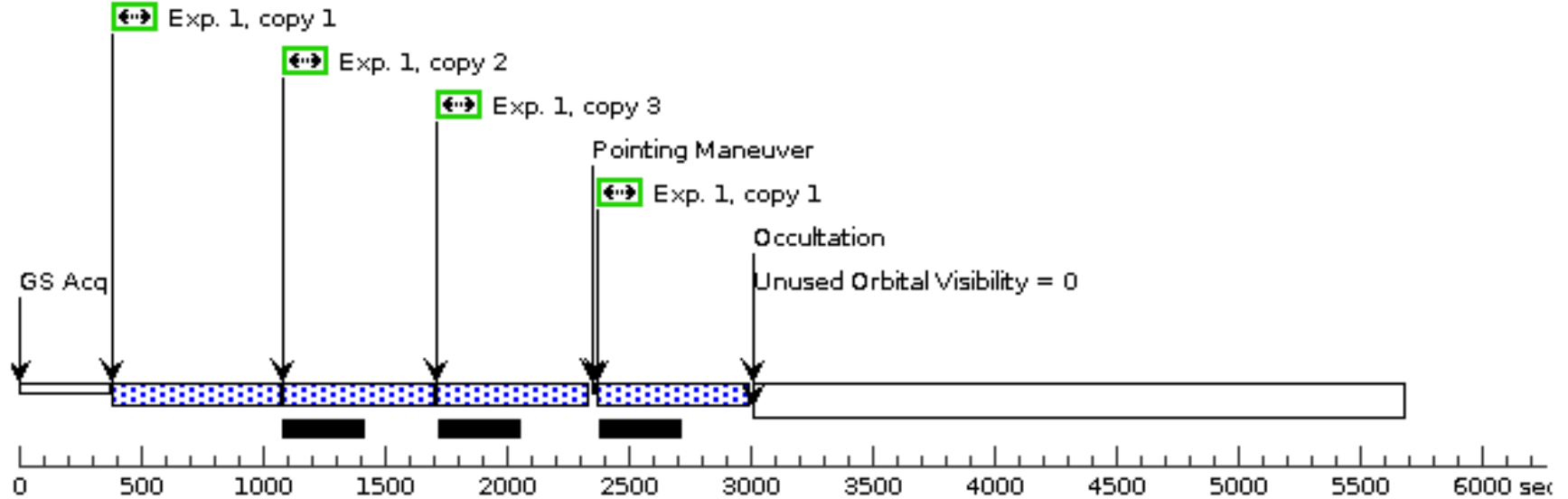


Proposal 17714 - F814w - 3 orb (05) - Understanding the Role of Massive Stars in Galaxies at Cosmic Noon in a Legacy Spectroscopi...

Visit	Proposal 17714, F814w - 3 orb (05), implementation										Thu Apr 24 19:00:52 GMT 2025	
	Diagnostic Status: No Diagnostics											
	Scientific Instruments: ACS/WFC											
	Special Requirements: ORIENT 198.5D TO 213.5 D											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures		
	(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false		Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.149 Line Spacing=		Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false		(1)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous			
	(1)	Q2343+125	RA: 23 46 27.2890 (356.6137042d) Dec: +12 48 7.50 (12.80208d) Equinox: J2000		Epoch of Position: 2000		V=17.5		Reference Frame: SIMBAD			
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=GALAXY Description=[QUASAR]											
Exposures	#	Label	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	F606w 2 orb it	(1) Q2343+125	ACS/WFC, ACCUM, WFC		F814W		POS TARG -1.5426 810976800902,-0.94 70887873046967	Pattern 2, Exps 1-1 in F814w - 3 orb (05) (2)	548 Secs X 3 (6103 Secs)		
										[==>481.0 Secs (Pattern 1,1, Copy 1)] [==>500.0 Secs (Pattern 1,1, Copy 2)] [==>500.0 Secs (Pattern 1,1, Copy 3)] [==>500.0 Secs (Pattern 1,2, Copy 1)]		[1]
										[==>518.0 Secs (Pattern 1,2, Copy 2)] [==>500.0 Secs (Pattern 1,2, Copy 3)] [==>541.0 Secs (Pattern 2,1, Copy 1)] [==>500.0 Secs (Pattern 2,1, Copy 2)]		[2]
										[==>541.0 Secs (Pattern 2,1, Copy 3)] [==>522.0 Secs (Pattern 2,2, Copy 1)] [==>500 Secs (Pattern 2,2, Copy 2)] [==>500 Secs (Pattern 2,2, Copy 3)]		[3]

Orbit 1

Server Version: 20241216



Orbit 2

Server Version: 20241216

