17462 - Evolution of an isolated shock-cloud interaction along the southeastern boundary of the Cygnus Loop supernova remnant

Cycle: 31, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Ravi Sankrit (PI) (Contact)	**Space Telescope Science Institute**
Dr. John Charles Raymond (CoI)	Smithsonian Institution Astrophysical Observatory
Dr. William P. Blair (CoI)	The Johns Hopkins University
Dr. Mitchell Revalski (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) CYGLOOP-SE-CLOUD	WFC3/UVIS	4	10-Jun-2024 11:00:45.0	yes
51	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS	4	10-Jun-2024 11:00:47.0	yes
52	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS	4	10-Jun-2024 11:00:48.0	yes

12 Total Orbits Used

ABSTRACT

We propose to use WFC3 narrowband imaging to obtain HST 2nd epoch H-alpha, [S II] and [O III] images of an isolated shock-cloud interaction in the Cygnus Loop that was previously observed in 1994 using WFPC2. The two sets of images separated by over 30 years will allow us to characterize the evolution of the shocked gas in great detail. Proper motions will be measured to an accuracy of better than 1.5 mas/yr. Thus, for well defined filaments and knots, the shock velocities will be determined based on the accurate GAIA-derived distance to the Cygnus Loop (725 +/- 15

pc) to within about 5 km/s. The differences in shock velocities along a filament and at different locations will allow us to estimate the variation in the pre-shock densities that exist within the cloud. Instabilities and shearing in the flow, or the development of turbulence will be seen as changes in the emission morphologies. The brightening of [O III] and [S II] emission relative to H-alpha will indicate that the recombination zone behind the shock front is getting stronger, and conversely the morphologies and brightnesses will remain more or less the same if the shock-front is moving in steady state. The long temporal baseline between observations combined with the high angular resolution of the HST instruments provides a powerful tool for analyzing the various physical processes that drive supernova remnant shock-cloud interactions.

OBSERVING DESCRIPTION

Three WFC3/UVIS filters, F656N, F673N and F502N will be used to image a single field in the Cygnus Loop supernova remnant in H-alpha, [S II] and [O III], respectively. The region to be observed is a shock-cloud interaction along the south-east perimeter of the remnant that has been imaged previously by WFPC2. We require all the exposures to be at the same orientation, and have specified them in a single four-orbit visit. For each exposure a standard dither pattern to cover the chip gap plus a sub-pattern to remove cosmic rays and bad pixels have been specified. We have also included a FLASH for each sub-exposure, as recommended.

Although the region of interest will be covered at any orientation, there are features near the edges of the field that are critical to include that may require the co-ordinates to be tweaked after the visits have been scheduled in the long-range plan. Once the target is scheduled we request the opportunity to update the target co-ordinates in the Phase II proposal before the visit executes.

Visit

Proposal 17462, CygLoopSE (01), failed

Mon Jun 10 15:00:49 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%

Diagnostics

(CygLoopSE (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=WFC3-UVIS-GAP-LINE Purpose=MOSAIC Number Of Points=2 Point Spacing=2.414 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.759 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=1.485 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	(1-3)

Fixed Targets

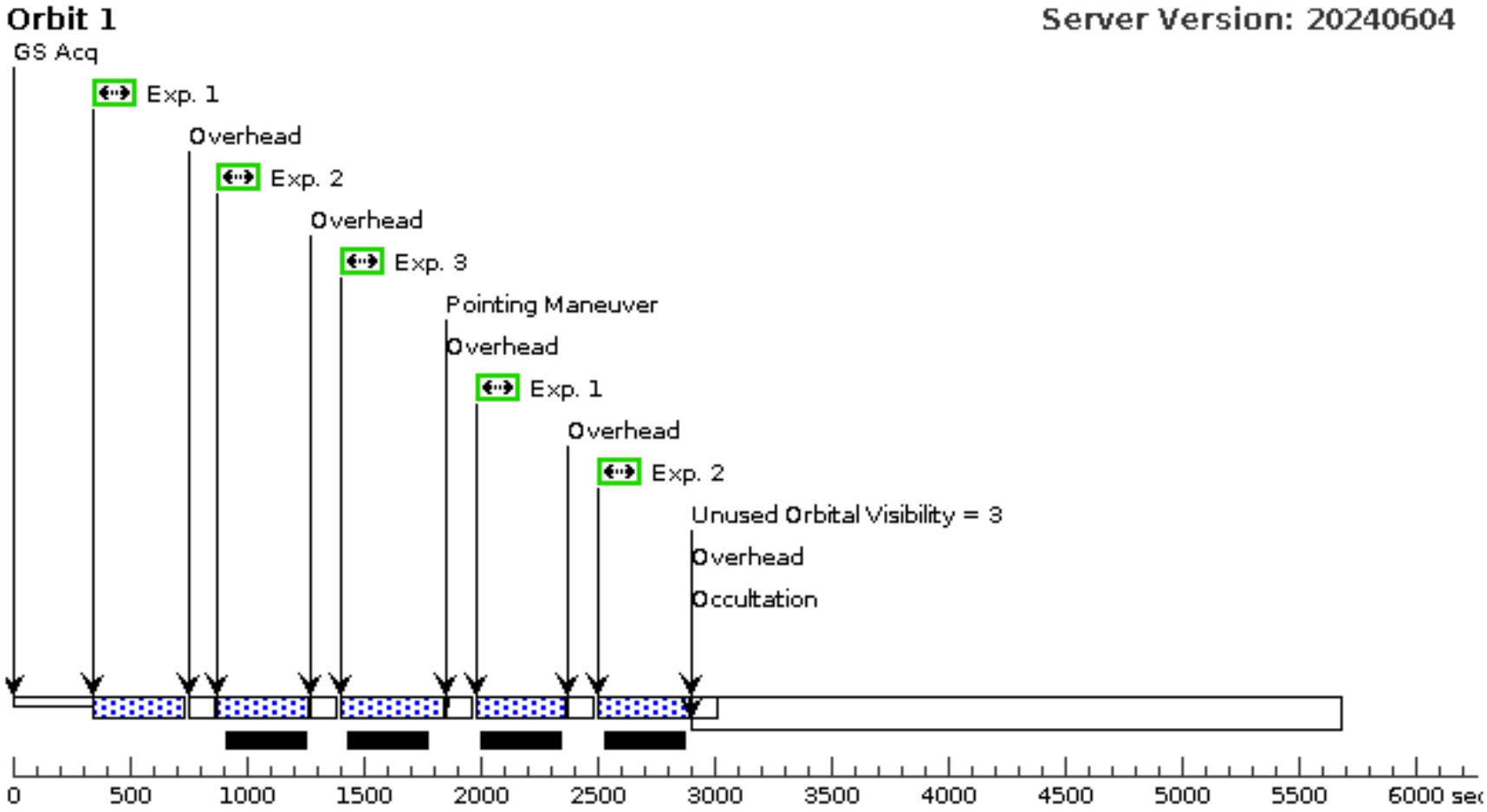
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CYGLOOP-SE-CLOUD	RA: 20 56 18.8000 (314.0783333d) Dec: +30 22 26.57 (30.37405d) Equinox: J2000		V=35+/-0 H-alpha surface brightness 6.0 + /- 0.5 E-15 erg/s/cm2/arcsec2	Reference Frame: ICRS

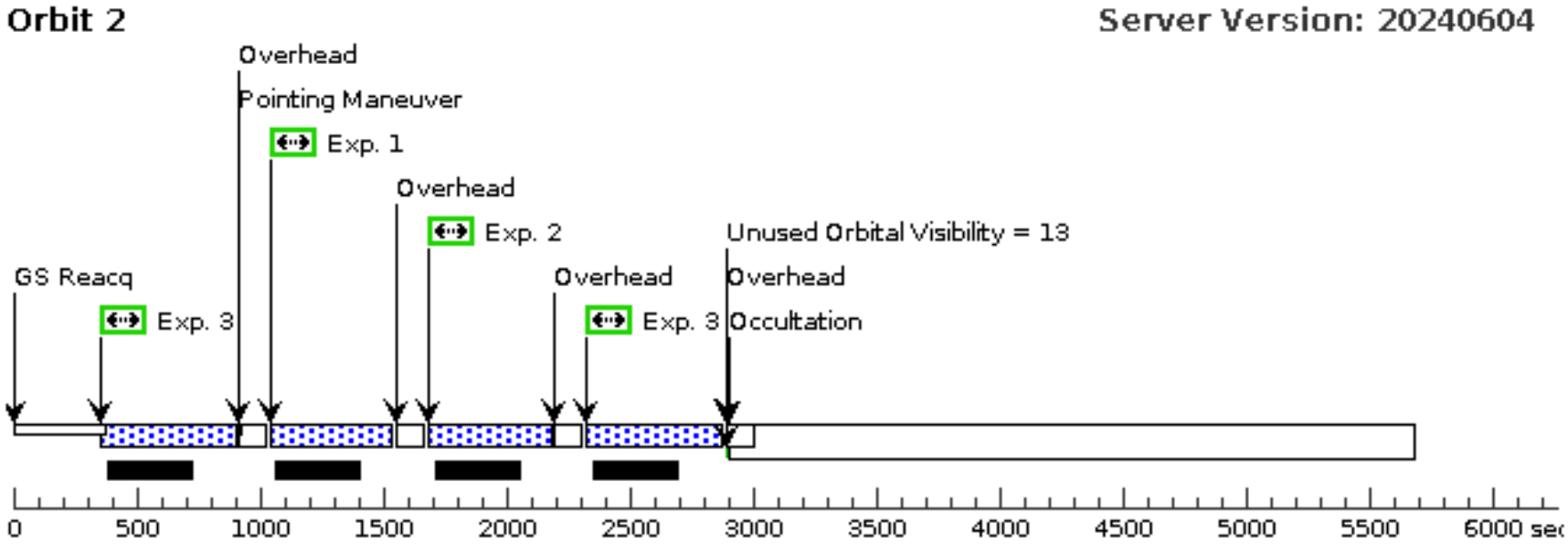
Comments:
Category=ISM
Description=[EMISSION LINE NEBULA, SHOCK FRONT, SNR]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F656N	(1) CYGLOOP-SE-CLOUD	WFC3/UVIS, ACCUM, UVIS-CENTER	F656N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (01) (1)	350 Secs (2408 Secs)	
								[==>363.0 Secs (Pattern 1,1)] *[==>363.0 Secs (Pattern 1,2)]*	***[1]***
								[==>480.0 Secs (Pattern 1,3)]	***[2]***
								[==>361.0 Secs (Pattern 2,1)] *[==>361.0 Secs (Pattern 2,2)]*	***[3]***
								[==>480.0 Secs (Pattern 2,3)]	***[4]***
2	F673N	(1) CYGLOOP-SE-CLOUD	WFC3/UVIS, ACCUM, UVIS-CENTER	F673N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (01) (1)	350 Secs (2408 Secs)	
								[==>363.0 Secs (Pattern 1,1)] *[==>363.0 Secs (Pattern 1,2)]*	***[1]***
								[==>480.0 Secs (Pattern 1,3)]	***[2]***
								[==>361.0 Secs (Pattern 2,1)] *[==>361.0 Secs (Pattern 2,2)]*	***[3]***
								[==>480.0 Secs (Pattern 2,3)]	***[4]***
3	F502N	(1) CYGLOOP-SE-CLOUD	WFC3/UVIS, ACCUM, UVIS-CENTER	F502N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (01) (1)	400 Secs (2944 Secs)	
								[==>413.0 Secs (Pattern 1,1)]	***[1]***
								[==>530.0 Secs (Pattern 1,2)] *[==>530.0 Secs (Pattern 1,3)]*	***[2]***
								[==>411.0 Secs (Pattern 2,1)]	***[3]***
								[==>530.0 Secs (Pattern 2,2)] *[==>530.0 Secs (Pattern 2,3)]*	***[4]***

Orbit Structure

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Pointing Maneuver
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Overhead
Exp. 2
Unused Orbital Visibility = 13
GS Reacq
Exp. 3
Overhead
Exp. 3
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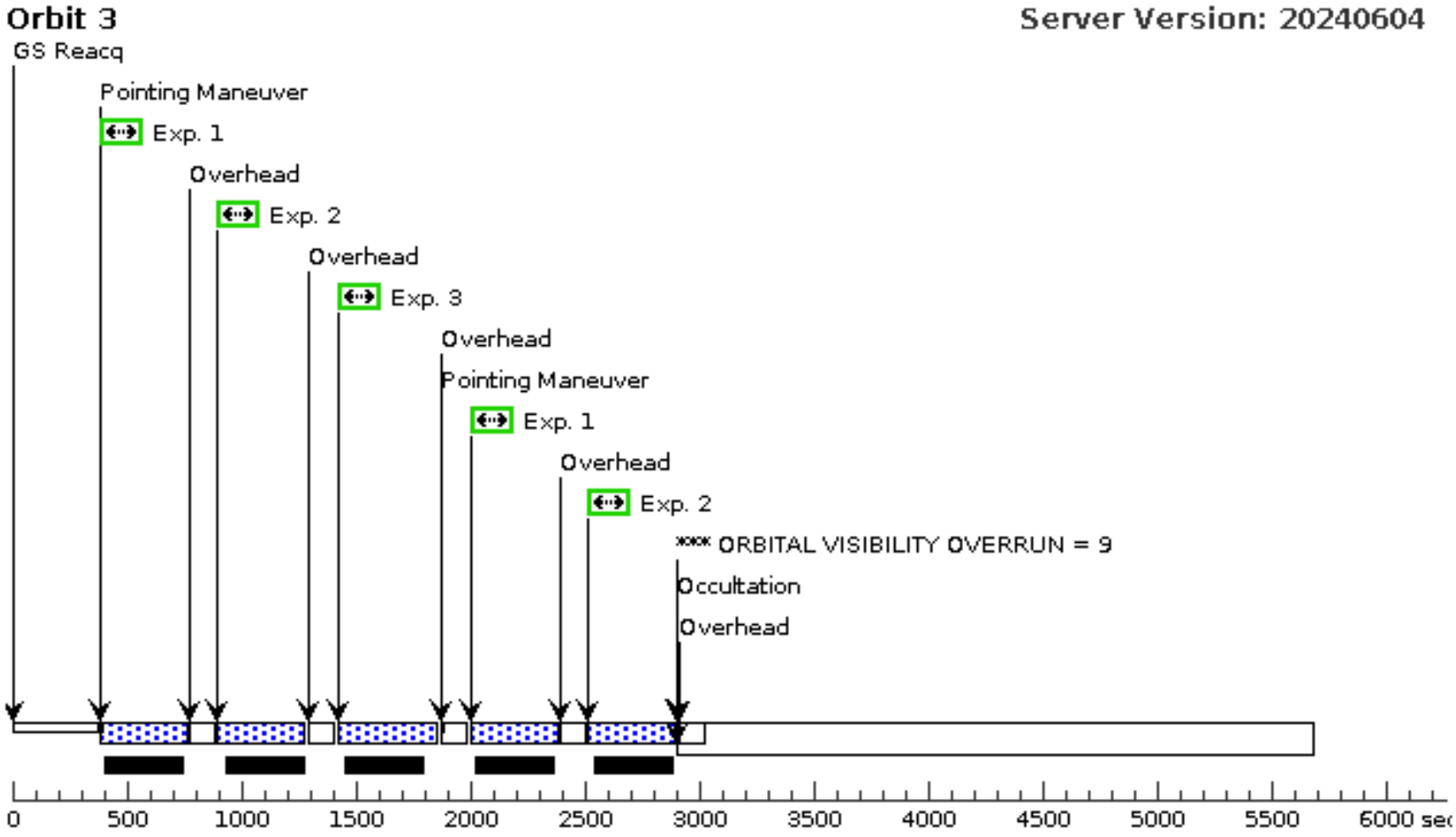
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Overhead
Pointing Maneuver
Exp. 1
Overhead
Exp. 2
*** ORBITAL VISIBILITY OVERRUN = 9
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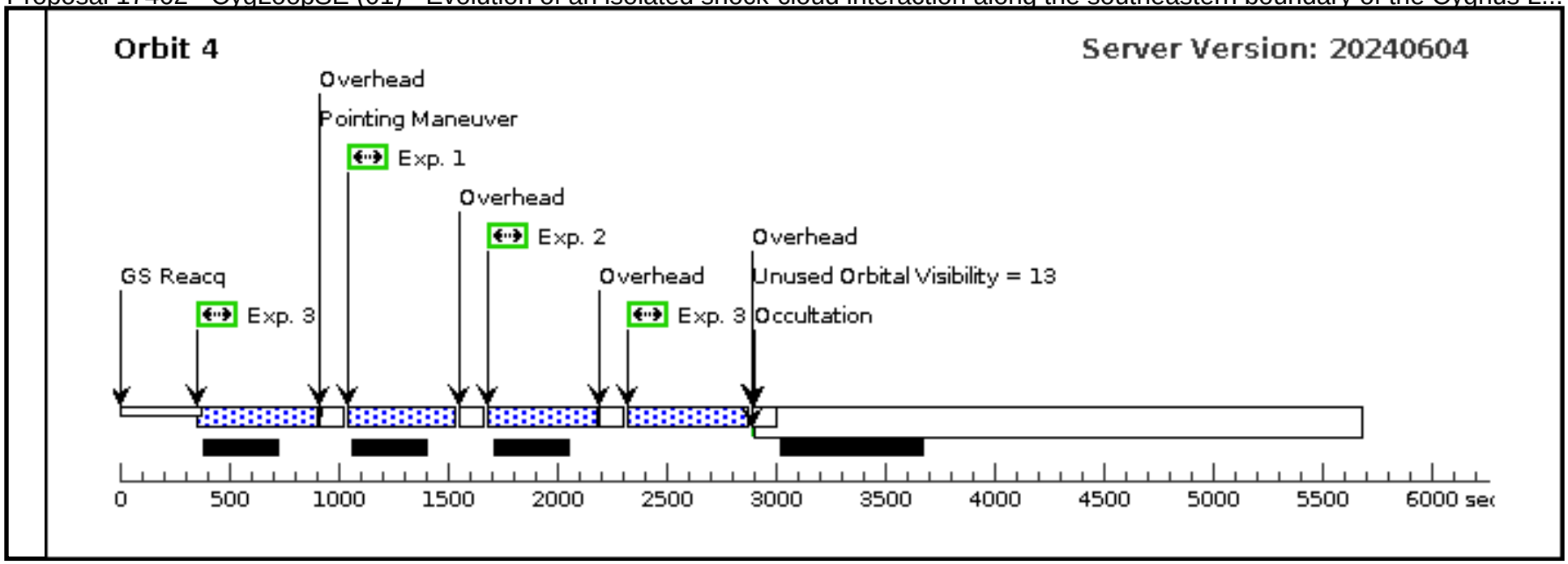
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Server Version: 20240604
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Pointing Maneuver
Exp. 1
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GS Reacq
Exp. 3
Overhead
Exp. 3
Unused Orbital Visibility = 13
Occultation
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Visit

Proposal 17462, CygLoopSE (51), failed Mon Jun 10 15:00:49 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%

Comments: HOPR repeat of visit 01.

Diagnostics

(CygLoopSE (51)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=WFC3-UVIS-GAP-LINE Purpose=MOSAIC Number Of Points=2 Point Spacing=2.414 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.759 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=1.485 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	(1-3)

Fixed Targets

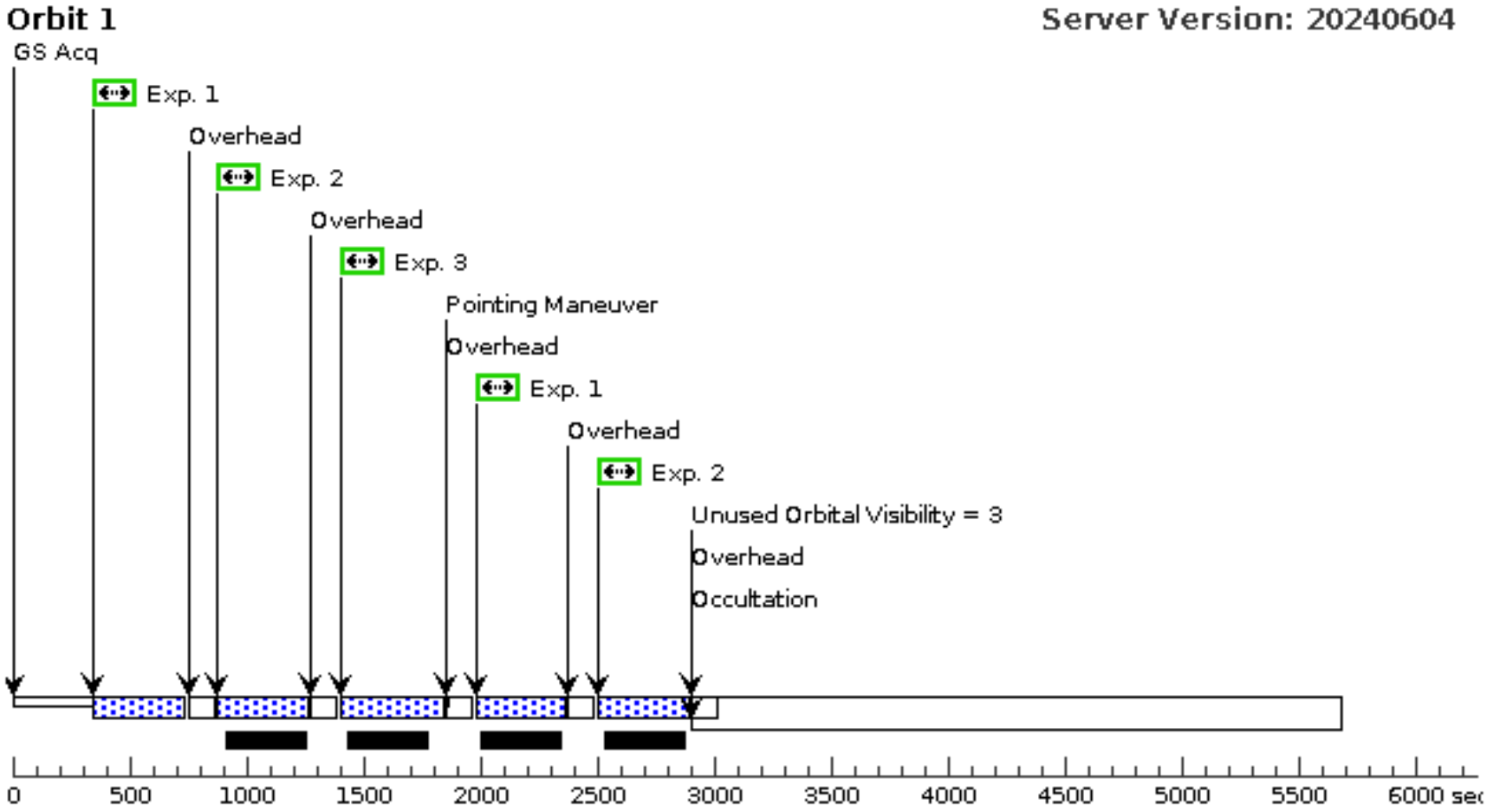
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CYGLOOP-SE-CLOUD-TWEAK	RA: 20 56 18.4601 (314.0769171d) Dec: +30 22 25.76 (30.37382d) Equinox: J2000		V=35+/-0 H-alpha surface brightness 6.0 + /- 0.5 E-15 erg/s/cm2/arcsec2	Reference Frame: ICRS

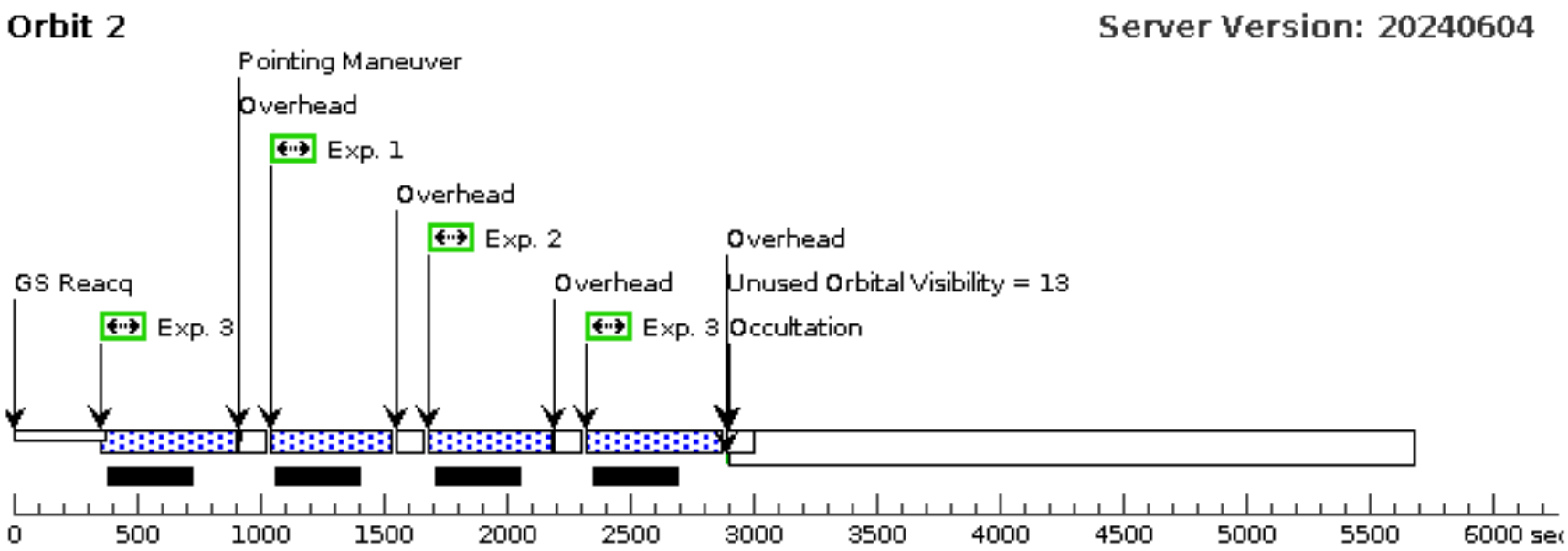
Comments:
Category=ISM
Description=[EMISSION LINE NEBULA, SHOCK FRONT, SNR]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F656N	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS, ACCUM, UVIS-CENTER	F656N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (51) (1)	350 Secs (2408 Secs)	
								[==>363.0 Secs (Pattern 1,1)] *[==>363.0 Secs (Pattern 1,2)]*	***[1]***
								[==>480.0 Secs (Pattern 1,3)]	***[2]***
								[==>361.0 Secs (Pattern 2,1)] *[==>361.0 Secs (Pattern 2,2)]*	***[3]***
								[==>480.0 Secs (Pattern 2,3)]	***[4]***
2	F673N	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS, ACCUM, UVIS-CENTER	F673N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (51) (1)	350 Secs (2408 Secs)	
								[==>363.0 Secs (Pattern 1,1)] *[==>363.0 Secs (Pattern 1,2)]*	***[1]***
								[==>480.0 Secs (Pattern 1,3)]	***[2]***
								[==>361.0 Secs (Pattern 2,1)] *[==>361.0 Secs (Pattern 2,2)]*	***[3]***
								[==>480.0 Secs (Pattern 2,3)]	***[4]***
3	F502N	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS, ACCUM, UVIS-CENTER	F502N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (51) (1)	400 Secs (2944 Secs)	
								[==>413.0 Secs (Pattern 1,1)]	***[1]***
								[==>530.0 Secs (Pattern 1,2)] *[==>530.0 Secs (Pattern 1,3)]*	***[2]***
								[==>411.0 Secs (Pattern 2,1)]	***[3]***
								[==>530.0 Secs (Pattern 2,2)] *[==>530.0 Secs (Pattern 2,3)]*	***[4]***

Orbit Structure

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Exp. 2
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GS Reacq
Exp. 3
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Exp. 3
Unused Orbital Visibility = 13
Occultation
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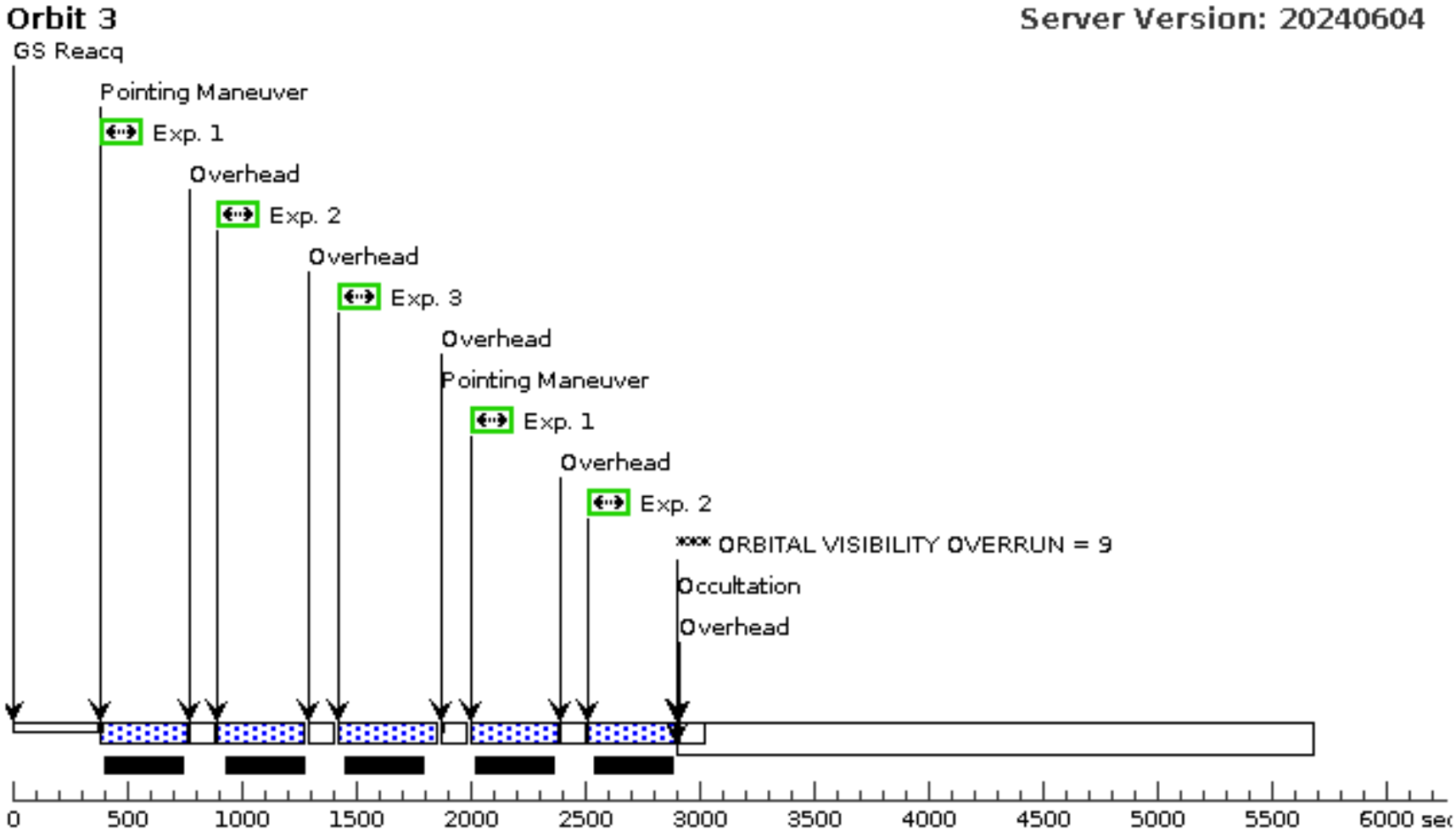
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Server Version: 20240604
GS Reacq
Pointing Maneuver
Exp. 1
Overhead
Exp. 2
Overhead
Exp. 3
Overhead
Pointing Maneuver
Exp. 1
Overhead
Exp. 2
*** ORBITAL VISIBILITY OVERRUN = 9
Occultation
Overhead
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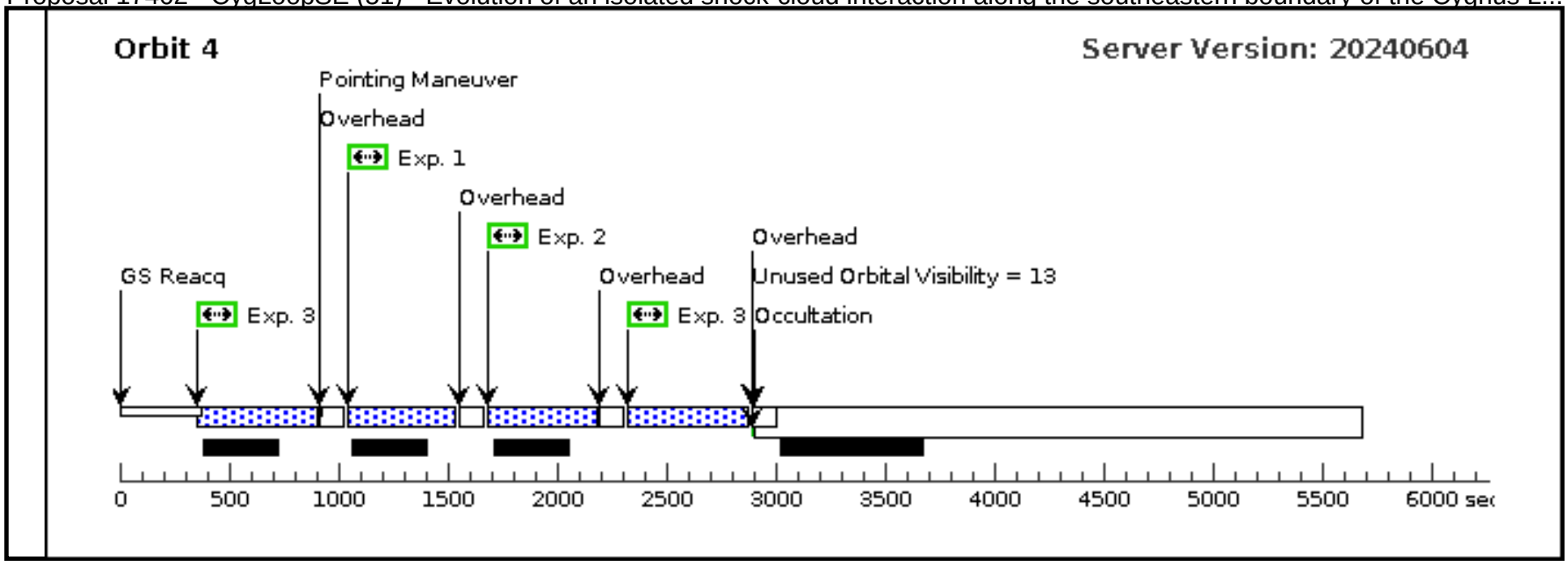
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Exp. 1
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Unused Orbital Visibility = 13
Occultation
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Visit

Proposal 17462, CygLoopSE (52), implementation Mon Jun 10 15:00:49 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%

Comments: HOPR repeat of visit 51.

Diagnostics

(CygLoopSE (52)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(1)	Pattern Type=WFC3-UVIS-GAP-LINE Purpose=MOSAIC Number Of Points=2 Point Spacing=2.414 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.759 Angle Between Sides= Center Pattern=true	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=1.485 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	(1-3)

Fixed Targets

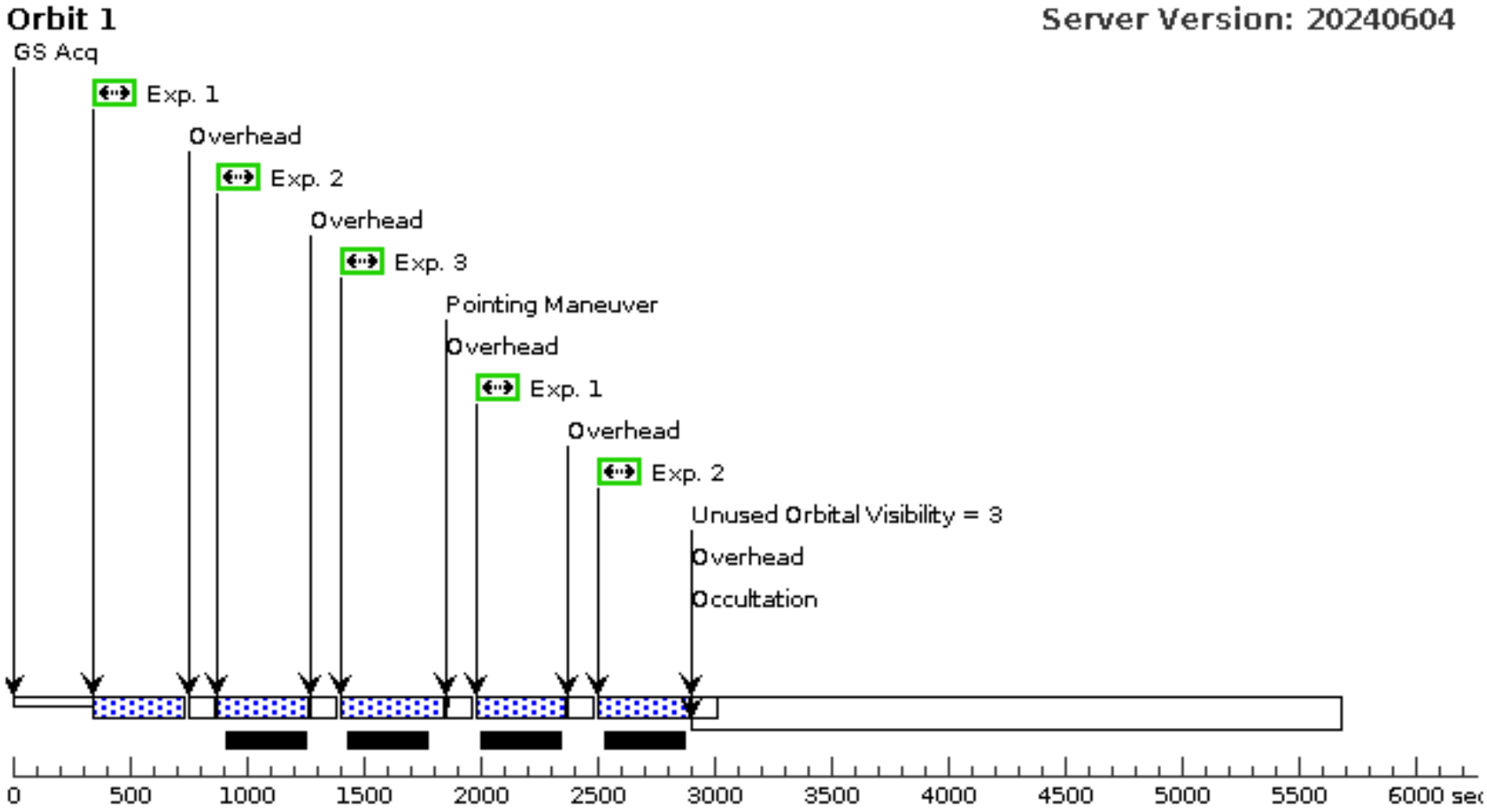
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	CYGLOOP-SE-CLOUD-TWEAK	RA: 20 56 18.4601 (314.0769171d) Dec: +30 22 25.76 (30.37382d) Equinox: J2000		V=35+/-0 H-alpha surface brightness 6.0 + /- 0.5 E-15 erg/s/cm2/arcsec2	Reference Frame: ICRS

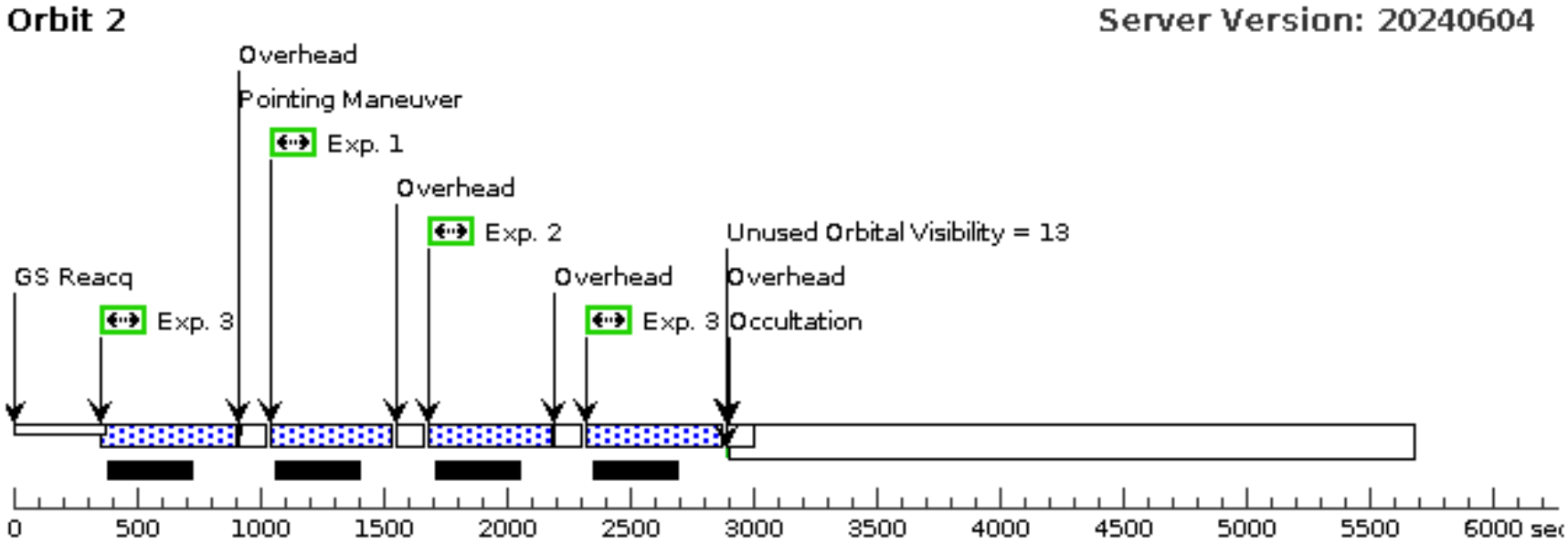
Comments:
Category=ISM
Description=[EMISSION LINE NEBULA, SHOCK FRONT, SNR]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F656N	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS, ACCUM, UVIS-CENTER	F656N	FLASH=20	GS ACQ SCENARIO BASE1O3	Pattern 1, Exps 1-3 in CygLoopSE (52) (1)	350 Secs (2408 Secs)	
								[==>363.0 Secs (Pattern 1,1)] *[==>363.0 Secs (Pattern 1,2)]*	***[1]***
								[==>480.0 Secs (Pattern 1,3)]	***[2]***
								[==>361.0 Secs (Pattern 2,1)] *[==>361.0 Secs (Pattern 2,2)]*	***[3]***
								[==>480.0 Secs (Pattern 2,3)]	***[4]***
2	F673N	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS, ACCUM, UVIS-CENTER	F673N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (52) (1)	350 Secs (2408 Secs)	
								[==>363.0 Secs (Pattern 1,1)] *[==>363.0 Secs (Pattern 1,2)]*	***[1]***
								[==>480.0 Secs (Pattern 1,3)]	***[2]***
								[==>361.0 Secs (Pattern 2,1)] *[==>361.0 Secs (Pattern 2,2)]*	***[3]***
								[==>480.0 Secs (Pattern 2,3)]	***[4]***
3	F502N	(2) CYGLOOP-SE-CLOUD-TWEAK	WFC3/UVIS, ACCUM, UVIS-CENTER	F502N	FLASH=20		Pattern 1, Exps 1-3 in CygLoopSE (52) (1)	400 Secs (2944 Secs)	
								[==>413.0 Secs (Pattern 1,1)]	***[1]***
								[==>530.0 Secs (Pattern 1,2)] *[==>530.0 Secs (Pattern 1,3)]*	***[2]***
								[==>411.0 Secs (Pattern 2,1)]	***[3]***
								[==>530.0 Secs (Pattern 2,2)] *[==>530.0 Secs (Pattern 2,3)]*	***[4]***

Orbit Structure

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Overhead
Exp. 2
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GS Reacq
Exp. 3
Overhead
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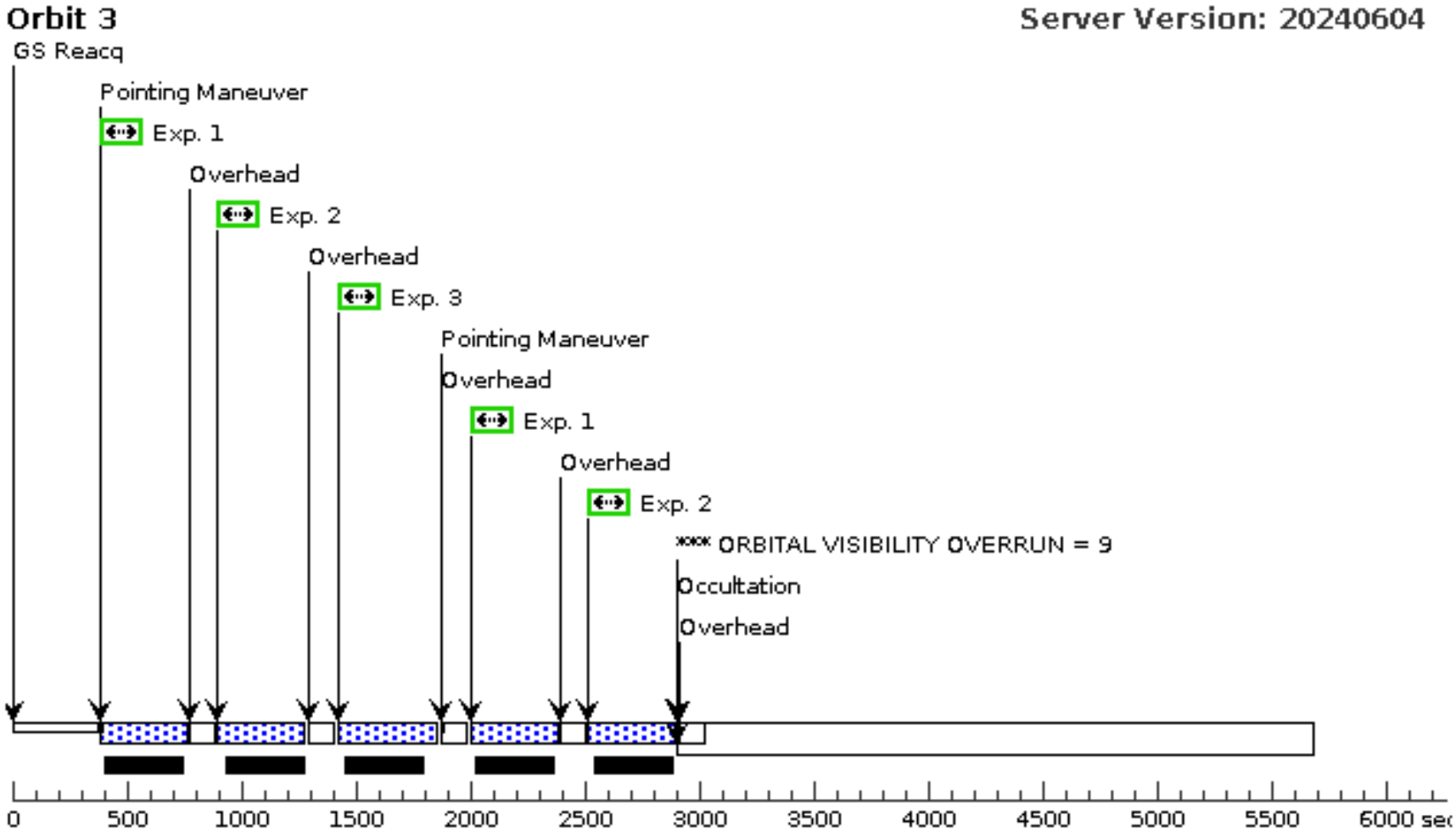
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Exp. 3
Pointing Maneuver
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Exp. 1
Overhead
Exp. 2
*** ORBITAL VISIBILITY OVERRUN = 9
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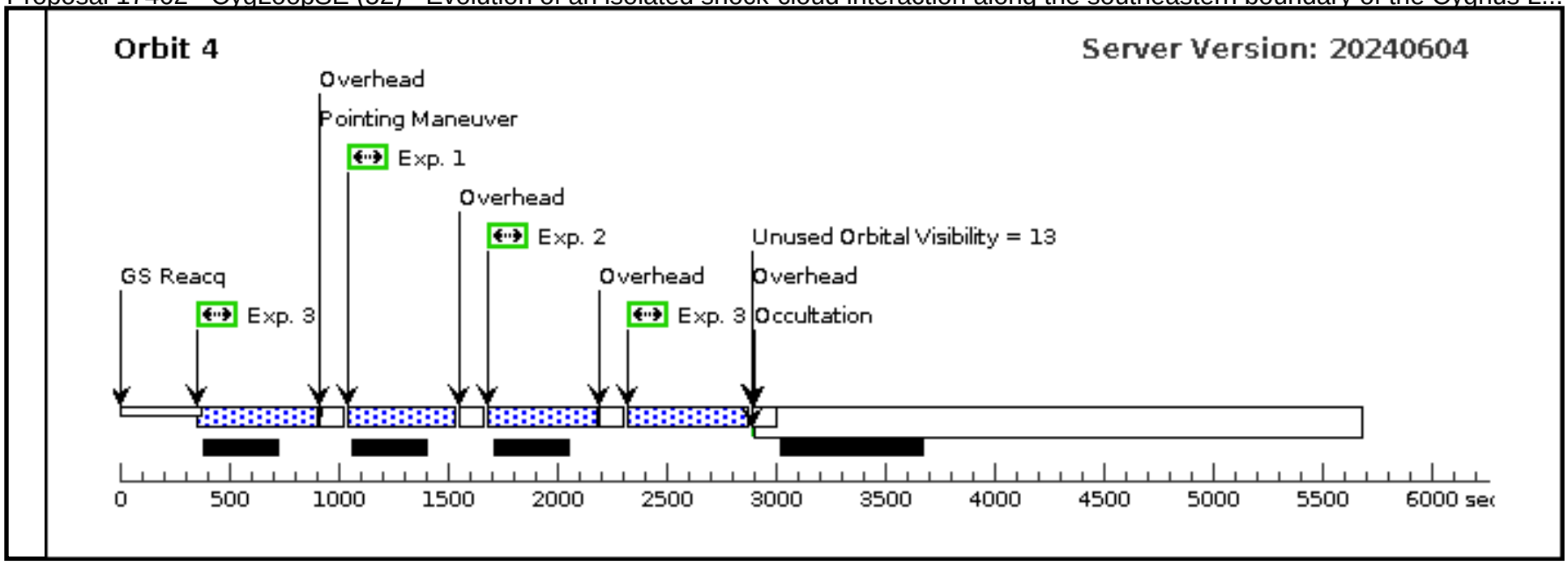
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Exp. 3
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Occultation
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