17452 - Lyman-alpha emission in low-mass compact galaxies with most extreme [OIII]5007/[OII]3727 ratios of above 30

Cycle: 31, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Yuri I. Izotov (PI) (Contact)	**Ukrainian National Academy of Sciences, BITP**
Dr. Natalia G. Guseva (CoI)	Ukrainian National Academy of Sciences, BITP
Prof. Daniel Schaerer (CoI) (ESA Member)	University of Geneva, Department of Astronomy
Dr. Gabor Worseck (CoI) (ESA Member)	Private Company
Prof. Trinh Xuan Thuan (CoI) (AdminUSPI)	The University of Virginia
Prof. Anne Verhamme (CoI) (ESA Member)	University of Geneva, Department of Astronomy

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) J0827+3429	COS/FUV COS/NUV	5	01-Jul-2024 16:00:57.0	yes
02	(2) J1046+4047	COS/FUV COS/NUV	4	01-Jul-2024 16:00:58.0	yes
03	(3) J1300+3625	COS/FUV COS/NUV	4	01-Jul-2024 16:00:58.0	yes
04	(4) J1416+4645	COS/FUV COS/NUV	4	01-Jul-2024 16:00:59.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
05	(5) J1444+4840	COS/FUV COS/NUV	5	01-Jul-2024 16:01:00.0	yes

22 Total Orbits Used

ABSTRACT

Compact and low-mass star-forming galaxies (SFGs) at low redshifts are considered to be the likely nearby counterparts of the high-z star-forming dwarf galaxies thought to be responsible for the reionization of the Universe. We propose to observe with the HST/COS a sample of the five compact SFGs with the highest O32 = [OIII] 5007/[OII] 3727 ratio of 30 - 69 known in the local universe, to obtain medium-resolution spectra of the Ly-alpha emission line. These SFGs were selected from the Data Release 16 of the Sloan Digital Sky Survey to be very compact and to have very young starbursts (EW(Hbeta)>250A). Two SFGs are characterized by the extremely high [OIII]5007/[OII]3727 emission-line ratios of 57 and 69, indicating extreme ionization conditions in their HII regions. The Ly-alpha profiles in those medium resolution spectra will be used to indirectly estimate the escape fraction of the Lyman continuum and will provide important insight on the ISM and radiation field of the star-forming regions. Obtaining the rest-UV spectra of these five SFGs which will serve as templates for the analysis of spectra of high-z dwarf galaxies with active star formation, is thus both urgent and crucial for studies with the JWST and the largest ground-based facilities.

OBSERVING DESCRIPTION

The galaxies are faint and satisfy safety conditions for observing with the COS. Furthermore, there are no sources brighter than the COS safety limits in circular regions with the diameter of 43 arcsec centered on the selected galaxies. NUV acquisition images of the targets will be obtained with thestandard Mirror A and the ACQ/IMAGE mode to reach a S/N20 inside a 9x9 pixel box centered on the brightest part of the galaxy. The adopted GALEX NUV magnitudes were used to estimate exposure times. The angular galaxy radius is chosen to be 0.2", inside which most of the galaxy light is concentrated. The total time for acquisition is up to 120s+2x400s=920s per object (HST Primer manual), or third of orbit. As a bonus, the UV morphology of the selected objects will be studied with these images including the low-brightness component of the galaxy. For medium-resolution spectroscopy, the COS in combination with the G130M grating will be used to observe the Ly-alpha line. This resolution is required to resolve the Ly-alpha line profile and to measure features such as the velocity separations between different emission peaks which give the best estimate of the LyC escape fraction. The Ly-alpha emission-line profiles in the spectra of the proposed galaxies will be compared to those in LyC leaking galaxies and in Green Pea galaxies. The GALEX FUV magnitude is used to calculate for each object the required number of orbits to obtain a S/N > 5 for the continuum near Ly-alpha line, in the case of a 100-pixel binned spectrum. This S/N would be enough to obtain the Ly-alpha profile with a sufficient

accuracy for radiative transfer modeling and for deriving velocity separations between the peaks. For each target, 0.3 orbit for acquisition, and 3.7 or 4.7 orbits for the spectrum with the medium-resolution G130M grating are needed, totalling 4 or 5 orbits per object. A total of 22 orbits for 5 objects is requested.

We do not expect the large impact of reduced-gyro operations on our program because we do not request special orientation requirement for observing of our targets.

Visit

Proposal 17452, J0827+3429 (01), implementation Mon Jul 01 20:01:00 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

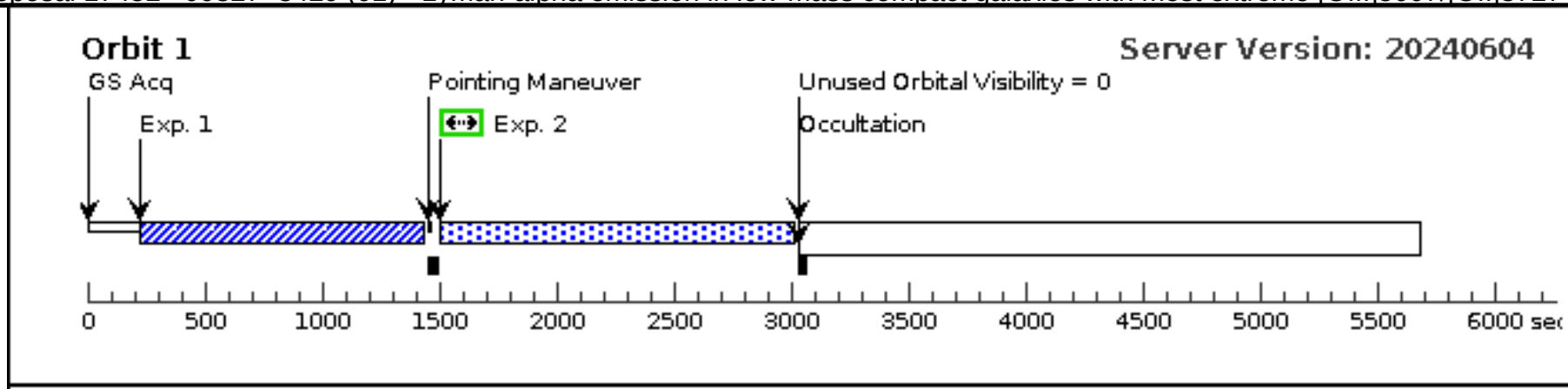
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J0827+3429	RA: 08 27 1.9700 (126.7582083d) Dec: +34 29 51.80 (34.49772d) Equinox: J2000	Redshift: 0.0856	V=21.52+/-0.05 FUV=22.30+/-0.30, NUV=22.59+/-0.43	Reference Frame: ICRS

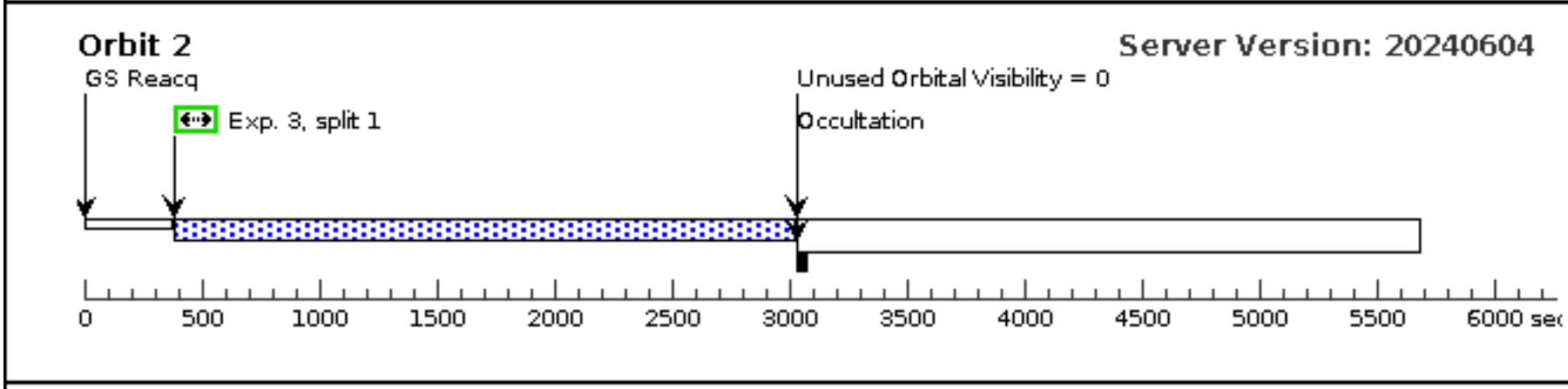
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STARBURST]
Extended=NO

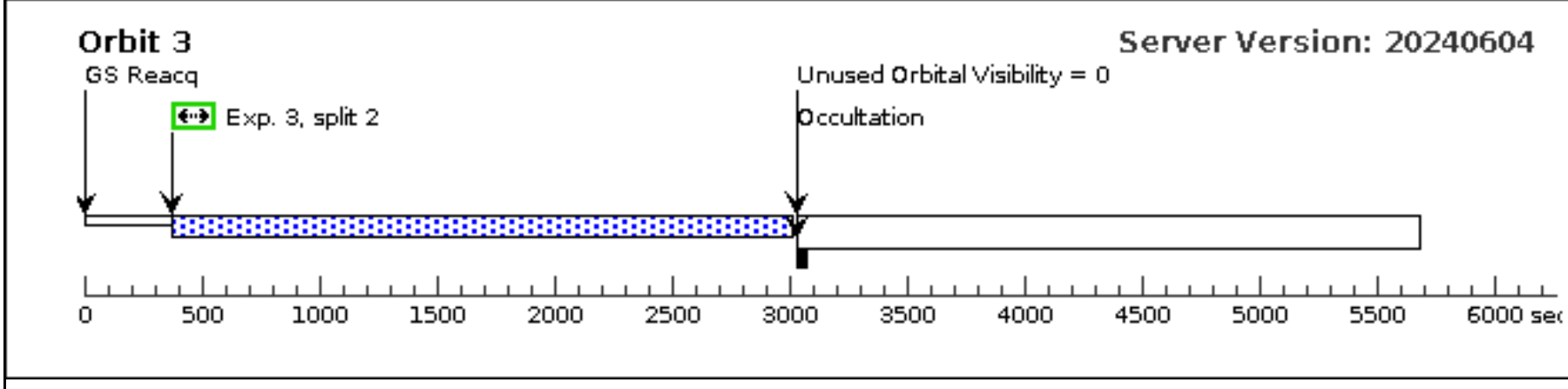
Exposures

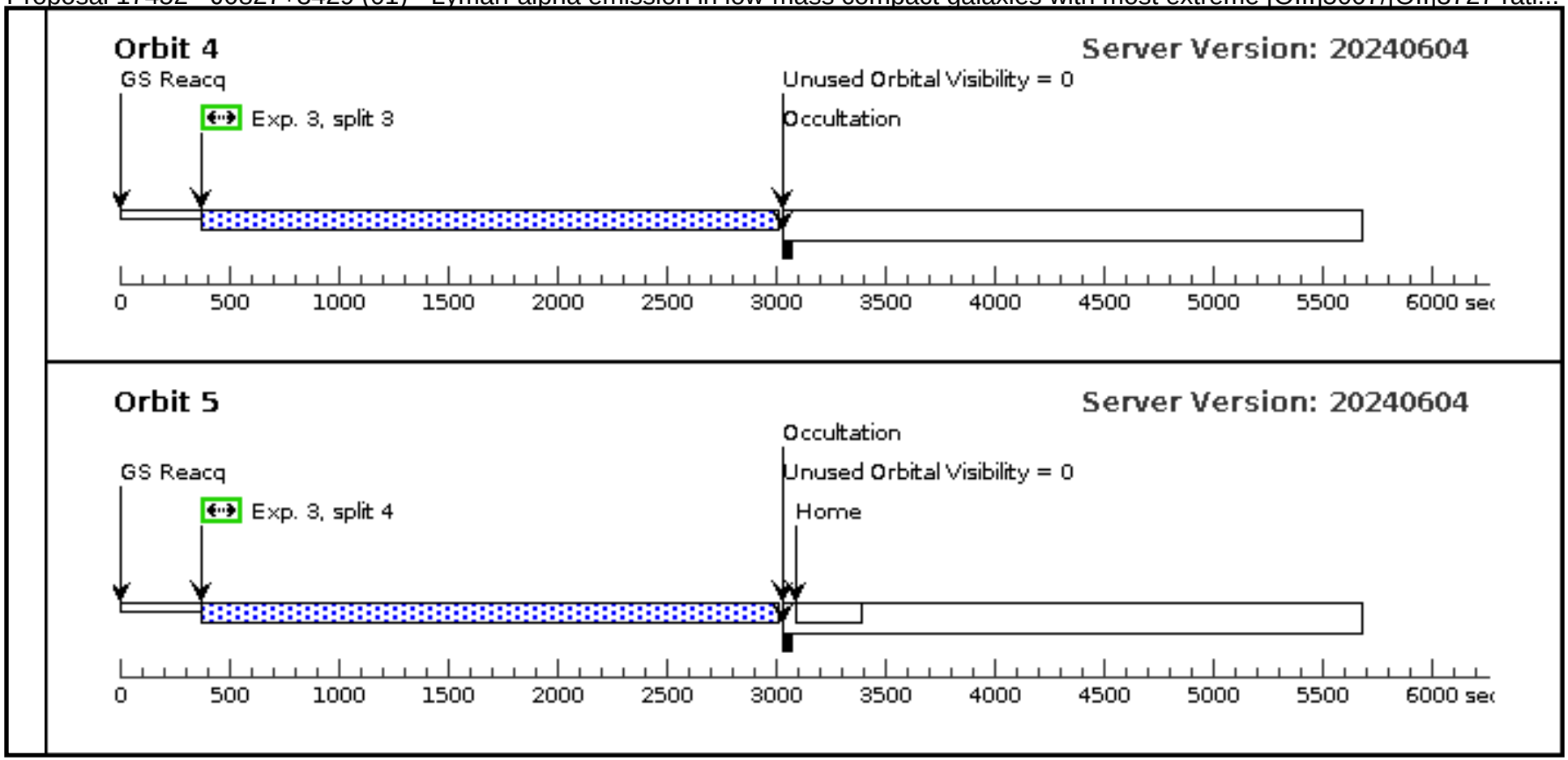
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J0827+3429 ACQ (COS.ta.1888064)	(1) J0827+3429	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				500 Secs (500 Secs) *[==>]*	 ***[1]***
2	J0827+3429 G130M1 (COS.sp.1888069)	(1) J0827+3429	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=9000.; FLASH=YES; FP-POS=1			1200 Secs (1327 Secs) *[==>1327.0 Secs]*	 ***[1]***
3	J0827+3429 G130M2 (COS.sp.1888069)	(1) J0827+3429	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=9000.; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			2200. Secs (10360 Secs) *[==>2590.0 Secs (Split 1)]* *[==>2590.0 Secs (Split 2)]* *[==>2590.0 Secs (Split 3)]* *[==>2590.0 Secs (Split 4)]*	 ***[2]*** ***[3]*** ***[4]*** ***[5]***

Orbit Structure





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3500
4000
4500
5000
5500
6000 sec
Orbit 5
Server Version: 20240604
Occultation
GS Reacq
Exp. 3, split 4
Unused Orbital Visibility = 0
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500
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1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17452, J1046+4047 (02), implementation Mon Jul 01 20:01:00 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

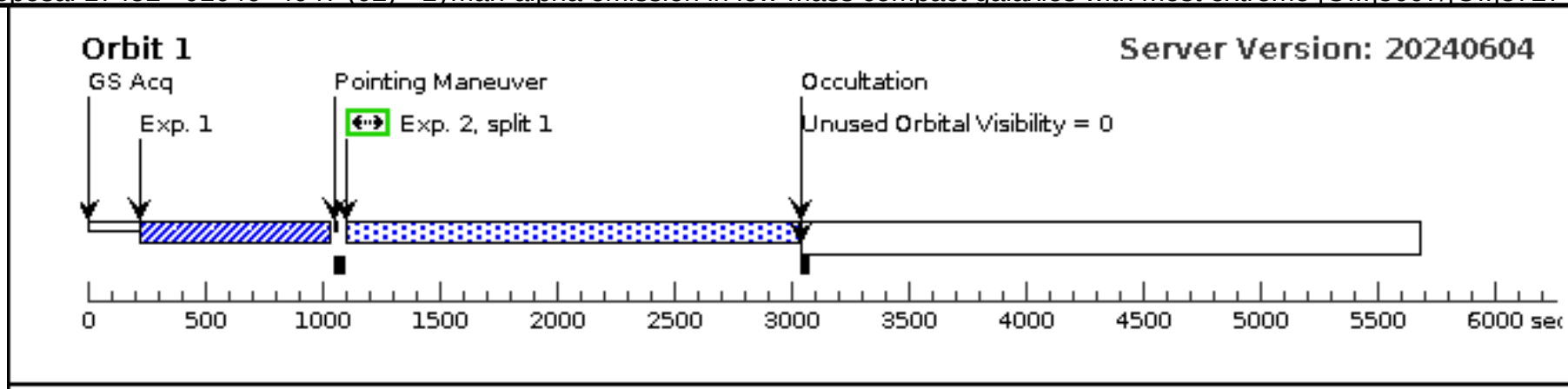
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J1046+4047	RA: 10 46 9.2300 (161.5384583d) Dec: +40 47 7.07 (40.78530d) Equinox: J2000	Redshift: 0.0487	V=20.18+/-0.02 FUV=20.27+/-0.24, NUV=21.19+/-0.28	Reference Frame: ICRS

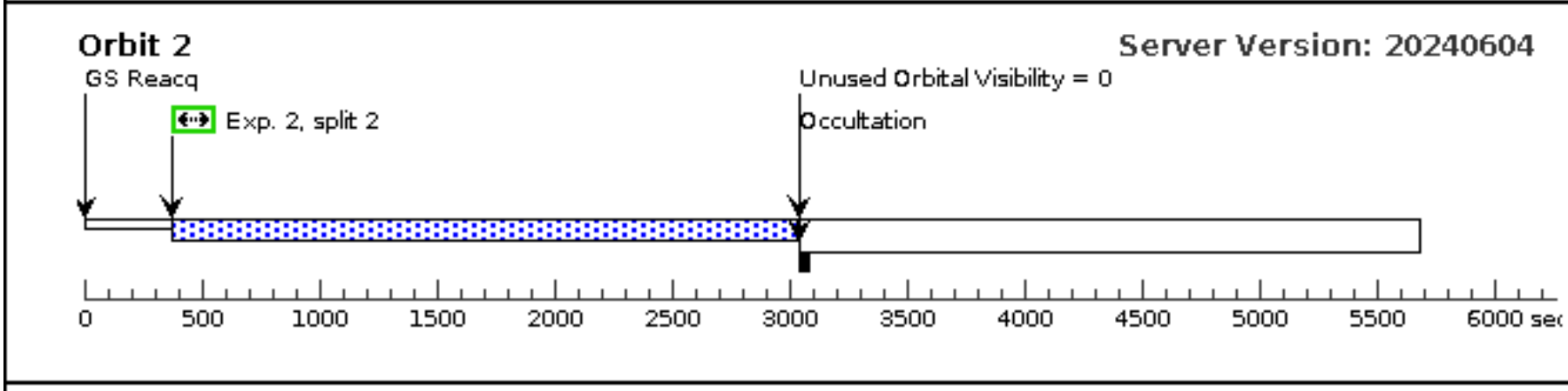
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STARBURST]
Extended=NO

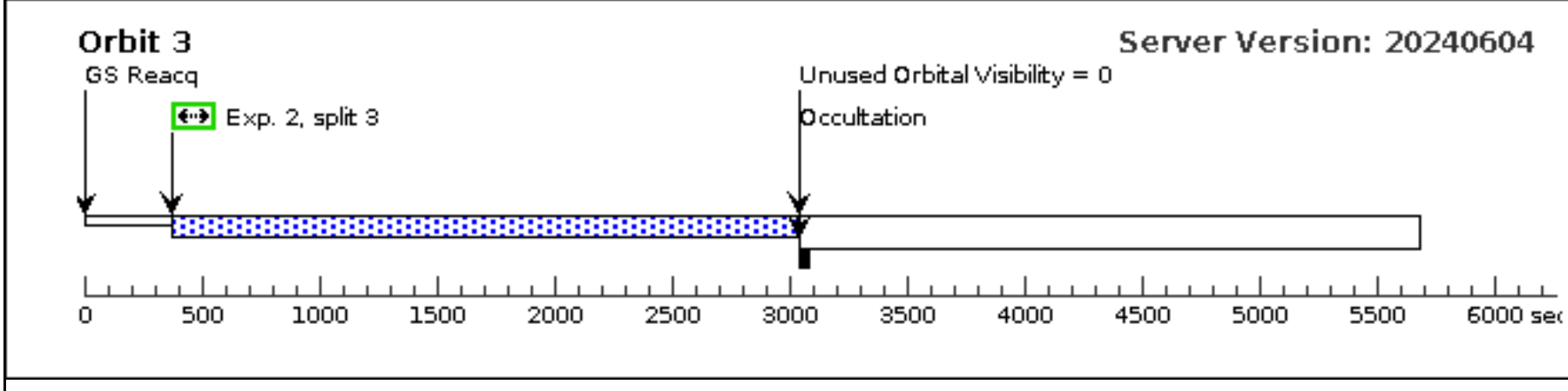
Exposures

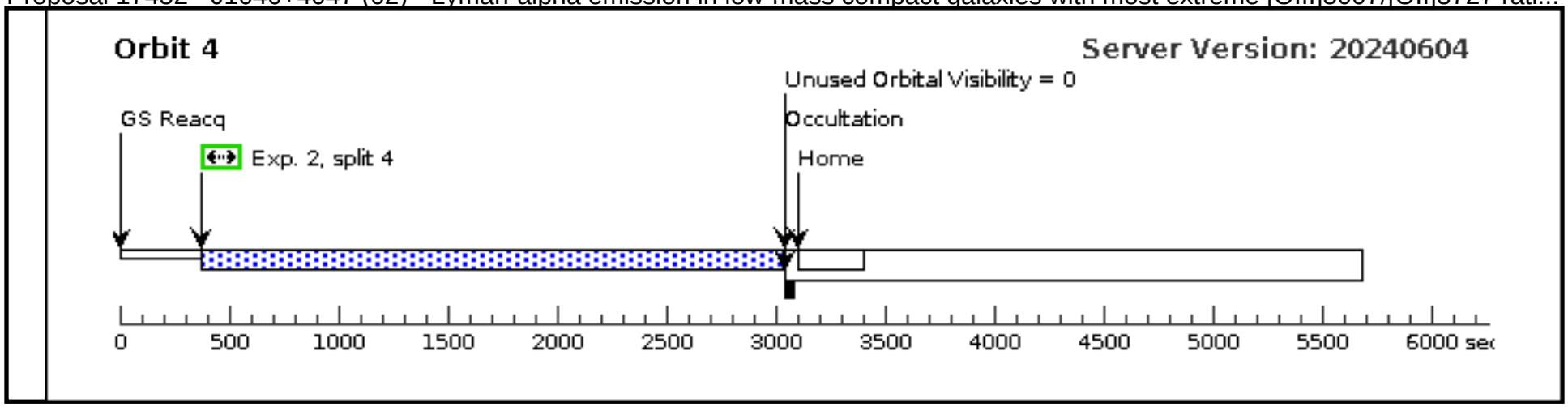
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1046+4047 ACQ (COS.ta.1888065)	(2) J1046+4047	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				300 Secs (300 Secs)	
								[==>]	***[1]***
2	J1046+4047 G130M (COS.sp.1888070)	(2) J1046+4047	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=9000.; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			2200 Secs (9557 Secs)	
								[==>1742.0 Secs (Split 1)]	***[1]***
								[==>2605.0 Secs (Split 2)]	***[2]***
								[==>2605.0 Secs (Split 3)]	***[3]***
								[==>2605.0 Secs (Split 4)]	***[4]***

Orbit Structure





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GS Reacq
Occultation
Exp. 2, split 4
Home
0
500
1000
1500
2000
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3000
3500
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4500
5000
5500
6000 sec

Visit

Proposal 17452, J1300+3625 (03), implementation Mon Jul 01 20:01:00 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

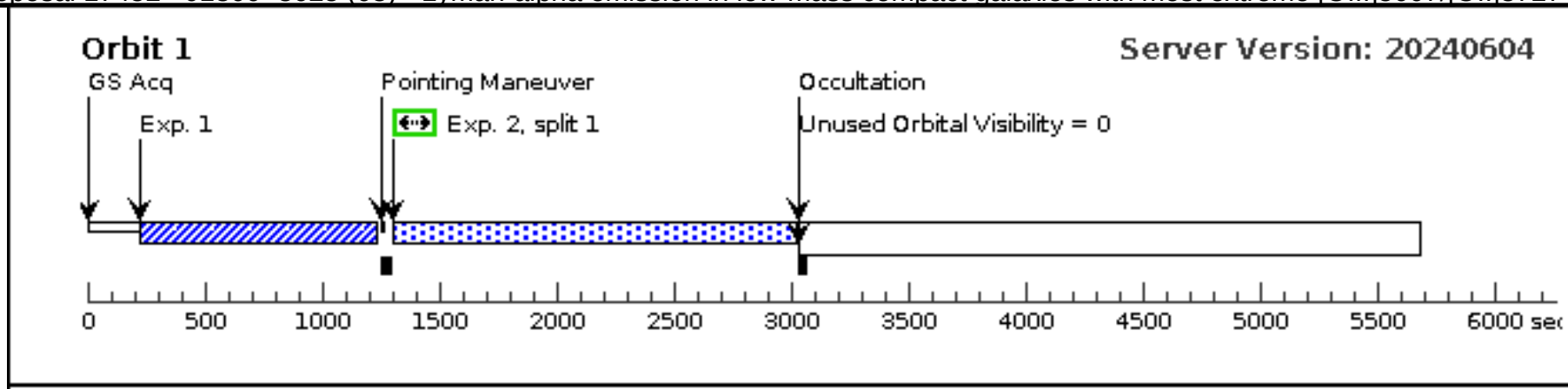
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	J1300+3625	RA: 13 00 37.7900 (195.1574583d) Dec: +36 25 51.27 (36.43091d) Equinox: J2000	Redshift: 0.0232	V=19.68+/-0.01 FUV=20.50+/-0.10, NUV=20.69+/-0.06	Reference Frame: ICRS

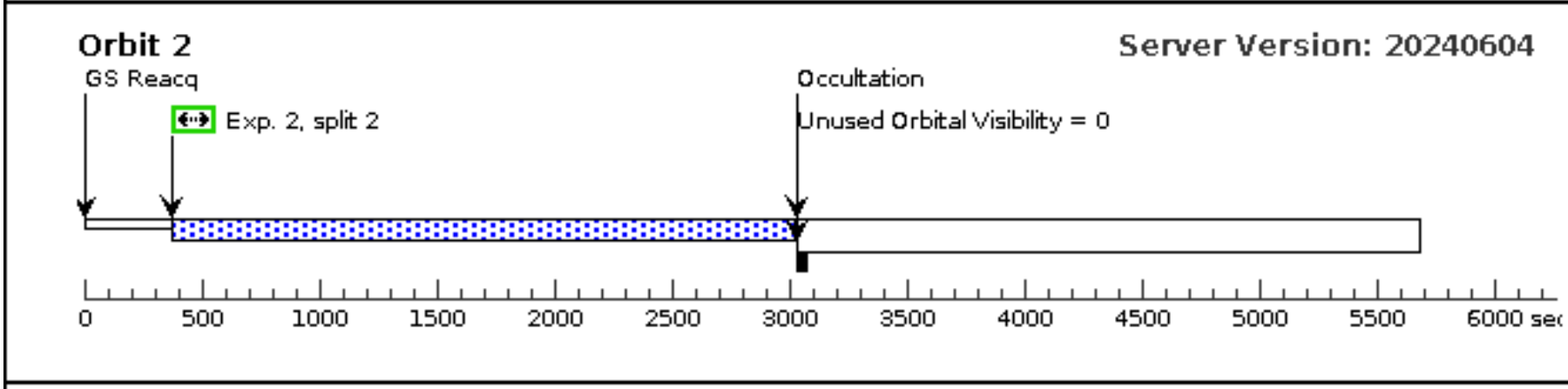
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STARBURST]
Extended=NO

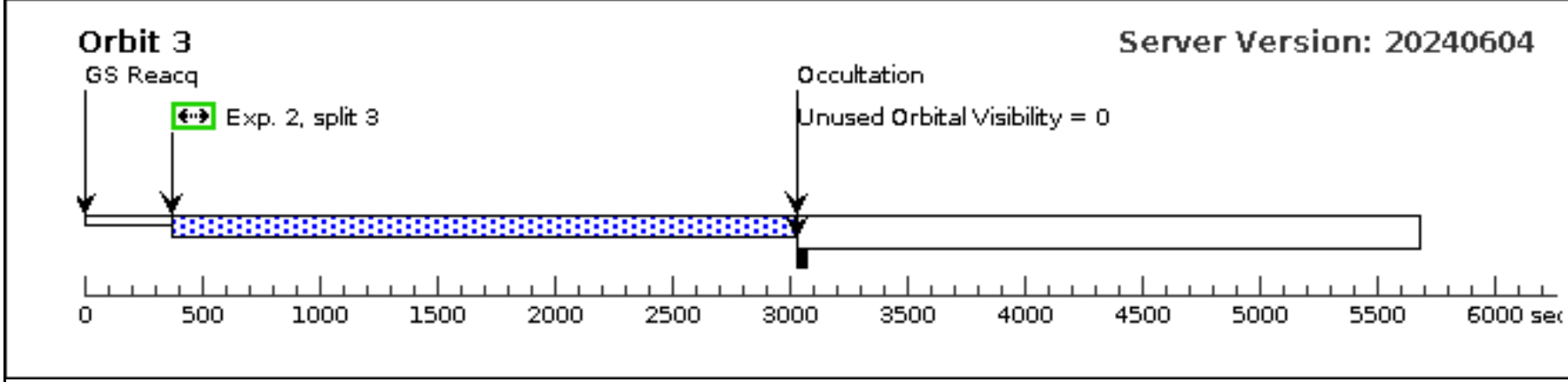
Exposures

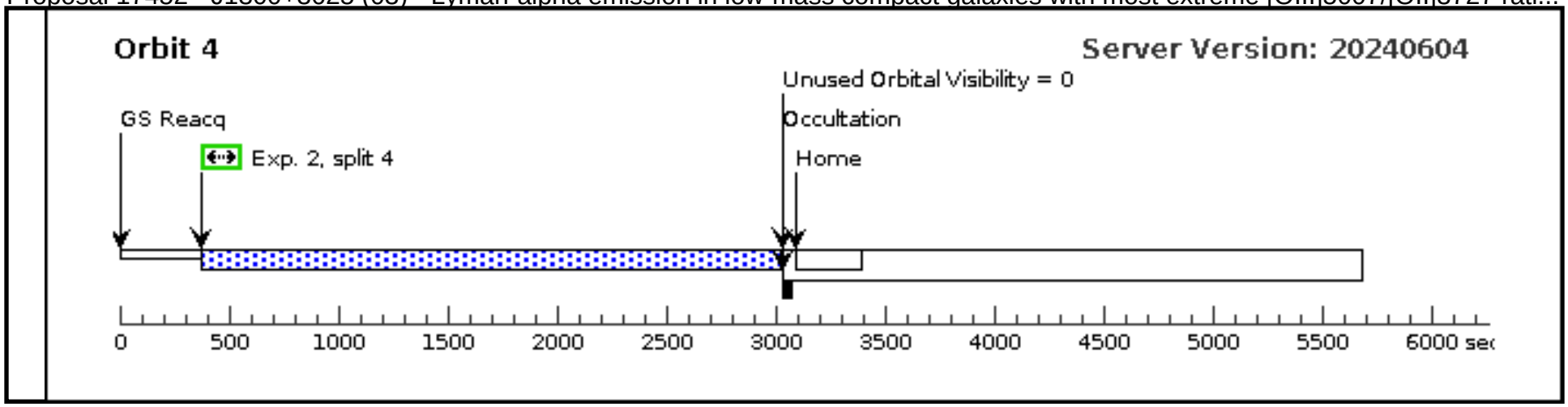
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1300+3625 ACQ (COS.ta.1888066)	(3) J1300+3625	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				400 Secs (400 Secs)	
								[==>]	***[1]***
2	J1300+3625 G130M (COS.sp.1888071)	(3) J1300+3625	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=9000.; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			2200 Secs (9317 Secs)	
								[==>1532.0 Secs (Split 1)]	***[1]***
								[==>2595.0 Secs (Split 2)]	***[2]***
								[==>2595.0 Secs (Split 3)]	***[3]***
								[==>2595.0 Secs (Split 4)]	***[4]***

Orbit Structure





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Occultation
Exp. 2, split 4
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6000 sec

Visit

Proposal 17452, J1416+4645 (04), implementation Mon Jul 01 20:01:00 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

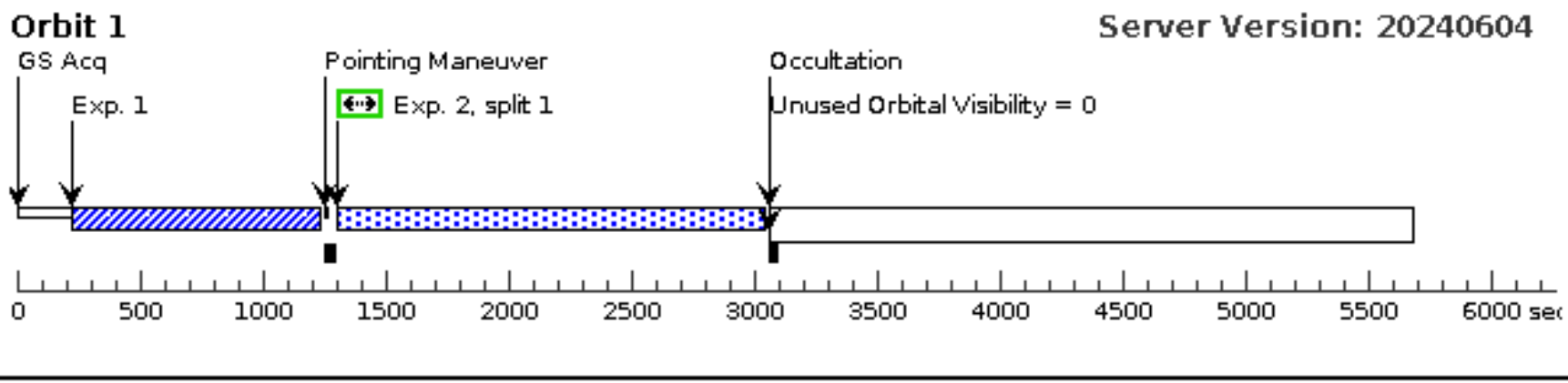
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	J1416+4645	RA: 14 16 8.3500 (214.0347917d) Dec: +46 45 13.36 (46.75371d) Equinox: J2000	Redshift: 0.0382	V=19.17+/-0.01 FUV=20.49+/-0.10, NUV=20.61+/-0.15 (No data in Galex database. FUV and NUV magnitudes are estimated from t he modeled spectral energy distri bution)	Reference Frame: ICRS

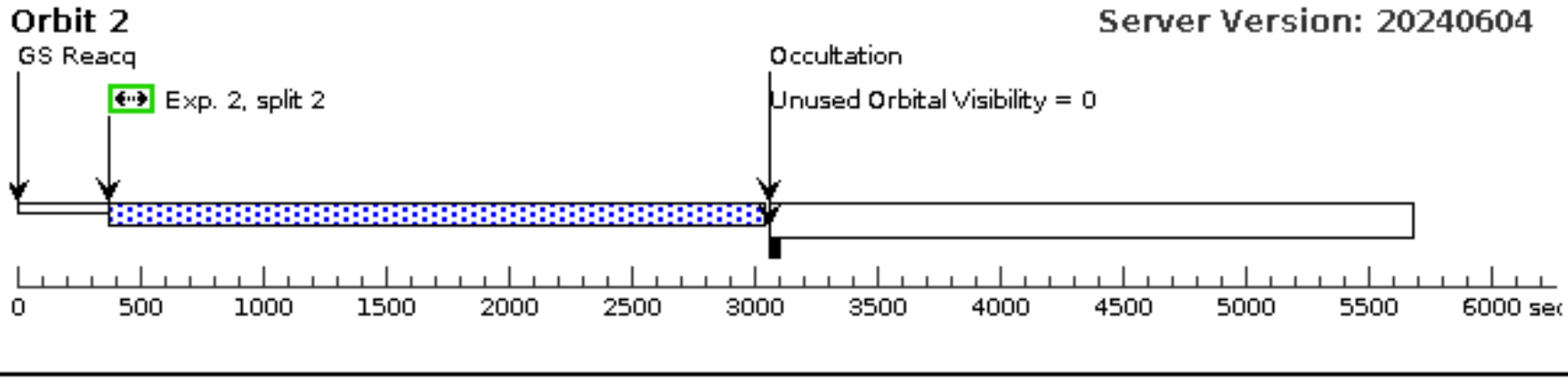
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STARBURST]
Extended=NO

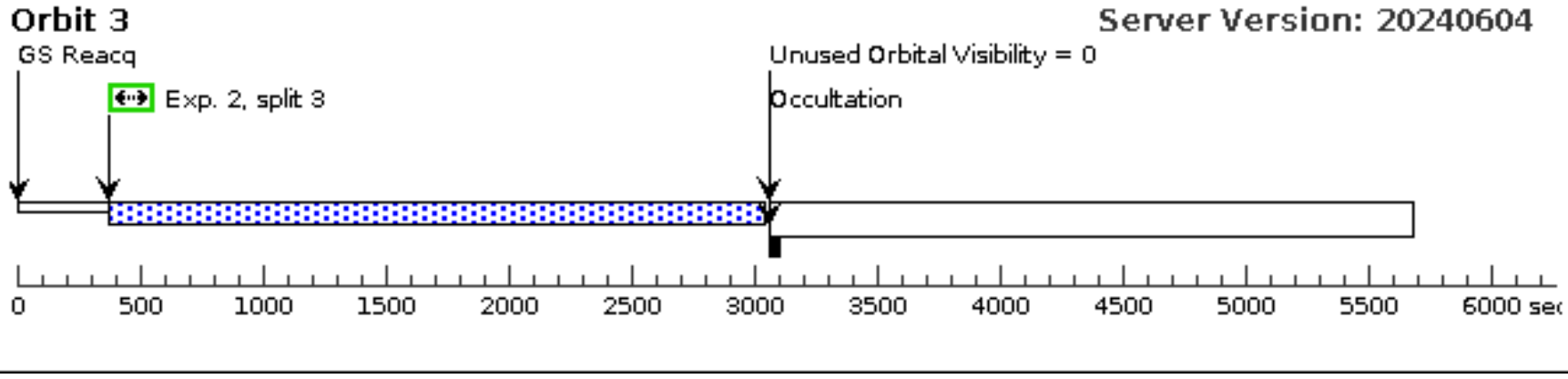
Exposures

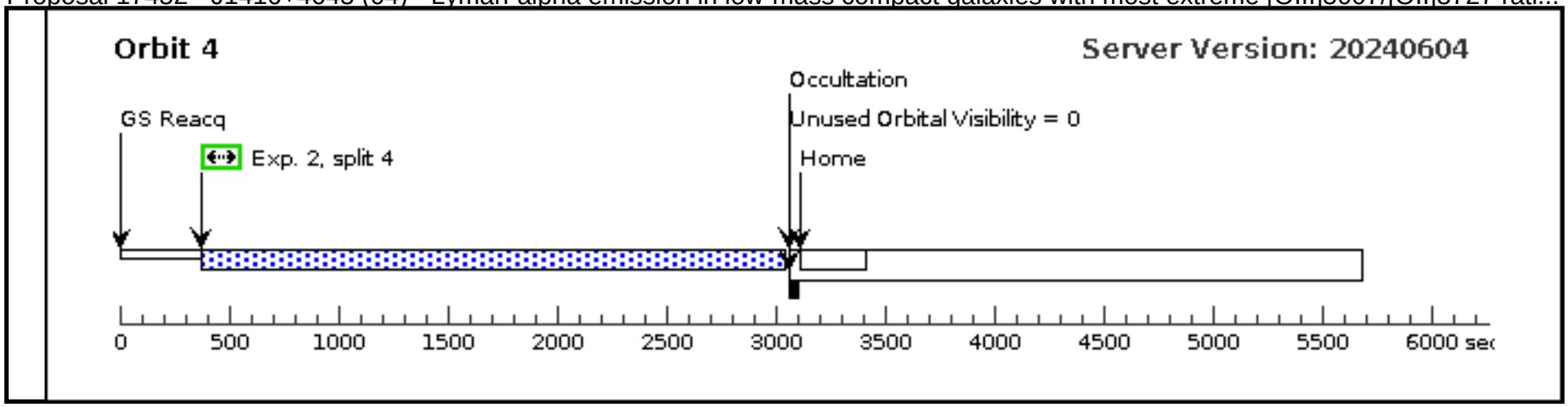
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1416+4645 ACQ (COS.ta.1888065)	(4) J1416+4645	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				400 Secs (400 Secs)	
								[==>]	***[1]***
2	J1416+4645 G130M (COS.sp.1888071)	(4) J1416+4645	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=9000.; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			2200 Secs (9409 Secs)	
								[==>1555.0 Secs (Split 1)]	***[1]***
								[==>2618.0 Secs (Split 2)]	***[2]***
								[==>2618.0 Secs (Split 3)]	***[3]***
								[==>2618.0 Secs (Split 4)]	***[4]***

Orbit Structure





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Occultation
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Exp. 2, split 4
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2000
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3500
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4500
5000
5500
6000 sec

Visit

Proposal 17452, J1444+4840 (05), implementation Mon Jul 01 20:01:00 GMT 2024

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	J1444+4840	RA: 14 44 59.0100 (221.2458750d) Dec: +48 40 6.83 (48.66856d) Equinox: J2000	Redshift: 0.0647	V=20.71+/-0.03 FUV=22.01+/-0.41, NUV=22.18+/-0.43	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STARBURST]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1444+4840 ACQ (COS.ta.1888064)	(5) J1444+4840	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				500 Secs (500 Secs)	
								[==>]	***[1]***
2	J1444+4840 G130M1 (COS.sp.1888069)	(5) J1444+4840	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=9000.; FLASH=YES; FP-POS=1; SEGMENT=BOTH			1200 Secs (1355 Secs)	
								[==>1355.0 Secs]	***[1]***
3	J1444+4840 G130M2 (COS.sp.1888069)	(5) J1444+4840	COS/FUV, TIME-TAG, PSA	G130M 1222 A	BUFFER-TIME=9000.; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			2200 Secs (10472 Secs)	
								[==>2618.0 Secs (Split 1)]	***[2]***
								[==>2618.0 Secs (Split 2)]	***[3]***
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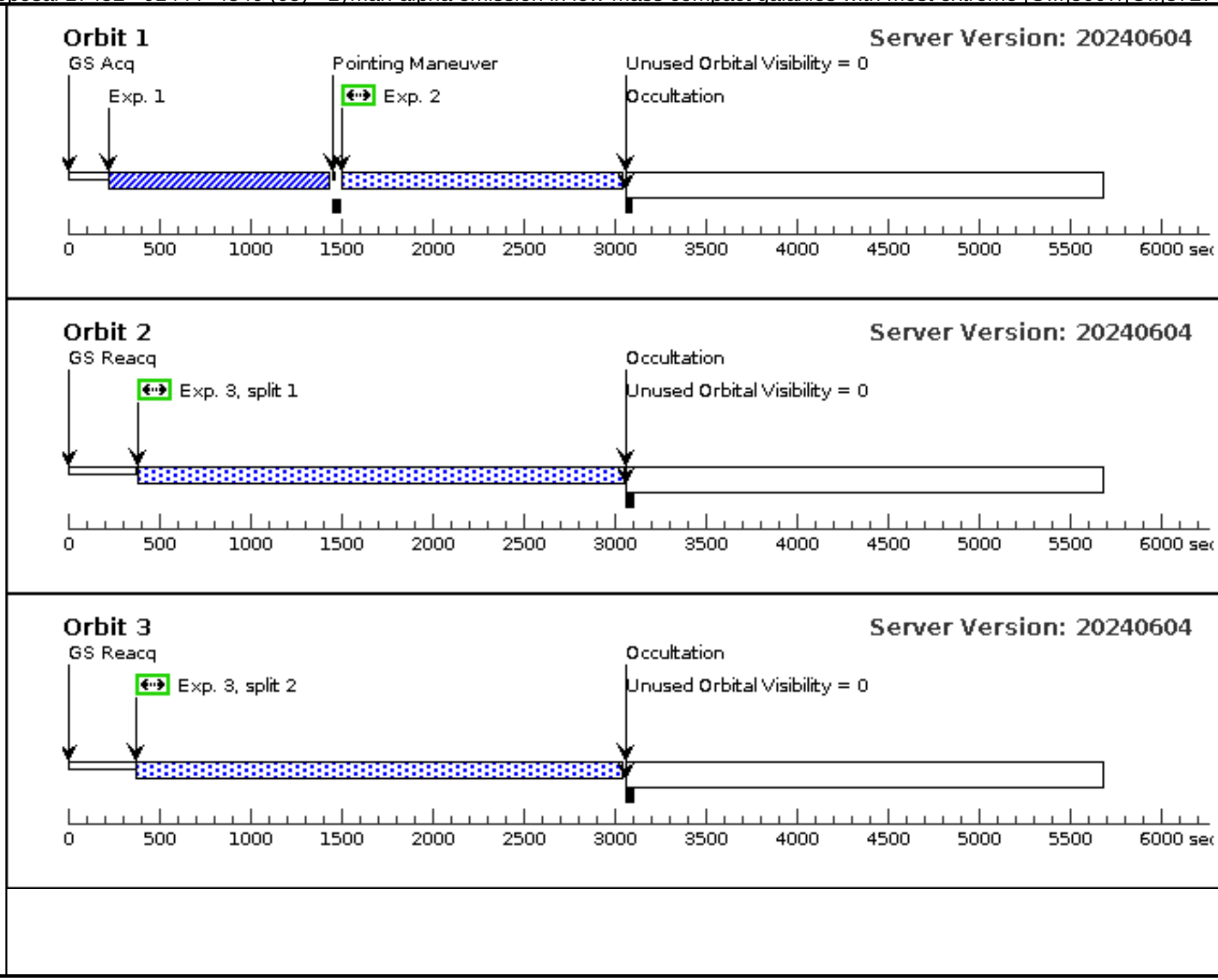
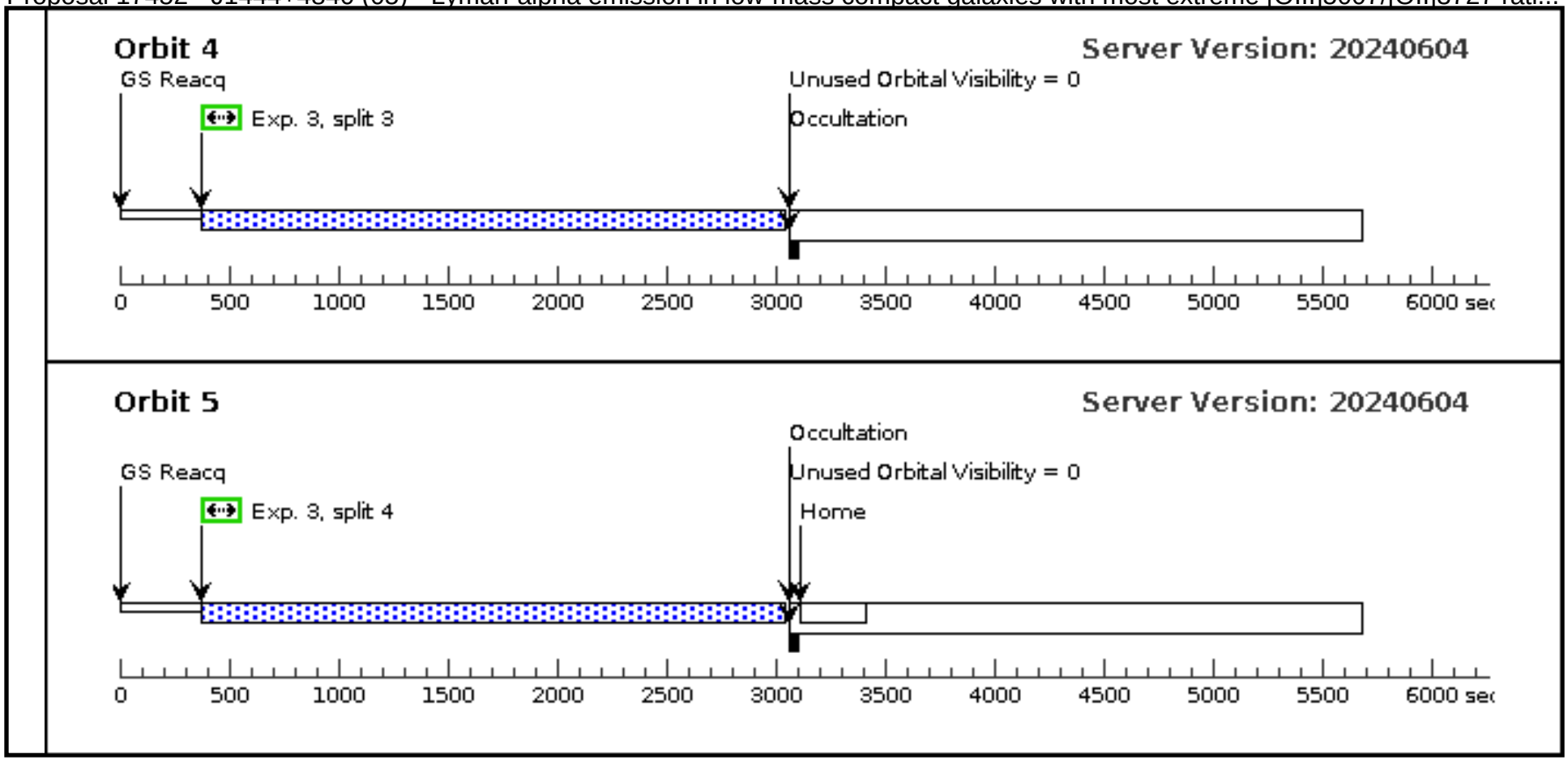
Orbit Structure

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Orbit 5
Server Version: 20240604
Occultation
GS Reacq
Exp. 3, split 4
Unused Orbital Visibility = 0
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