15845 - Deciphering Cosmic Reionization with Mg II Emission: Uncovering the most Promising Tracer of LyC Escape for JWST

Cycle: 27, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Yuri I. Izotov (PI) (Contact)	**Ukrainian National Academy of Sciences, BITP**	**yizotov@bitp.kiev.ua**
Dr. John Chisholm (CoI) (AdminUSPI) (Contact)	University of California - Santa Cruz	jochisho@ucsc.edu
Dr. Natalia G. Guseva (CoI)	Ukrainian National Academy of Sciences, BITP	nguseva@bitp.kiev.ua
Dr. Jason X. Prochaska (CoI)	University of California - Santa Cruz	xavier@ucolick.org
Prof. Daniel Schaerer (CoI) (ESA Member)	Observatoire de Geneve	daniel.schaerer@unige.ch
Dr. Gabor Worseck (CoI) (ESA Member)	Universitat Potsdam	gworseck@uni-potsdam.de

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) J0130-0014	COS/FUV COS/NUV	4	23-Jul-2019 09:00:14.0	yes
02	(2) J0141-0304	COS/FUV COS/NUV	4	23-Jul-2019 09:00:16.0	yes
03	(3) J0844+5312	COS/FUV COS/NUV	4	23-Jul-2019 09:00:18.0	yes
04	(4) J1014+5501	COS/FUV COS/NUV	4	23-Jul-2019 09:00:20.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
05	(5) J1046+5827	COS/FUV COS/NUV	2	23-Jul-2019 09:00:21.0	yes
06	(6) J1137+3605	COS/FUV COS/NUV	4	23-Jul-2019 09:00:22.0	yes
07	(7) J1157+5801	COS/FUV COS/NUV	4	23-Jul-2019 09:00:23.0	yes
08	(8) J1352+5617	COS/FUV COS/NUV	4	23-Jul-2019 09:00:25.0	yes

30 Total Orbits Used

ABSTRACT

The Universe was reionized at z~6, but it is unknown what sources instigated cosmic reionization. Theory argues that either accretion onto black holes or massive stars reionized the Universe. JWST and ELTs will soon usher in the needed observations to determine the sources of reionization, but the neutral high-z IGM precludes a direct detection of ionizing photons (LyC). Further, the community does not yet have a flawless method to indirectly infer the fraction of LyC that escapes star-forming galaxies. Without such a calibrated method, JWST will struggle to determine the source of reionization. Here we propose new HST/COS observations to directly measure the LyC emission from 8 galaxies drawn from the SDSS that have a diverse sample of Mg II emission properties. Mg II emission possesses many strengths that other indirect indicators do not; chiefly the Mg II escape fraction tentatively correlates with the LyC escape fraction. However, this tentative correlation is only with 6 local confirmed leakers. If confirmed by our proposed observations, JWST and ELTs will use this relation to infer the LyC escape fraction within the Epoch of Reionization. To aid in the interpretation of LyC transmission, we also propose Lyman-alpha observations to perform simultaneous radiative transfer simulations of Mg II and Lyman-alpha to provide vital physical context for why Mg II traces LyC escape. In total, we request 32 orbits to fully-develop the most promising proposed method for determining the LyC escape fraction during the Epoch of Reionization. These observations may be the key for JWST to accomplish one of its primary science goal: determining the source of cosmic reionization.

OBSERVING DESCRIPTION

We selected star-forming galaxies from the SDSS DR14 sample using the following criteria: (1) compact and similar angular sizes in the SDSS photometric bands to ensure the FUV light is within the 2.5" diameter COS aperture, (2) z > 0.3 to ensure that Mg II is within the SDSS bandpass and

the LyC is on the sensitive portion of the COS detector, (3) an Hbeta equivalent width greater than 100A and an [O III]/[O II] ratio >4 to select young stellar populations with intrinsically bright (i.e. observable) LyC, (4) no other bright galaxies within the COS safety limit, (5) no previous HST observations, (6) a representative and expansive range of observed Mg II/[O III] flux ratios to probe the full range of possible fesc(Mg II). The result of these selection criteria is a sample of 8 galaxies. None of these galaxies were previously observed or scheduled for observations with HST/COS. The galaxies are faint and satisfy safety conditions for observing with HST/COS. Furthermore, there are no sources brighter than the COS safety limits within a 43" diameter centered on the selected galaxies.

NUV acquisition images of the targets will be obtained with the standard Mirror A and the ACQ/IMAGE mode to reach a S/N~20 inside a 9x9 pixel box centered on the brightest part of the galaxy. The adopted GALEX NUV magnitudes were used to estimate exposure times. We also assumed that the galaxy light is concentrated within 0.4" in diameter, which is consistent with other Green Peas in the literature and is corresponding to the surface brightness NUV/0.4**2. The total estimated acquisition times vary in the range from 2x100s to 2x300s. However, keeping in mind that ETC estimates are uncertain for our type of objects (intermediate case between point-like and extended options in ETC) and based on the previous observations of similar objects with the COS we conservatively adopted acquisition exposure time 2x700s per object to be safe with successful pointing. Using these deeper acquisition images we will study the UV morphology (size, light distribution, etc.) of the selected objects.

The low-resolution G140L grating with central wavelength of 800A will be used to measure the LyC. The exposure time for each object is calculated to detect the LyC at the 3sigma significance level by binning in the spectral direction by 100-pixels at the observed wavelength of 912x(1+z) and by 20-pixels binning along the spatial axis, corresponding to SNR ~ 3/sqrt(100x20)~0.1 per pixel. We estimated the LyC flux assuming an escape fraction of 5% and that the intrinsic LyC flux density is equal to I(Hbeta)/I(912) ~ 9A, where I(Hbeta) is the extinction-corrected Hbeta flux. This value corresponds to a theoretical 3 Myr instantaneous burst, stellar population and acts as a conservative lower limit for the expected LyC flux density for galaxies with the large observed Hbeta equivalent widths.

For the medium-resolution Ly-alpha spectroscopy, the G160M grating on COS will be used to observe the Ly-alpha line. The resolution of G160M grating is required to resolve the Ly-alpha line profile and to measure features such as the narrow velocity separation between the Ly-alpha emission peaks. While the effective resolution of G160M is R = 16000, galaxies are not point sources and the G160M grating instead delivers observations with effective R ~ 4000 - 10000. We will compare the observed Ly-alpha profiles to medium-resolution (R ~ 8000) follow-up observations of the Mg II profile to determine how the line profile varies across transitions with optical depths that differ by 1e5 (the typical H/Mg ratio). This will constrain future radiative transfer simulations. If Ly-alpha is in absorption, we will derive N(H I) by fitting the Lorentzian wings of the Ly-alpha absorption profile. An intrinsic flux derived from the galaxy SED is used to calculate the exposure time needed to obtain a S/N ~ 3 in the continuum near Ly-alpha line by binning by 100-pixels and 20 pixels along spectral and spatial axes, respectively, corresponding to SNR~0.1 per pixel. This SNR is sufficient to determine the shape of the Ly-alpha profile with ample accuracy to constrain radiative transfer models and to derive velocity separations between the emission peaks.

For each target 0.5 orbits are allocated for acquisition, 1.5 orbits for the the medium-resolution G160M Ly-alpha spectrum, and 2 orbits for the low-resolution G140L spectrum that will determine the LyC, totalling 4 orbits per object.

Our observations do not require repeated visits to the same galaxy and do not require constraints on the HST orientation. Therefore, operating HST in reduced gyro mode would likely affect our program a little, slightly increasing the time for acquisition and slightly reducing the time for science observations.

Visit

Proposal 15845, J0130-0014 (01), implementation

Tue Jul 23 13:00:26 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

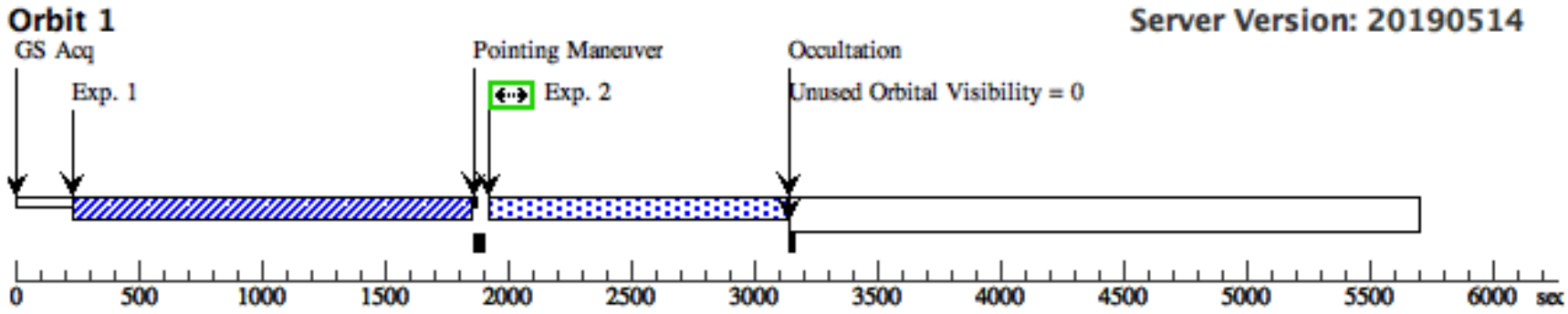
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J0130-0014	RA: 01 30 32.3700 (22.6348750d) Dec: -00 14 32.52 (-.24237d) Equinox: J2000	Redshift: 0.3161	V=21.95+/-0.05 FUV=22.42+/-0.16, NUV=22.15+/-0.14, frest(900)=4.0e-18 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=7.0e-17 erg/s/cm2/A	Reference Frame: ICRS

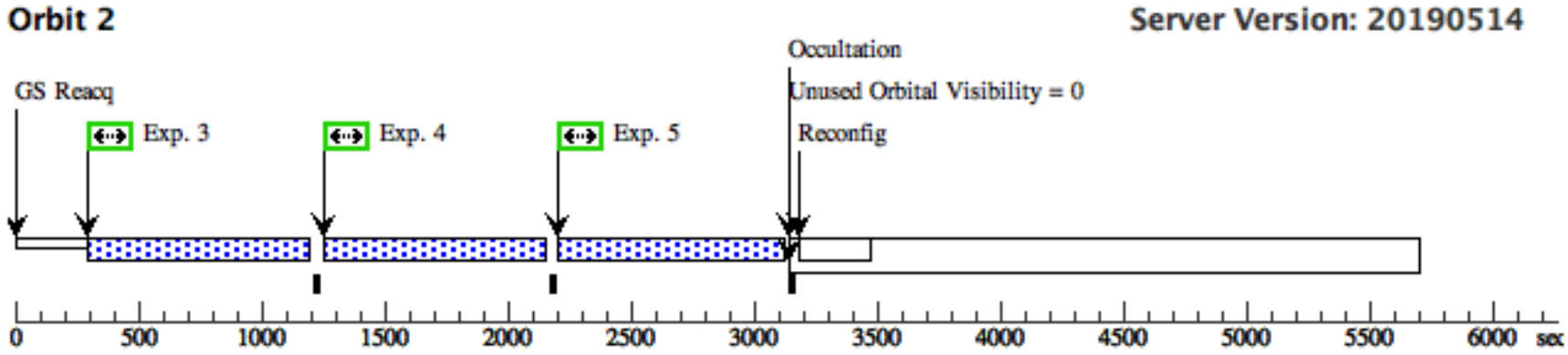
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, STARBURST]
Extended=NO

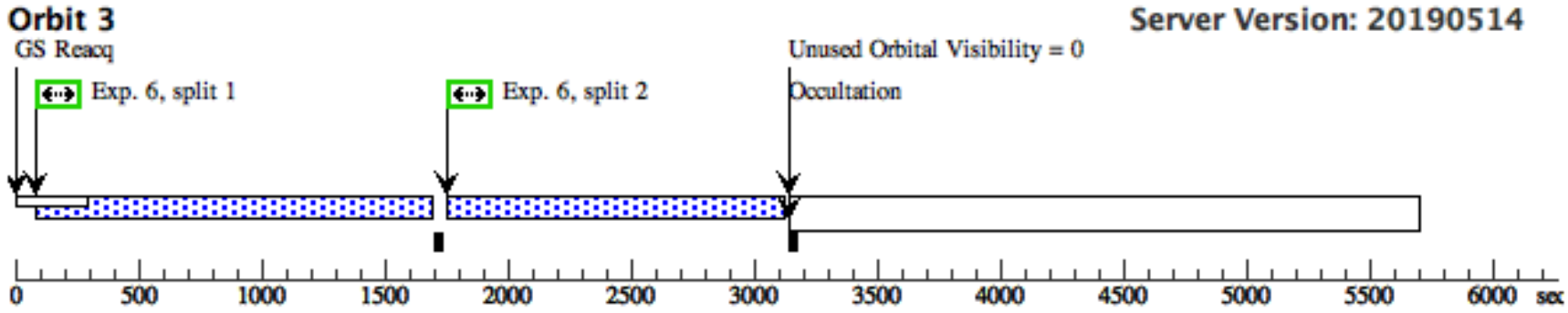
Exposures

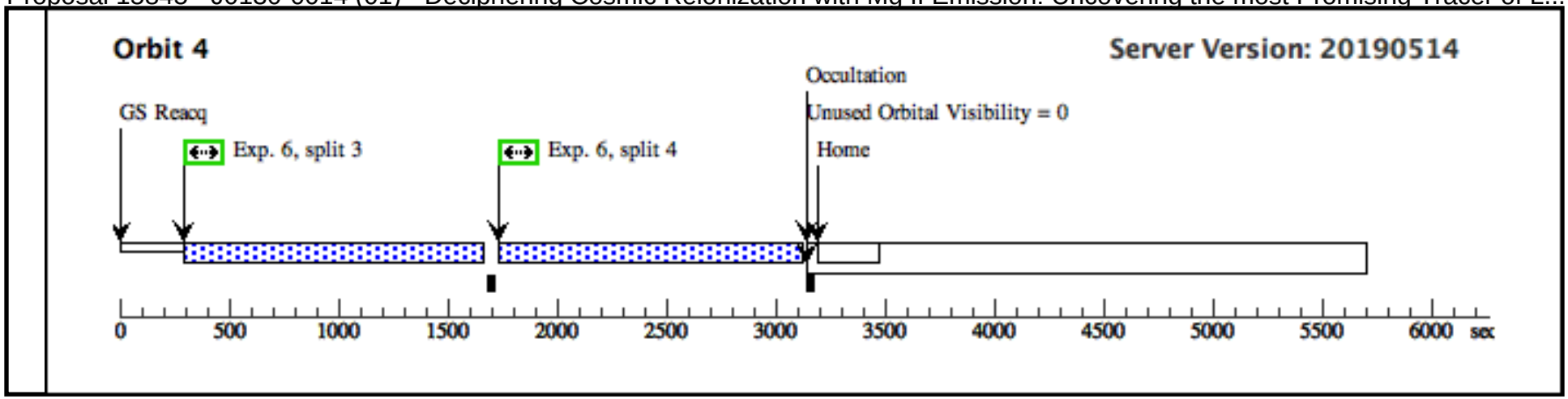
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J0130-0014 ACQ (COS.ta.1366611)	(1) J0130-0014	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	***[1]***
2	J0130-0014 G160M (COS.sp.1366642)	(1) J0130-0014	COS/FUV, TIME-TAG, PSA	G160M 1533 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (984 Secs) *[==>984.0 Secs]*	***[1]***
3	J0130-0014 G160M (COS.sp.1366642)	(1) J0130-0014	COS/FUV, TIME-TAG, PSA	G160M 1533 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	***[2]***
4	J0130-0014 G160M (COS.sp.1366642)	(1) J0130-0014	COS/FUV, TIME-TAG, PSA	G160M 1533 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	***[2]***
5	J0130-0014 G160M (COS.sp.1366642)	(1) J0130-0014	COS/FUV, TIME-TAG, PSA	G160M 1533 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (866 Secs) *[==>866.0 Secs]*	***[2]***
6	J0130-0014 G140L (COS.sp.1366636)	(1) J0130-0014	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=9200.0; FLASH=YES; FP-POS=ALL; SEGMENT=A			1200.0 Secs (5320 Secs) *[==>1339.0 Secs (Split 1)]* *[==>1320.0 Secs (Split 2)]* *[==>1320.0 Secs (Split 3)]* *[==>1341.0 Secs (Split 4)]*	***[3]*** ***[4]***

Orbit Structure








Orbit 4
Server Version: 20190514
Occultation
GS Reacq
Unused Orbital Visibility = 0
Exp. 6, split 3
Exp. 6, split 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15845, J0141-0304 (02), implementation Tue Jul 23 13:00:26 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

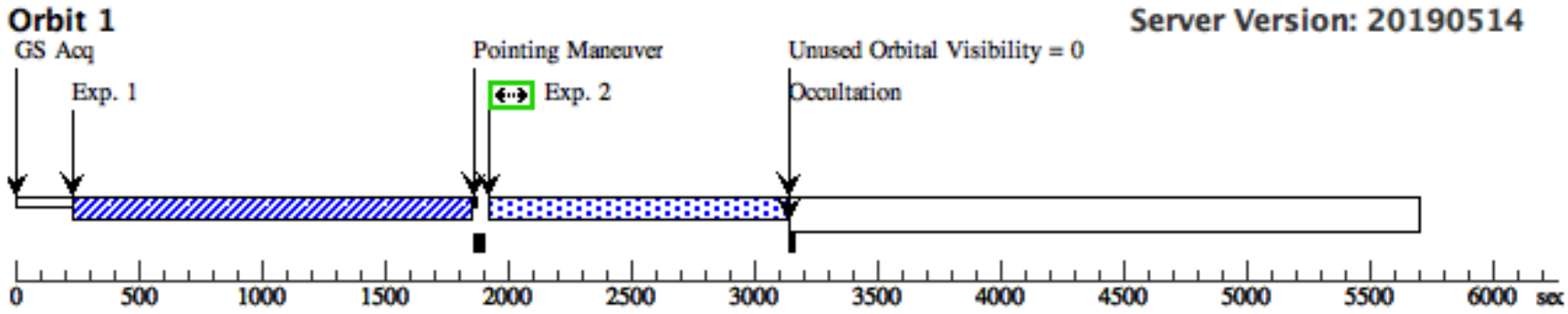
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J0141-0304	RA: 01 41 42.8500 (25.4285417d) Dec: -03 04 51.12 (-3.08087d) Equinox: J2000	Redshift: 0.3816	V=21.25+/-0.05 FUV=21.35+/-0.35, NUV=22.04+/-0.44, frest(900)=1.2e-17 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=4.0e-16 erg/s/cm2/A	Reference Frame: ICRS

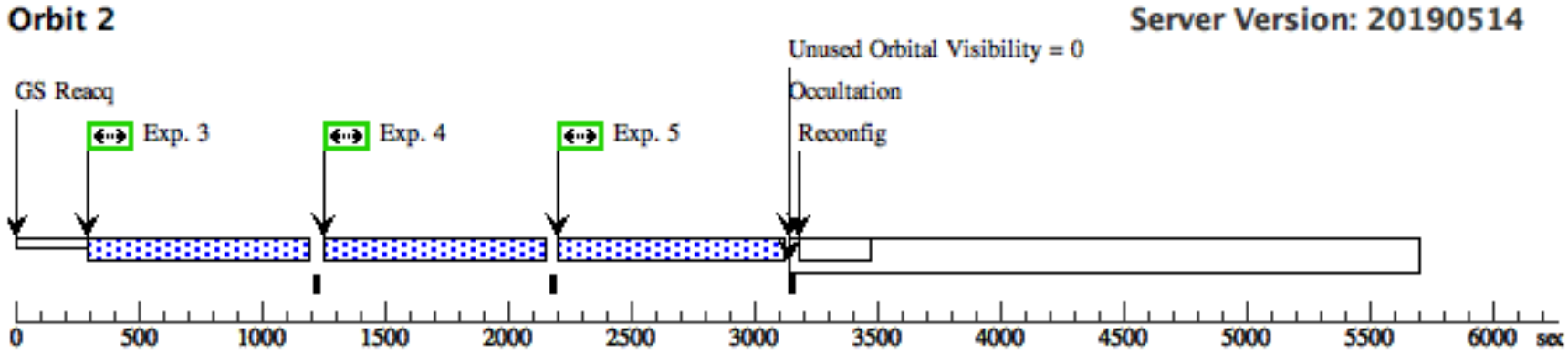
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, STARBURST]
Extended=NO

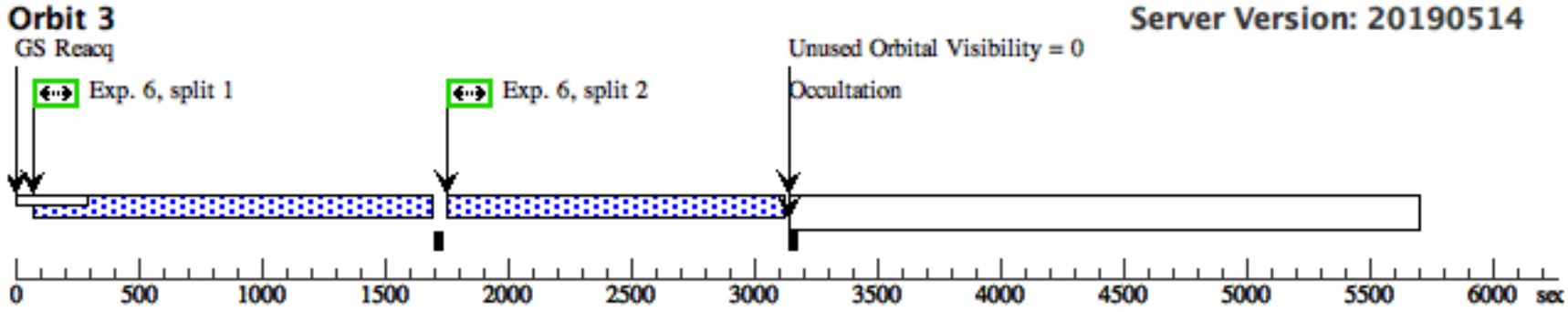
Exposures

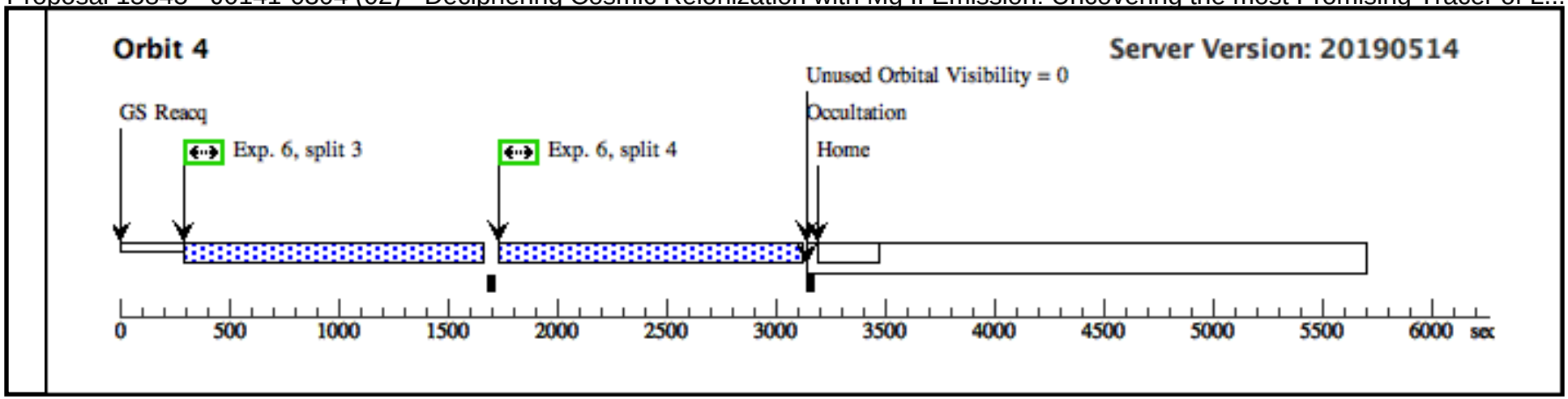
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J0141-0304 ACQ (COS.ta.1366612)	(2) J0141-0304	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	***[1]***
2	J0141-0304 G160M (COS.sp.1366643)	(2) J0141-0304	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (994 Secs) *[==>994.0 Secs]*	***[1]***
3	J0141-0304 G160M (COS.sp.1366643)	(2) J0141-0304	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	***[2]***
4	J0141-0304 G160M (COS.sp.1366643)	(2) J0141-0304	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	***[2]***
5	J0141-0304 G160M (COS.sp.1366643)	(2) J0141-0304	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (866 Secs) *[==>866.0 Secs]*	***[2]***
6	J0141-0304 G140L (COS.sp.1366637)	(2) J0141-0304	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=9200.0; FLASH=YES; FP-POS=ALL; SEGMENT=A			1200.0 Secs (5320 Secs) *[==>1339.0 Secs (Split 1)]* *[==>1320.0 Secs (Split 2)]* *[==>1320.0 Secs (Split 3)]* *[==>1341.0 Secs (Split 4)]*	***[3]*** ***[4]***

Orbit Structure








Orbit 4
Server Version: 20190514
Unused Orbital Visibility = 0
GS Reacq
Occultation
Exp. 6, split 3
Exp. 6, split 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15845, J0844+5312 (03), implementation Tue Jul 23 13:00:26 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

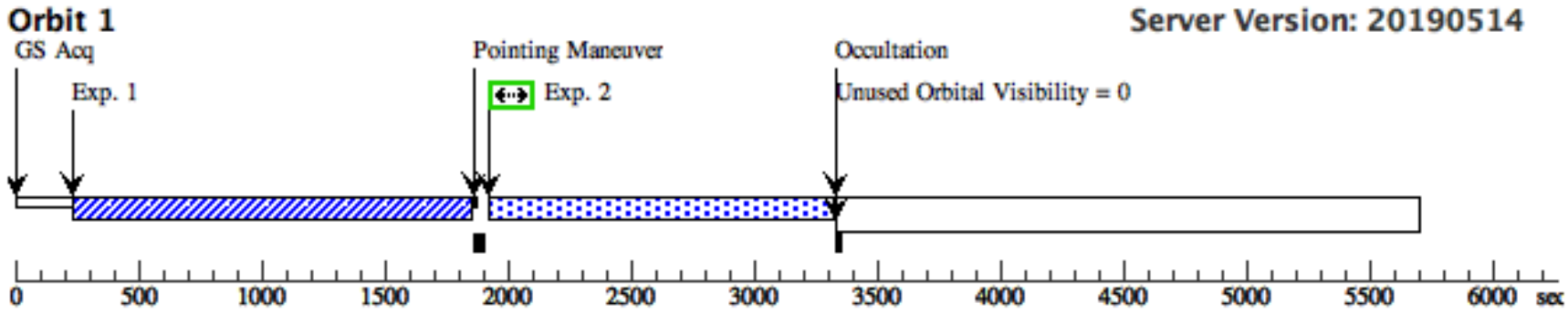
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	J0844+5312	RA: 08 44 57.9000 (131.2412500d) Dec: +53 12 30.11 (53.20836d) Equinox: J2000	Redshift: 0.4276	V=21.44+/-0.05 FUV=21.99+/-0.53, NUV=21.61+/-0.49, frest(900)=5.0e-18 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=2.2e-16 erg/s/cm2/A	Reference Frame: ICRS

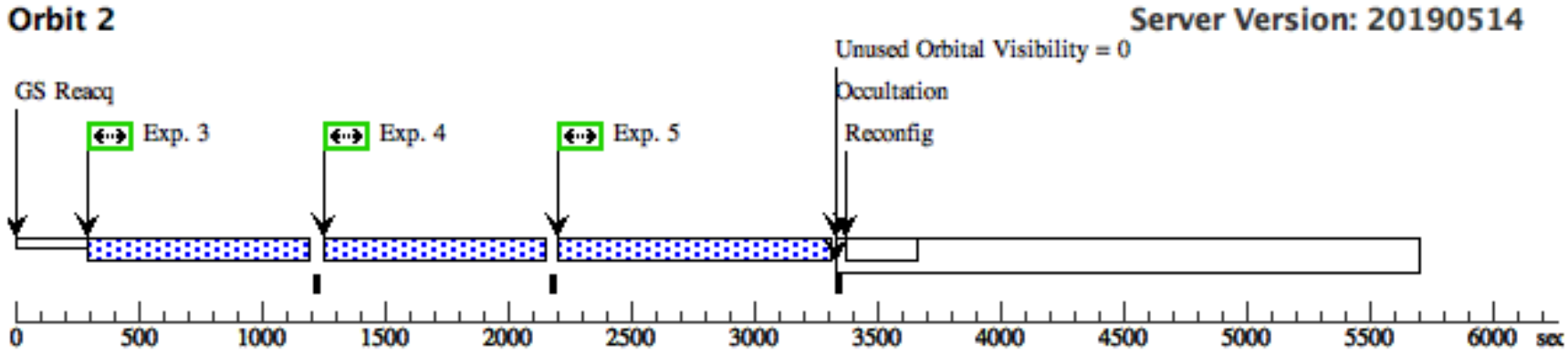
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, STARBURST]
Extended=NO

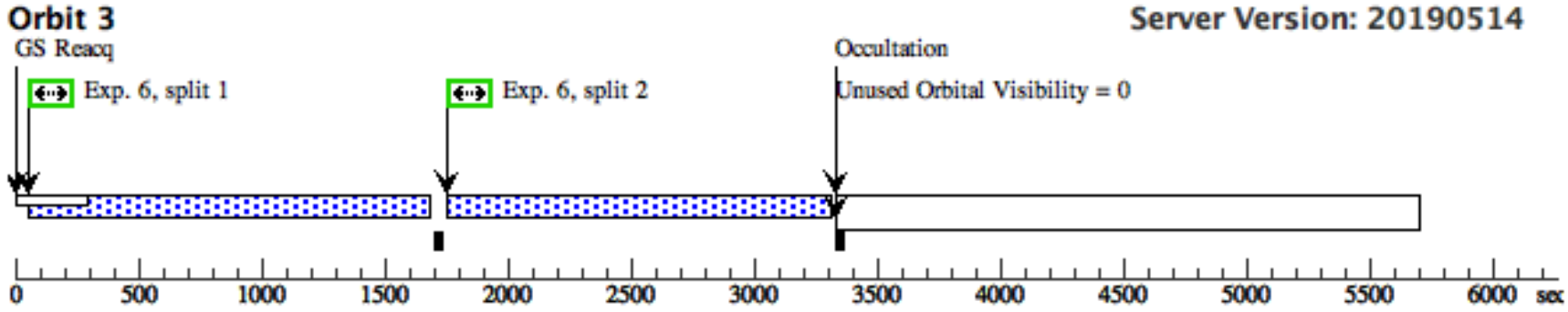
Exposures

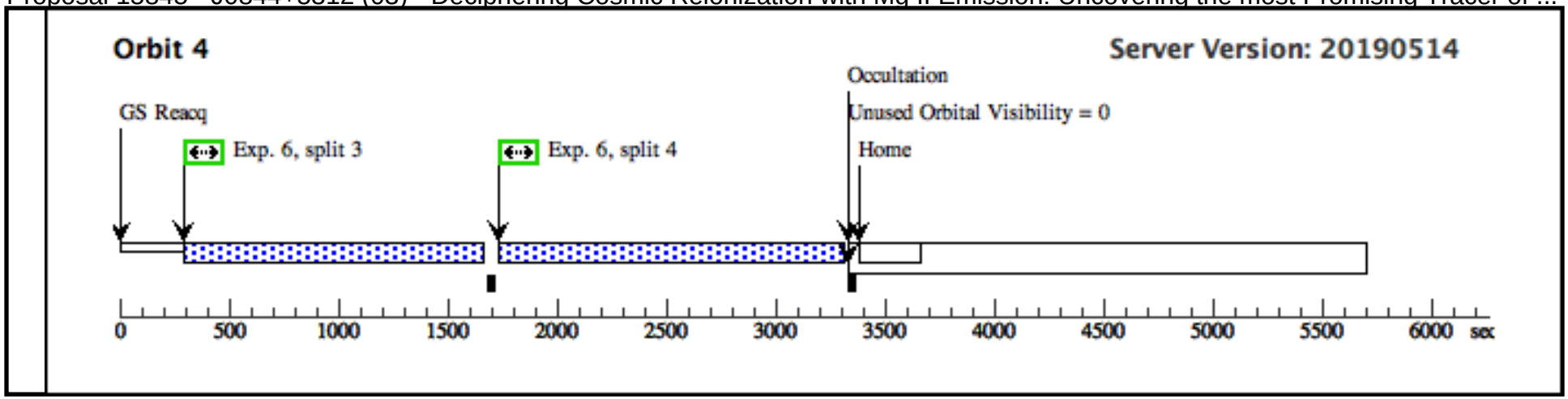
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J0844+5312 ACQ (COS.ta.1366613)	(3) J0844+5312	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	 ***[1]***
2	J0844+5312 G160M (COS.sp.1366645)	(3) J0844+5312	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (1175 Secs) *[==>1175.0 Secs]*	 ***[1]***
3	J0844+5312 G160M (COS.sp.1366645)	(3) J0844+5312	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	 ***[2]***
4	J0844+5312 G160M (COS.sp.1366645)	(3) J0844+5312	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	 ***[2]***
5	J0844+5312 G160M (COS.sp.1366645)	(3) J0844+5312	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (1057 Secs) *[==>1057.0 Secs]*	 ***[2]***
6	J0844+5312 G140L (COS.sp.1366638)	(3) J0844+5312	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=9200.0; FLASH=YES; FP-POS=ALL; SEGMENT=A			1200.0 Secs (5702 Secs) *[==>1339.0 Secs (Split 1)]* *[==>1511.0 Secs (Split 2)]* *[==>1320.0 Secs (Split 3)]* *[==>1532.0 Secs (Split 4)]*	 ***[3]*** ***[4]***

Orbit Structure








Orbit 4
Server Version: 20190514
Occultation
GS Reacq
Unused Orbital Visibility = 0
Exp. 6, split 3
Exp. 6, split 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15845, J1014+5501 (04), implementation Tue Jul 23 13:00:26 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

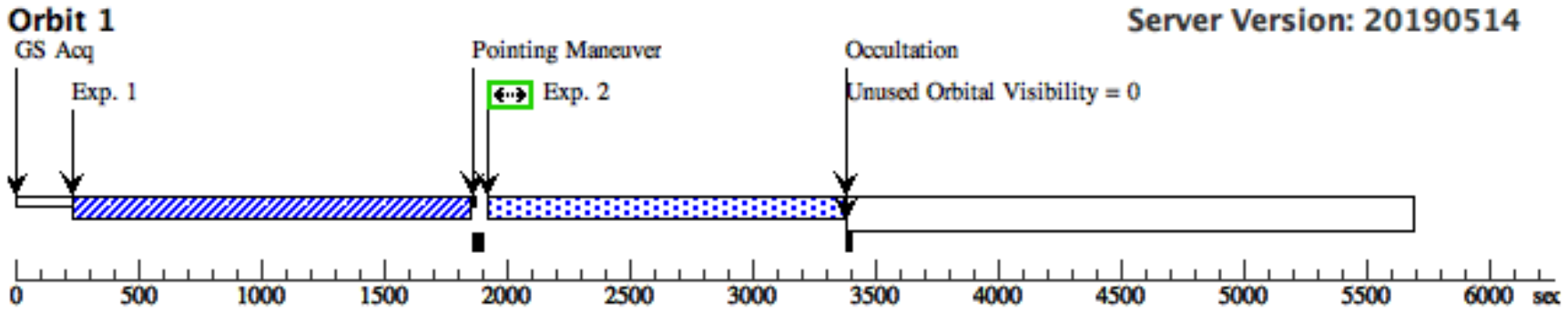
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	J1014+5501	RA: 10 14 23.7800 (153.5990833d) Dec: +55 01 43.82 (55.02884d) Equinox: J2000	Redshift: 0.3730	V=21.73+/-0.06 FUV=21.88+/-0.59, NUV=22.29+/-0.70, frest(900)=4.6e-18 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=1.3e-16 erg/s/cm2/A	Reference Frame: ICRS

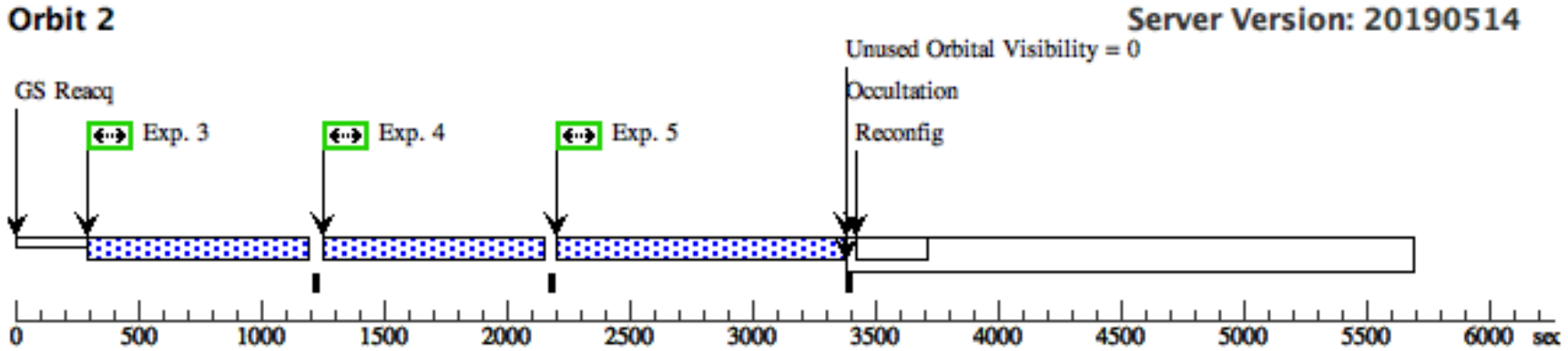
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, STARBURST]
Extended=NO

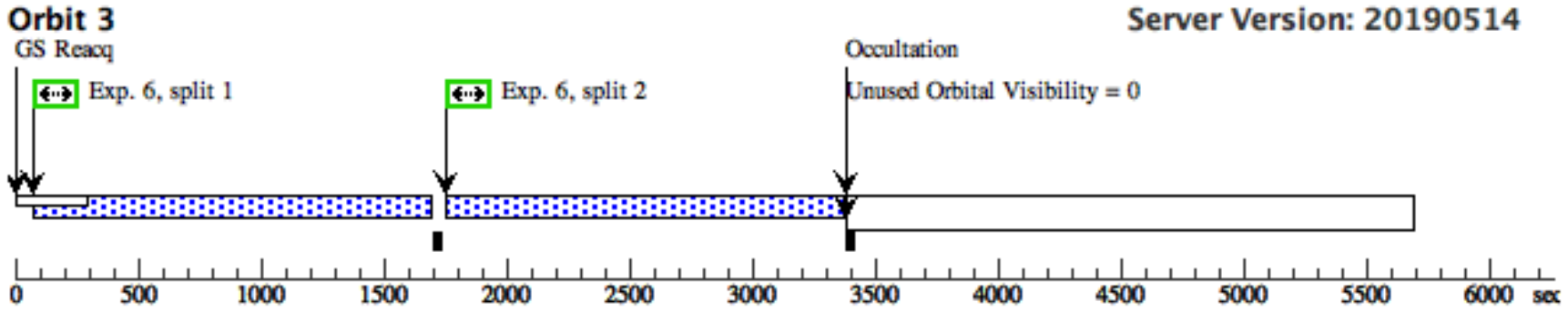
Exposures

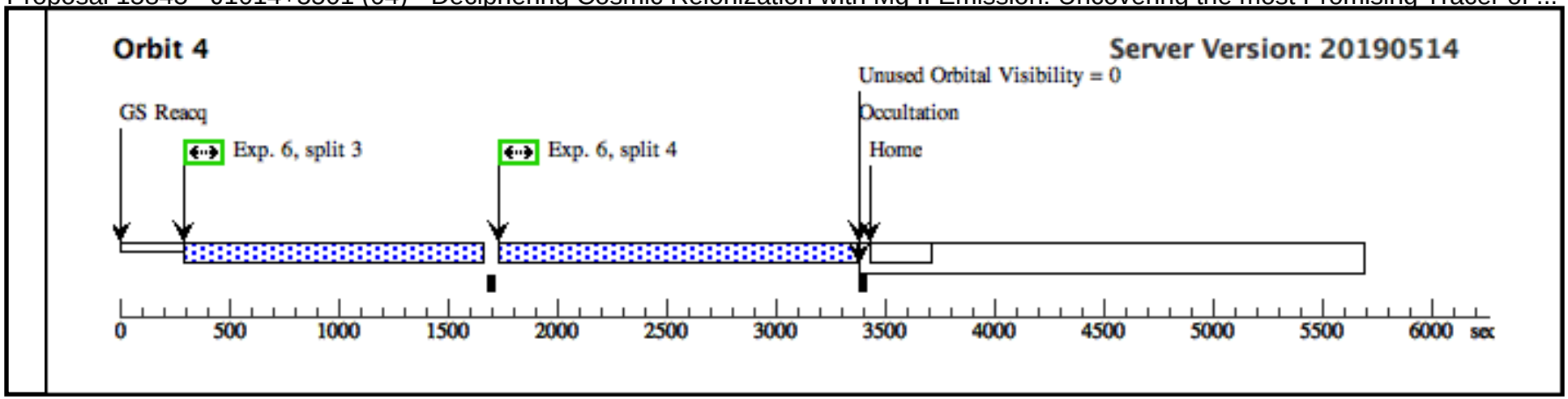
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1014+5501 ACQ (COS.ta.1366614)	(4) J1014+5501	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	 ***[1]***
2	J1014+5501 G160M (COS.sp.1366646)	(4) J1014+5501	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (1241 Secs) *[==>1241.0 Secs]*	 ***[1]***
3	J1014+5501 G160M (COS.sp.1366646)	(4) J1014+5501	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	 ***[2]***
4	J1014+5501 G160M (COS.sp.1366646)	(4) J1014+5501	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	 ***[2]***
5	J1014+5501 G160M (COS.sp.1366646)	(4) J1014+5501	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (1113 Secs) *[==>1113.0 Secs]*	 ***[2]***
6	J1014+5501 G140L (COS.sp.1366639)	(4) J1014+5501	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=9200.0; FLASH=YES; FP-POS=ALL; SEGMENT=A			1200.0 Secs (5814 Secs) *[==>1339.0 Secs (Split 1)]* *[==>1567.0 Secs (Split 2)]* *[==>1320.0 Secs (Split 3)]* *[==>1588.0 Secs (Split 4)]*	 ***[3]*** ***[4]***

Orbit Structure








Orbit 4
Server Version: 20190514
Unused Orbital Visibility = 0
GS Reacq
Exp. 6, split 3
Exp. 6, split 4
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15845, J1046+5827 (05), implementation Tue Jul 23 13:00:26 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

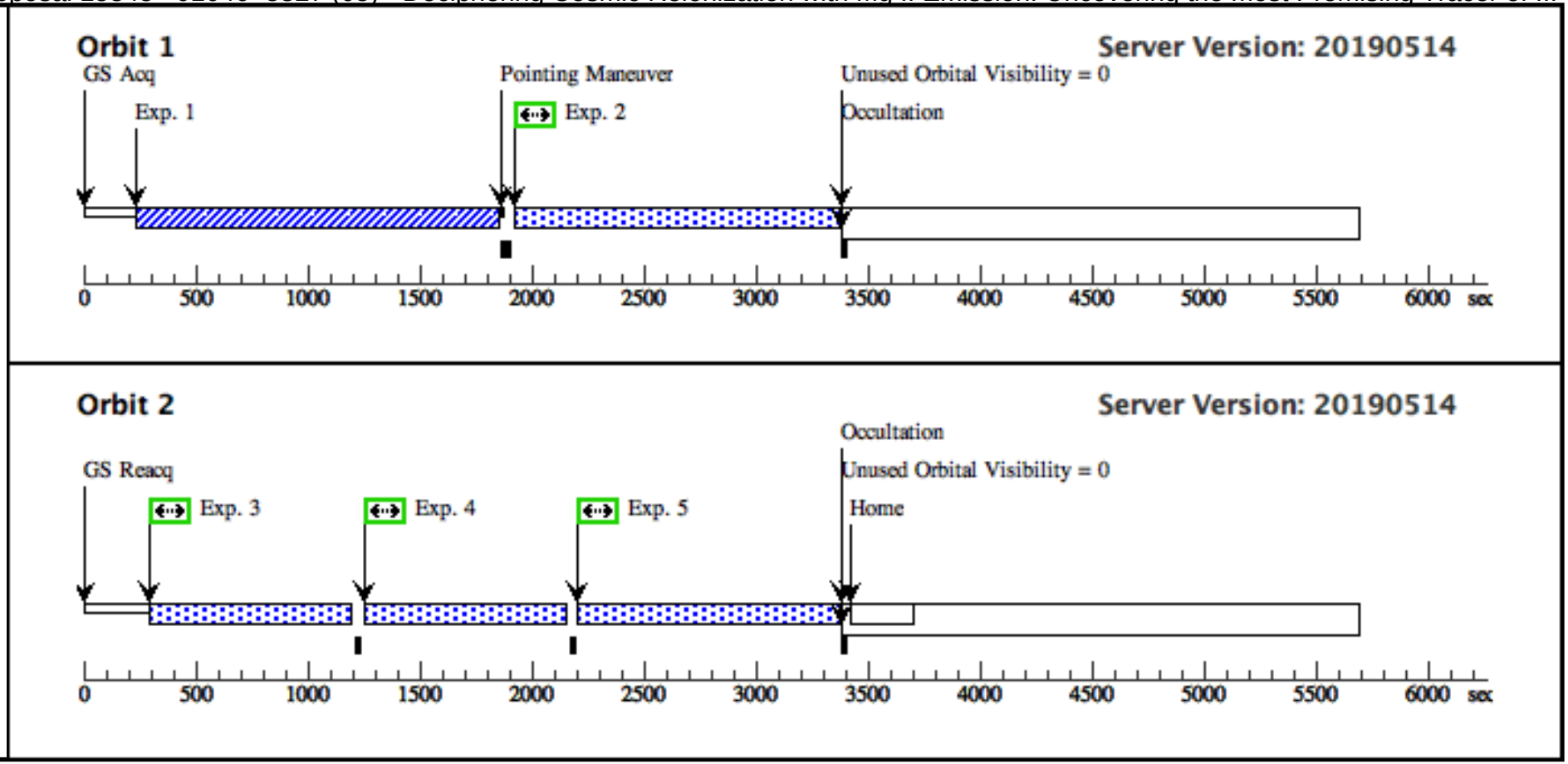
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	J1046+5827	RA: 10 46 1.9400 (161.5080833d) Dec: +58 27 56.90 (58.46581d) Equinox: J2000	Redshift: 0.3968	V=21.07+/-0.05 FUV=20.92+/-0.37, NUV=21.29+/-0.35, frest(900)=3.0e-18 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=1.3e-16 erg/s/cm2/A	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, 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+5827 ACQ (COS.ta.1366615)	(5) J1046+5827	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	***[1]***
2	J1046+5827 G160M (COS.sp.1366650)	(5) J1046+5827	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (1234 Secs) *[==>1234.0 Secs]*	***[1]***
3	J1046+5827 G160M (COS.sp.1366650)	(5) J1046+5827	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	***[2]***
4	J1046+5827 G160M (COS.sp.1366650)	(5) J1046+5827	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	***[2]***
5	J1046+5827 G160M (COS.sp.1366650)	(5) J1046+5827	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (1113 Secs) *[==>1113.0 Secs]*	***[2]***

Orbit Structure



Visit

Proposal 15845, J1137+3605 (06), implementation Tue Jul 23 13:00:26 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

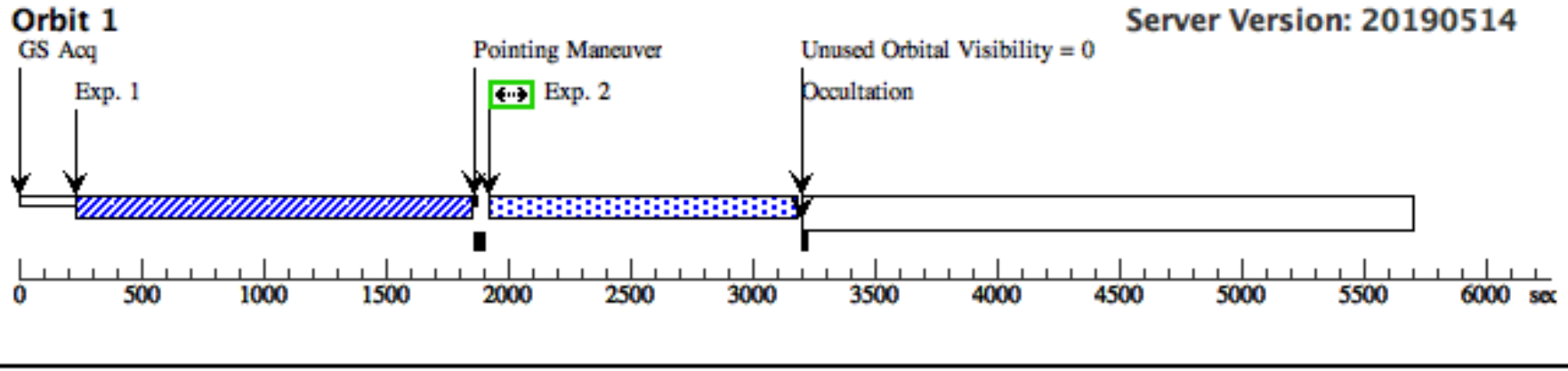
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	J1137+3605	RA: 11 37 47.7700 (174.4490417d) Dec: +36 05 4.62 (36.08462d) Equinox: J2000	Redshift: 0.3439	V=21.79+/-0.05 NUV=22.46+/-0.20, frest(900)=8.5e-18 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=1.3e-16 erg/s/cm2/A	Reference Frame: ICRS

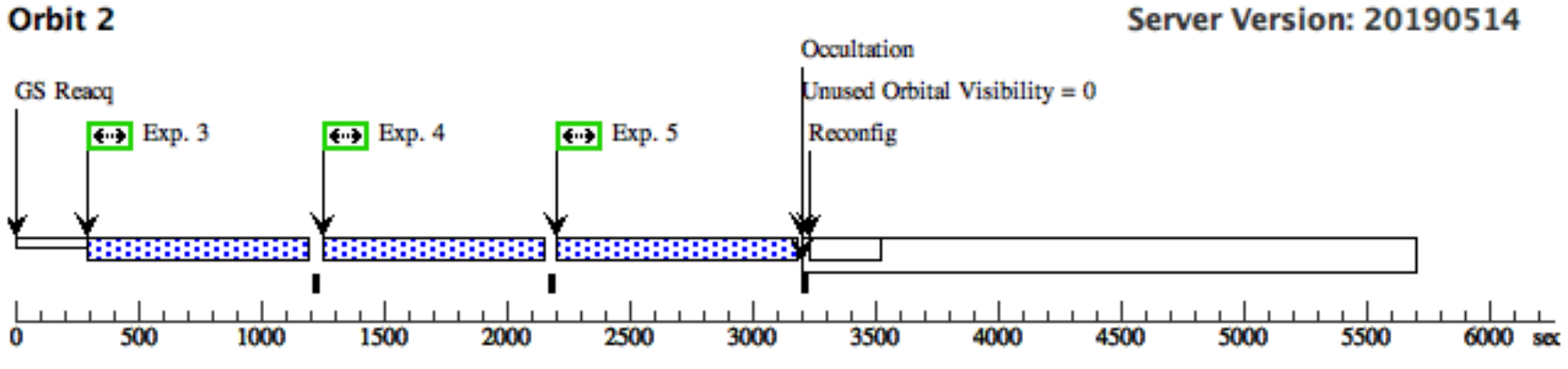
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, STARBURST]
Extended=NO

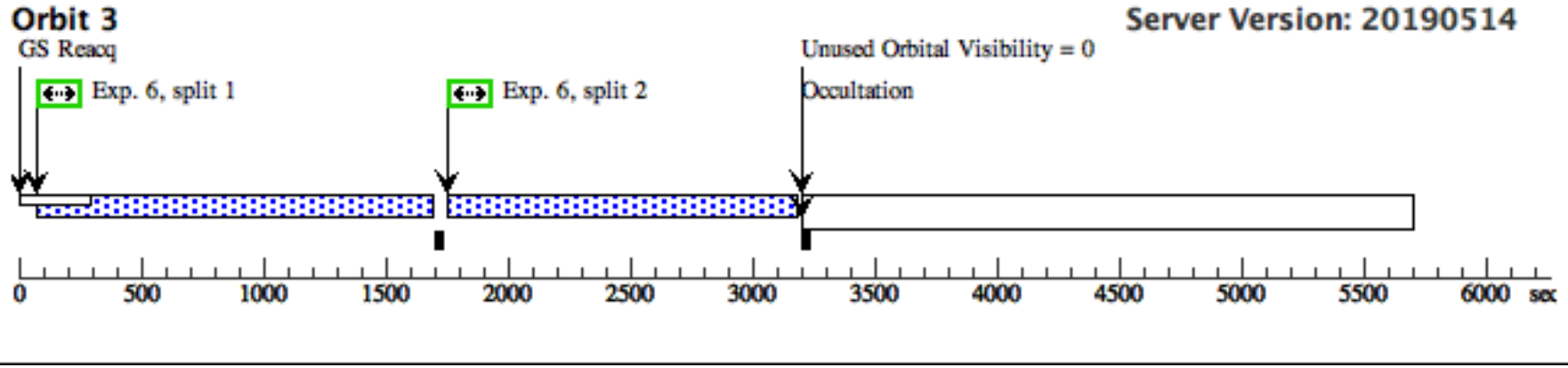
Exposures

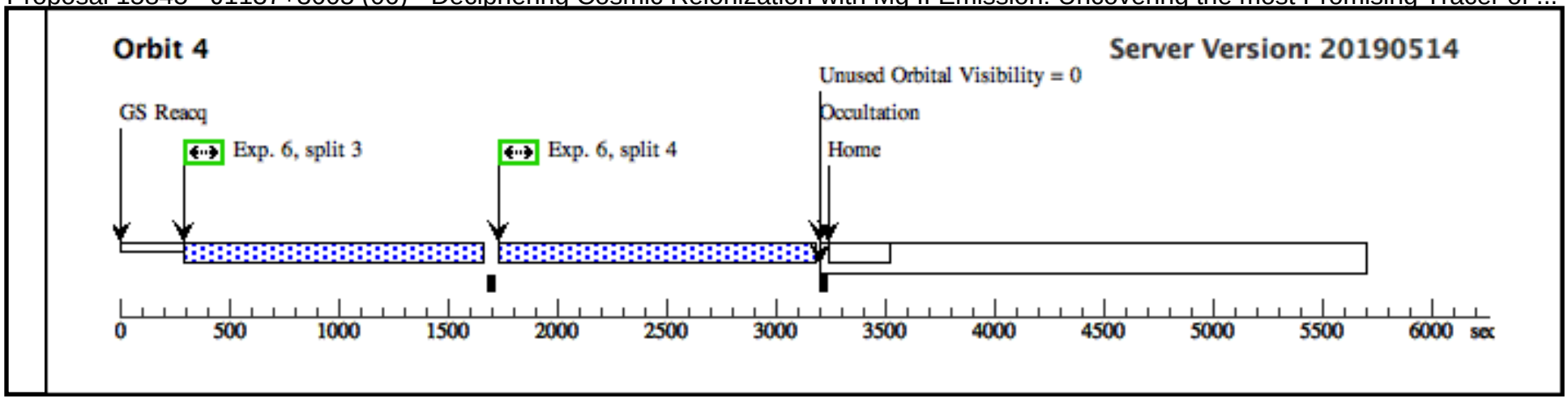
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1137+3605 ACQ (COS.ta.1366616)	(6) J1137+3605	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	*[1]*
2	J1137+3605 G160M (COS.sp.1366654)	(6) J1137+3605	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (1054 Secs) *[==>1054.0 Secs]*	*[1]*
3	J1137+3605 G160M (COS.sp.1366654)	(6) J1137+3605	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	*[2]*
4	J1137+3605 G160M (COS.sp.1366654)	(6) J1137+3605	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	*[2]*
5	J1137+3605 G160M (COS.sp.1366654)	(6) J1137+3605	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (924 Secs) *[==>924.0 Secs]*	*[2]*
6	J1137+3605 G140L (COS.sp.1366630)	(6) J1137+3605	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=9200.0; FLASH=YES; FP-POS=ALL; SEGMENT=A			1200.0 Secs (5436 Secs) *[==>1339.0 Secs (Split 1)]* *[==>1378.0 Secs (Split 2)]* *[==>1320.0 Secs (Split 3)]* *[==>1399.0 Secs (Split 4)]*	*[3]* *[4]*

Orbit Structure








Orbit 4
Server Version: 20190514
Unused Orbital Visibility = 0
GS Reacq
Occultation
Exp. 6, split 3
Exp. 6, split 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15845, J1157+5801 (07), implementation Tue Jul 23 13:00:26 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

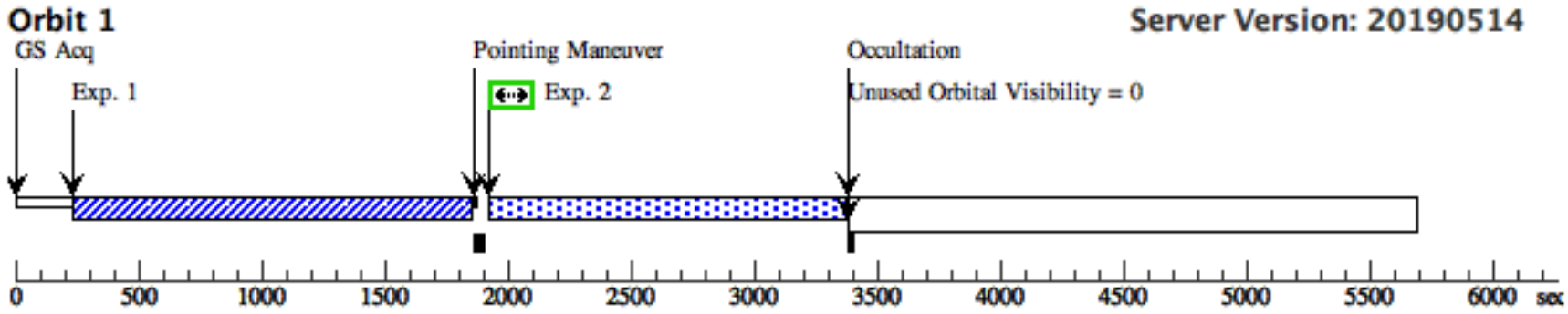
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(7)	J1157+5801	RA: 11 57 44.8000 (179.4366667d) Dec: +58 01 42.69 (58.02853d) Equinox: J2000	Redshift: 0.3522	V=22.32+/-0.05 NUV=22.94+/-0.37, frest(900)=4.7e-18 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=1.1e-16 erg/s/cm2/A	Reference Frame: ICRS

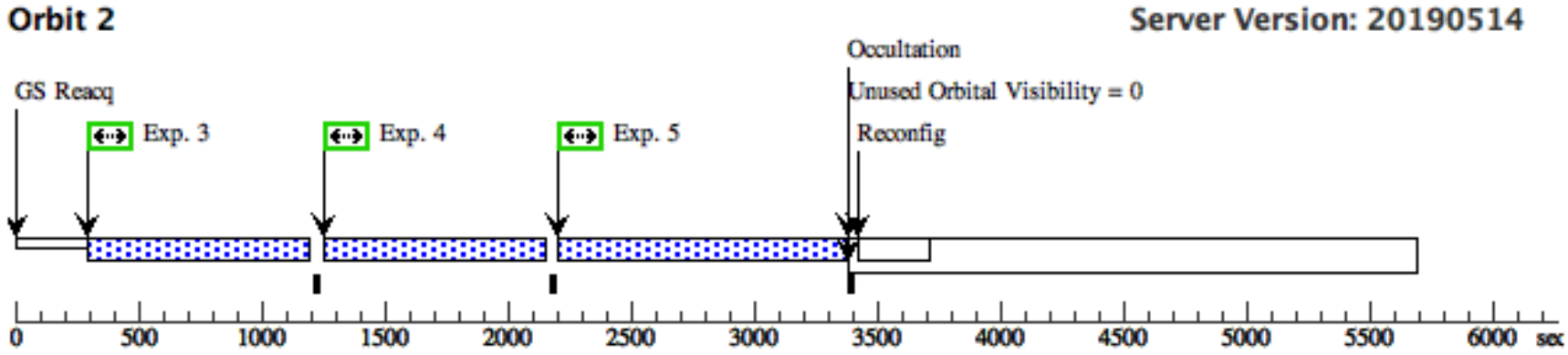
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, STARBURST]
Extended=NO

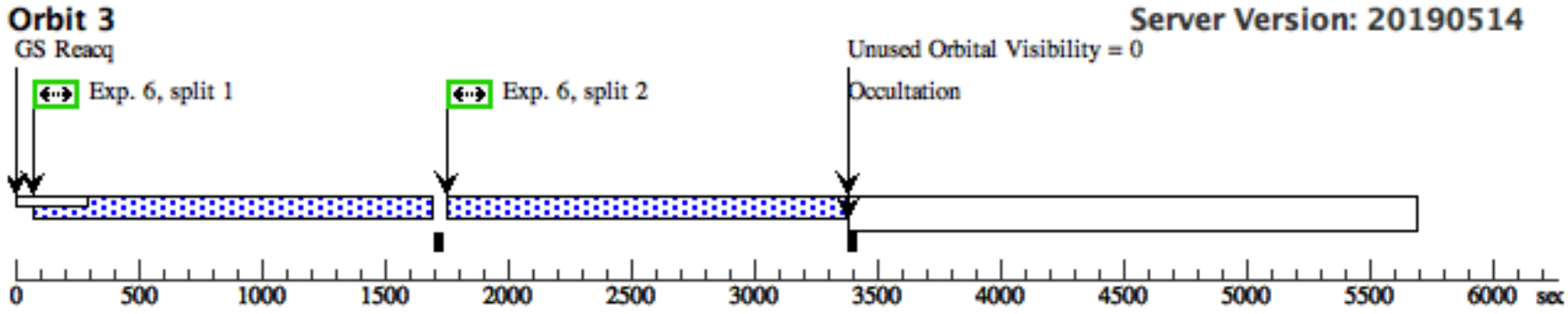
Exposures

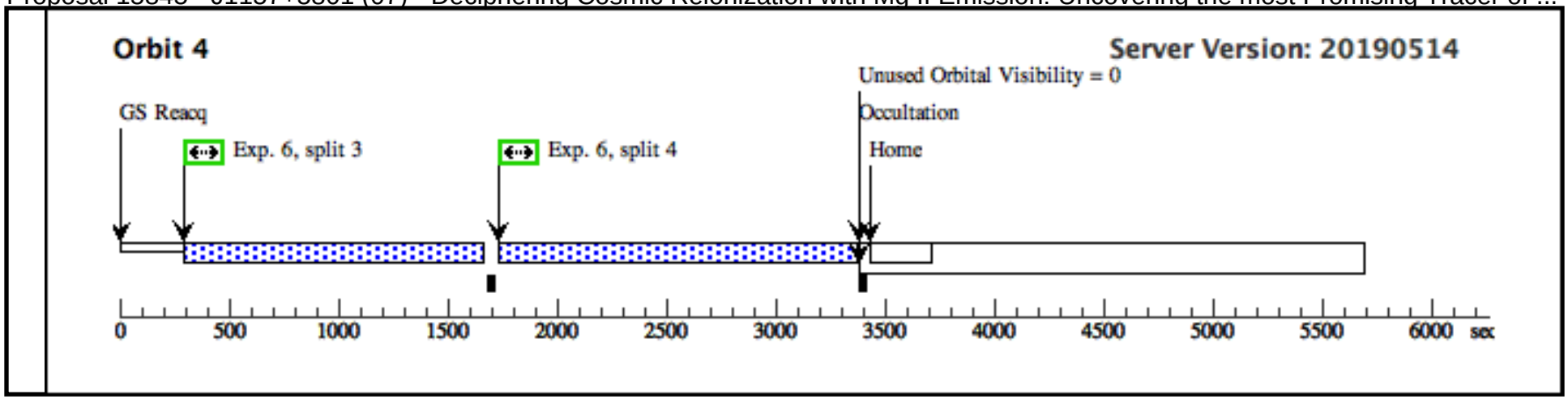
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1157+5801 ACQ (COS.ta.1366617)	(7) J1157+5801	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	 ***[1]***
2	J1157+5801 G160M (COS.sp.1366657)	(7) J1157+5801	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (1241 Secs) *[==>1241.0 Secs]*	 ***[1]***
3	J1157+5801 G160M (COS.sp.1366657)	(7) J1157+5801	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	 ***[2]***
4	J1157+5801 G160M (COS.sp.1366657)	(7) J1157+5801	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	 ***[2]***
5	J1157+5801 G160M (COS.sp.1366657)	(7) J1157+5801	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=1950.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (1113 Secs) *[==>1113.0 Secs]*	 ***[2]***
6	J1157+5801 G140L (COS.sp.1366633)	(7) J1157+5801	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=9200.0; FLASH=YES; FP-POS=ALL; SEGMENT=A			1200.0 Secs (5814 Secs) *[==>1339.0 Secs (Split 1)]* *[==>1567.0 Secs (Split 2)]* *[==>1320.0 Secs (Split 3)]* *[==>1588.0 Secs (Split 4)]*	 ***[3]*** ***[4]***

Orbit Structure








Orbit 4
Server Version: 20190514
Unused Orbital Visibility = 0
GS Reacq
Exp. 6, split 3
Exp. 6, split 4
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 15845, J1352+5617 (08), implementation Tue Jul 23 13:00:27 GMT 2019

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

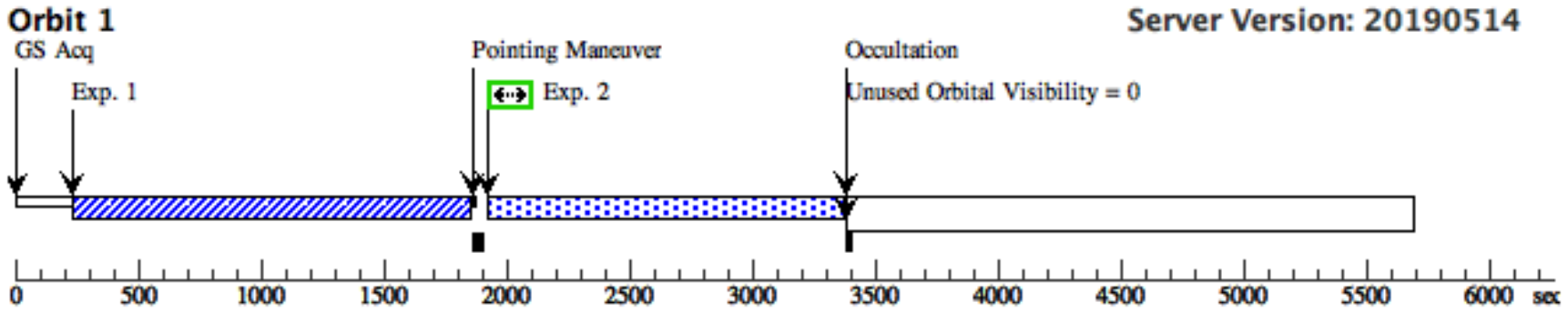
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(8)	J1352+5617	RA: 13 52 35.8000 (208.1491667d) Dec: +56 17 1.41 (56.28372d) Equinox: J2000	Redshift: 0.3882	V=21.73+/-0.05 FUV=21.83+/-0.17, NUV=21.81+/-0.13, frest(900)=5.0e-18 erg/s/cm2/A (5% of intrinsic flux), frest(1216)=1.1e-16 erg/s/cm2/A	Reference Frame: ICRS

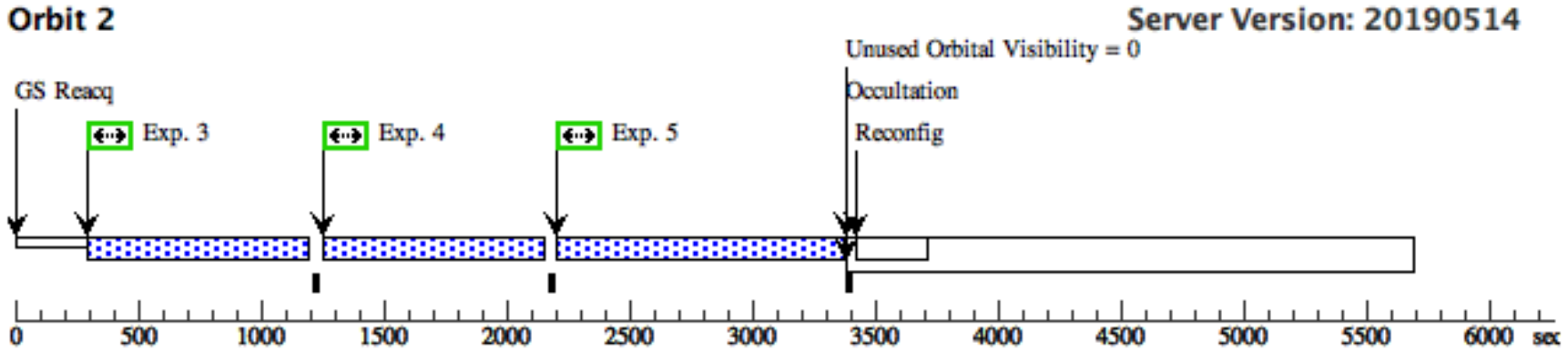
Comments:
Category=GALAXY
Description=[DWARF COMPACT, EMISSION LINE NEBULA, STAR FORMING REGION, STARBURST]
Extended=NO

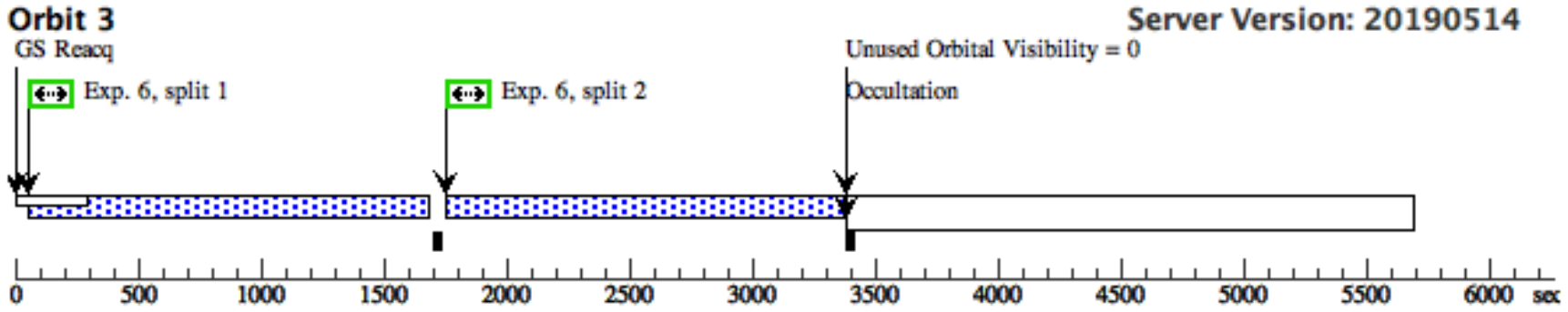
Exposures

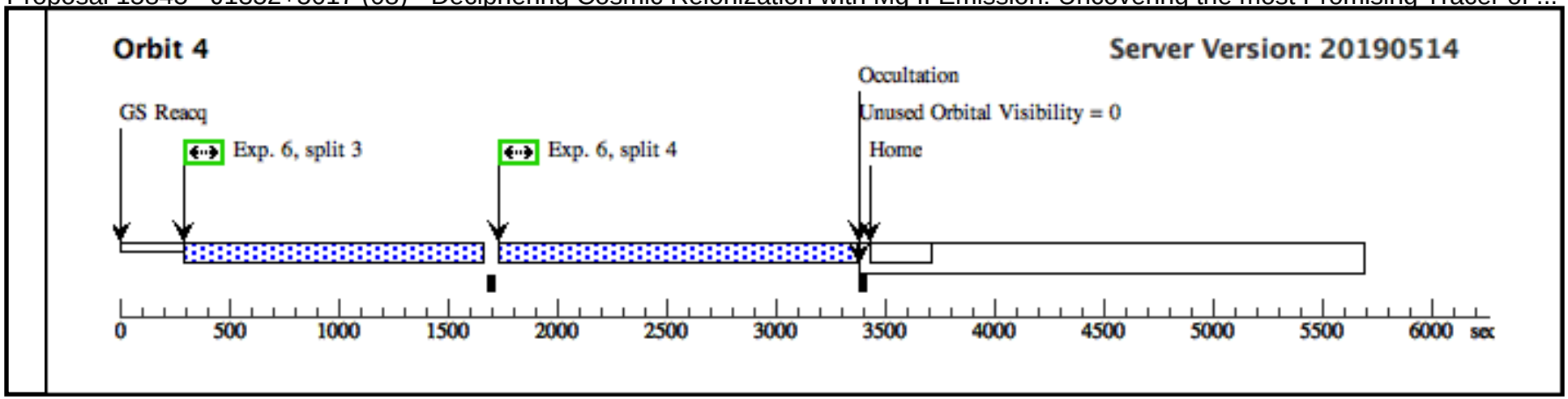
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	J1352+5617 ACQ (COS.ta.1366618)	(8) J1352+5617	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				700 Secs (700 Secs) *[==>]*	*[1]*
2	J1352+5617 G160M (COS.sp.1366658)	(8) J1352+5617	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=1; SEGMENT=BOTH			984 Secs (1231 Secs) *[==>1231.0 Secs]*	*[1]*
3	J1352+5617 G160M (COS.sp.1366658)	(8) J1352+5617	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=2; SEGMENT=BOTH			500 Secs (850 Secs) *[==>850.0 Secs]*	*[2]*
4	J1352+5617 G160M (COS.sp.1366658)	(8) J1352+5617	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=3; SEGMENT=BOTH			700 Secs (850 Secs) *[==>850.0 Secs]*	*[2]*
5	J1352+5617 G160M (COS.sp.1366658)	(8) J1352+5617	COS/FUV, TIME-TAG, PSA	G160M 1623 A	BUFFER-TIME=19850.0; FLASH=YES; FP-POS=4; SEGMENT=BOTH			850.0 Secs (1113 Secs) *[==>1113.0 Secs]*	*[2]*
6	J1352+5617 G140L (COS.sp.1366634)	(8) J1352+5617	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=9200.0; FLASH=YES; FP-POS=ALL; SEGMENT=A			1200.0 Secs (5814 Secs) *[==>1339.0 Secs (Split 1)]* *[==>1567.0 Secs (Split 2)]* *[==>1320.0 Secs (Split 3)]* *[==>1588.0 Secs (Split 4)]*	*[3]* *[4]*

Orbit Structure








Orbit 4
Server Version: 20190514
Occultation
GS Reacq
Unused Orbital Visibility = 0
Exp. 6, split 3
Exp. 6, split 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec