15465 - Resolving Extreme High-Ionization UV Emission-Line Diagnostics in Preparation for JWST

Cycle: 25, Proposal Category: GO

(UV Initiative, JWST Initative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SDSSJ104457	COS/FUV COS/NUV	3	01-Jun-2018 15:09:08.0	yes
02	(2) J141851	COS/FUV COS/NUV	5	01-Jun-2018 15:09:12.0	yes

8 Total Orbits Used

ABSTRACT

The recent observations of extreme ultraviolet (UV) emission lines with complex line profiles in a z~2 lensed galaxy (Berg et al. 2018a) suggest our ability to characterize sources using their UV emission lines may be biased by the unaccounted for stellar and interstellar medium (ISM) contributions. This is of particular concern for the imminent window onto reionization-era sources allowed by the James Webb Space Telescope

(JWST), where extreme UV emission lines may be the only diagnostic probes available. Because the CIII], OIII], CIV, and HeII high-ionization emission lines are rarely seen in lower redshift galaxies (0<z<3), the promising UV diagnostic diagrams combining these lines (e.g., Feltre et al. 2016; Nakajima et al. 2017; Byler et al. 2018) lack observational confirmation or calibration. Fortunately, recent UV spectral campaigns have identified a sample of nearby galaxies with analogous emission-line features to reionization-era systems, including the strongest CIV (Berg et al. 2016) and HeII (Berg et al. 2018b) emitters in the local Universe. We therefore propose high resolution, high signal-to-noise HST/COS spectral observations of two reionization-era analogues that will allow us to robustly model the massive star populations and resolve the stellar and nebular components of the high-ionization emission lines. These data will provide the first stringent test of the high-ionization UV emission line diagnostics critical to the interpretation of distant sources accessible with JWST.

OBSERVING DESCRIPTION

Goal:

We will obtain NUV target aquisiton images and high-resolution, high signal-to-noise HST/COS spectral observations of two reionization-era analogues that will allow us to robustly model the massive star populations and resolve the stellar and nebular components of the high-ionization emission lines.

Targets:

Our targets were selected from previous low-resolution HST/COS obsevations for their large CIV and HeII equivalent widths. These targets have high [OIII] optical emission line surface brightnesses, large ionizations, low metallicities (12+log(O/H) < 8.0), and compact morphologies in order to achieve maximum flux through the 2.5" COS aperture. We use the coordinates from our target's SDSS optical spectra, which are in the ICRS reference frame.

Target Acquisition:

Since all sources have SDSS positions, which are generally accurate to 0.1", we do not do an ACQ/SEARCH routine. With such excellent input coordinates from the SDSS, we aquire our targets using the ACQ/IMAGE mode with the PSA aperture and MirrorA for the COS/NUV configuration. Following the successful target acquisition method of our previous HST-GO14628 program, we have determined integration times necessary to reach a S/N = 25 for our targets. We assume a flat spectral distribution normalized by the GALEX FUV surface brightnesses. Both galaxies are compact in the SDSS imaging with a FWHM PSF diameter of ~2". We then divide the GALEX FUV fluxes by the area of the 2" PSF to determine the FUV surface brightnesses. Note that Target 18 required us to use Mirror B to ensure safe levels when using the BOT.

Science Exposures:
We will use COS with the G160M grating with a central wavelength of 1589 angstroms in TIMETAG mode in order to simultaneously observe the CIV 1548,1550 and HeII 1640 spectra features. In order to resolve the stellar and nebular components of the CIV and HeII features, we use the ETC to determine the total science integration times necessary to achieve a S/N >~ 7 per resolution in the continuum for our targets using input continuum fluxes at 1500 A from our previous HST/COS observations. We will observe our targets for 3 and 5 orbits each though the PSA aperture with the COS/FUV configuration. With the G160M grating we use FP-POS=ALL, which takes 4 images offset from one another in the dispersion direction and increases S/N. These 4 positions allow a flat to be created and cosmic rays to be eliminated.

Visit

Proposal 15465, Visit 01, implementation Fri Jun 01 19:09:14 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

(Visit 01) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

(Visit 01) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

(Science (01.002)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

(Science (01.003)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

(Science (01.004)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

Fixed Targets

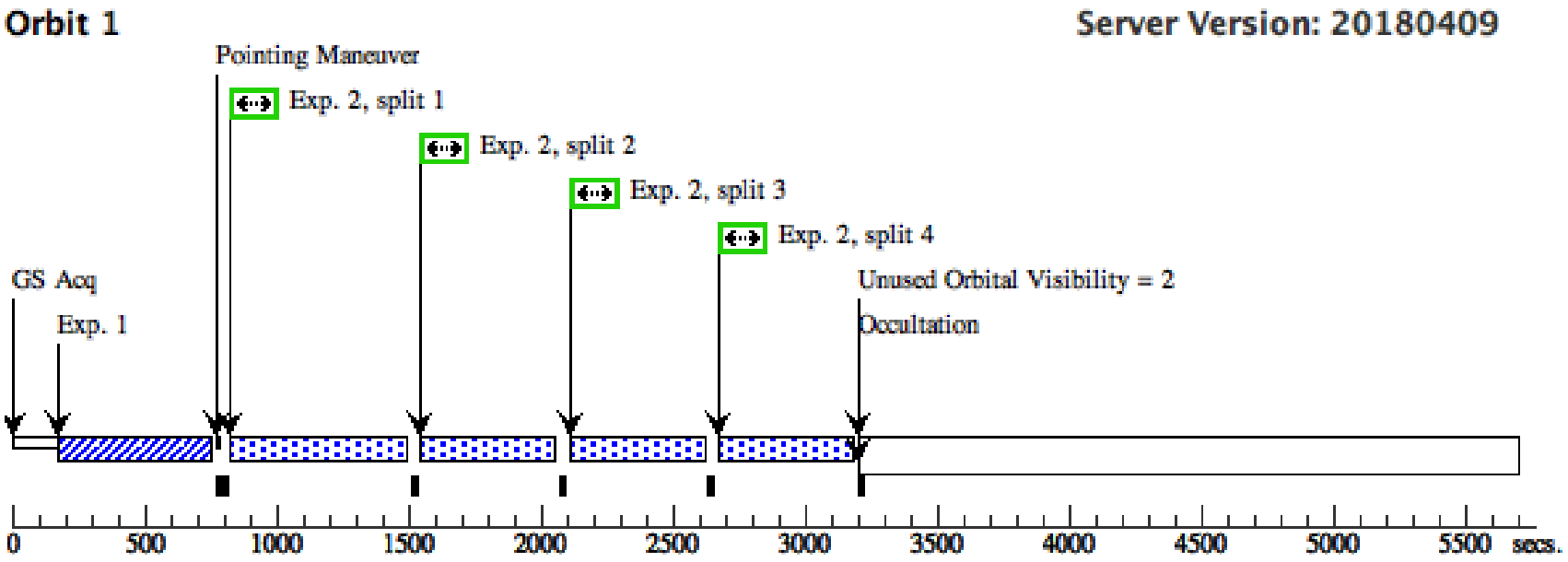
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ104457	RA: 10 44 57.7900 (161.2407917d) Dec: +03 53 13.10 (3.88697d) Equinox: J2000		V=17.55 g = 17.49, r = 17.76	Reference Frame: ICRS

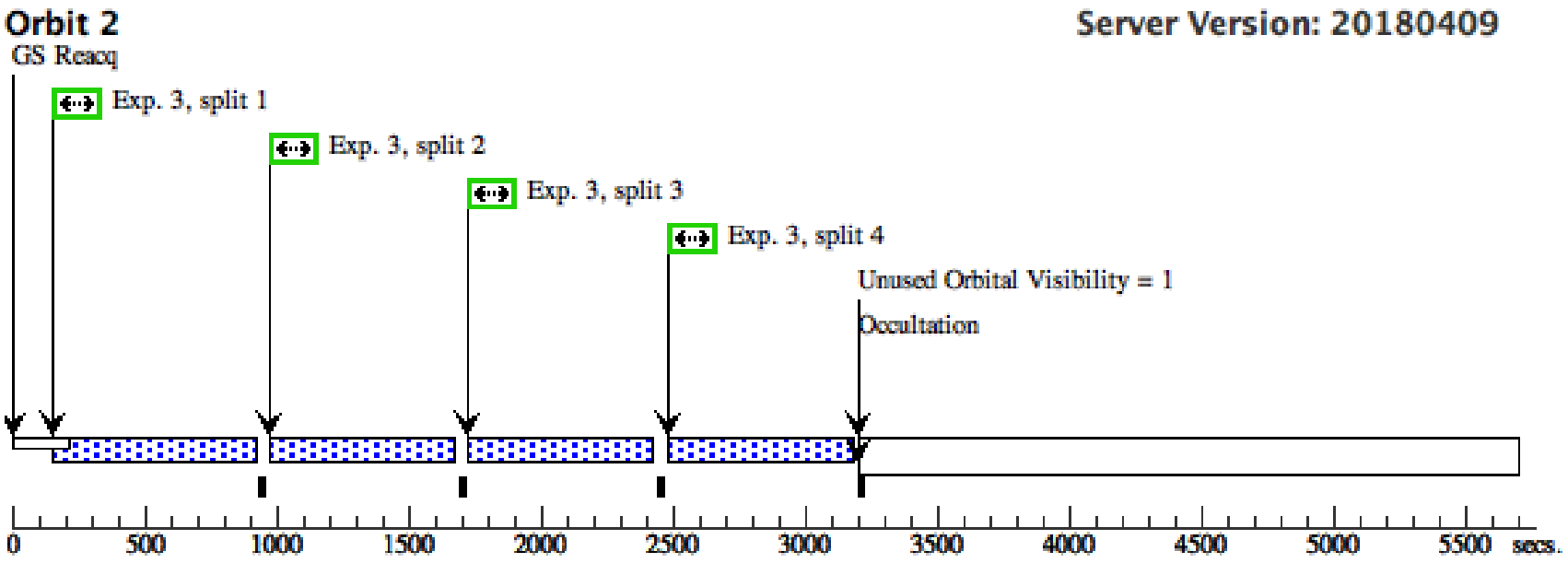
Comments:
Category=GALAXY
Description=[DWARF COMPACT]
Extended=YES

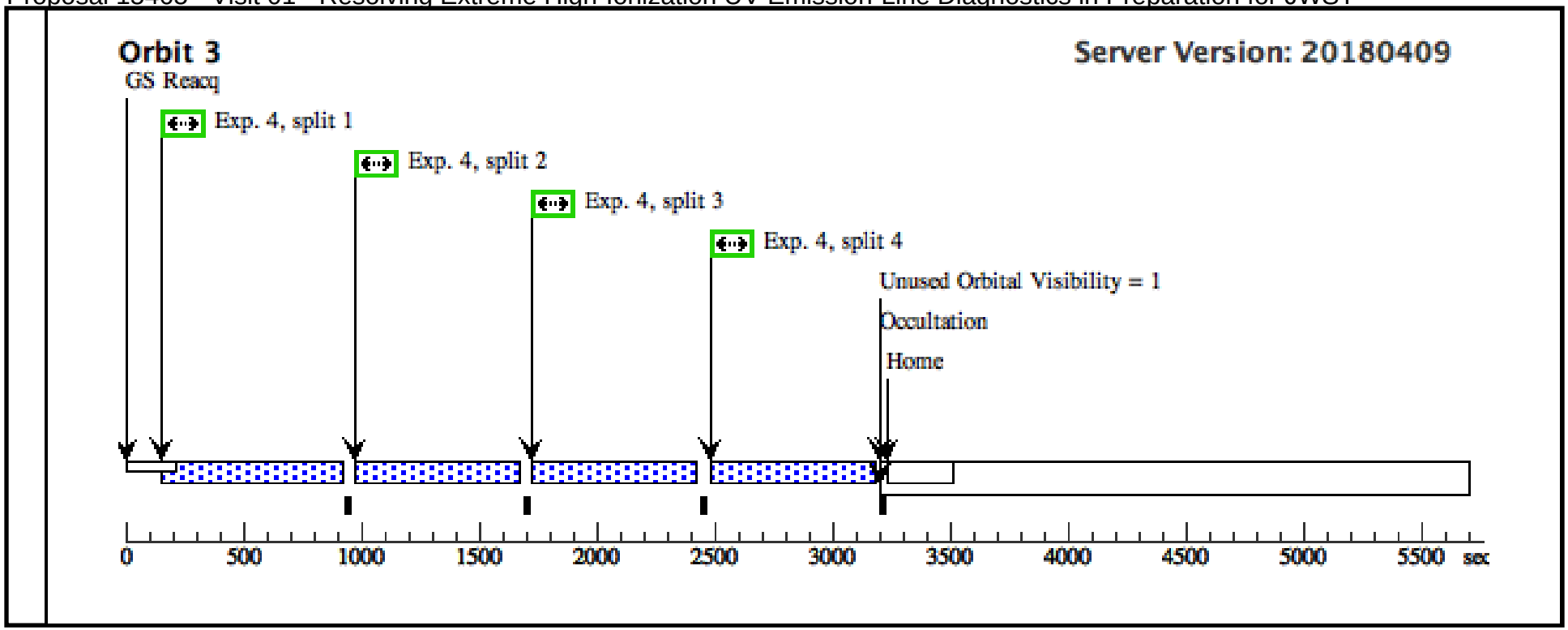
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (1166419)	(1) SDSSJ104457	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				183 Secs (183 Secs) *[==>]*	*[1]*
2	Science (1154484)	(1) SDSSJ104457	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=27581			1846 Secs (1832 Secs) *[==>458.0 Secs (Split 1)]* *[==>458.0 Secs (Split 2)]* *[==>458.0 Secs (Split 3)]* *[==>458.0 Secs (Split 4)]*	*[1]*
3	Science (1154484)	(1) SDSSJ104457	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=27851			1846 Secs (2600 Secs) *[==>650.0 Secs (Split 1)]* *[==>650.0 Secs (Split 2)]* *[==>650.0 Secs (Split 3)]* *[==>650.0 Secs (Split 4)]*	*[2]*
4	Science (1154484)	(1) SDSSJ104457	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=27851			1846 Secs (2600 Secs) *[==>650.0 Secs (Split 1)]* *[==>650.0 Secs (Split 2)]* *[==>650.0 Secs (Split 3)]* *[==>650.0 Secs (Split 4)]*	*[3]*

Orbit Structure






Orbit 3
Server Version: 20180409
GS Reacq
Exp. 4, split 1
Exp. 4, split 2
Exp. 4, split 3
Exp. 4, split 4
Unused Orbital Visibility = 1
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15465, Visit 02, implementation Fri Jun 01 19:09:14 GMT 2018

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

(Visit 02) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

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(Science (02.002)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

(Science (02.003)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

(Science (02.004)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

(Science (02.005)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

(Science (02.006)) Warning (Form): COS FUV PSA science exposures with extended targets have special calibration limitations. See "Errors and Warnings" for more details.

Fixed Targets

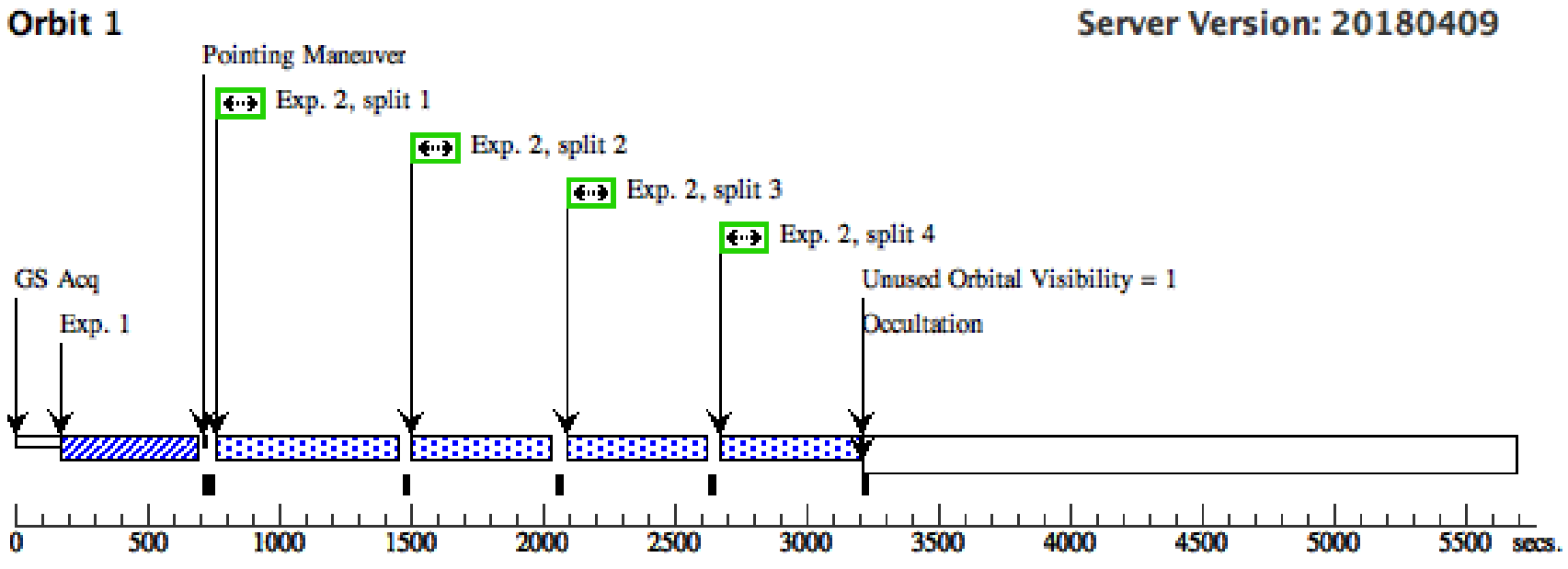
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	J141851	RA: 14 18 51.1194 (214.7129975d) Dec: +21 02 39.84 (21.04440d) Equinox: J2000		V=17.77 SDSS r-band = 17.65	Reference Frame: ICRS

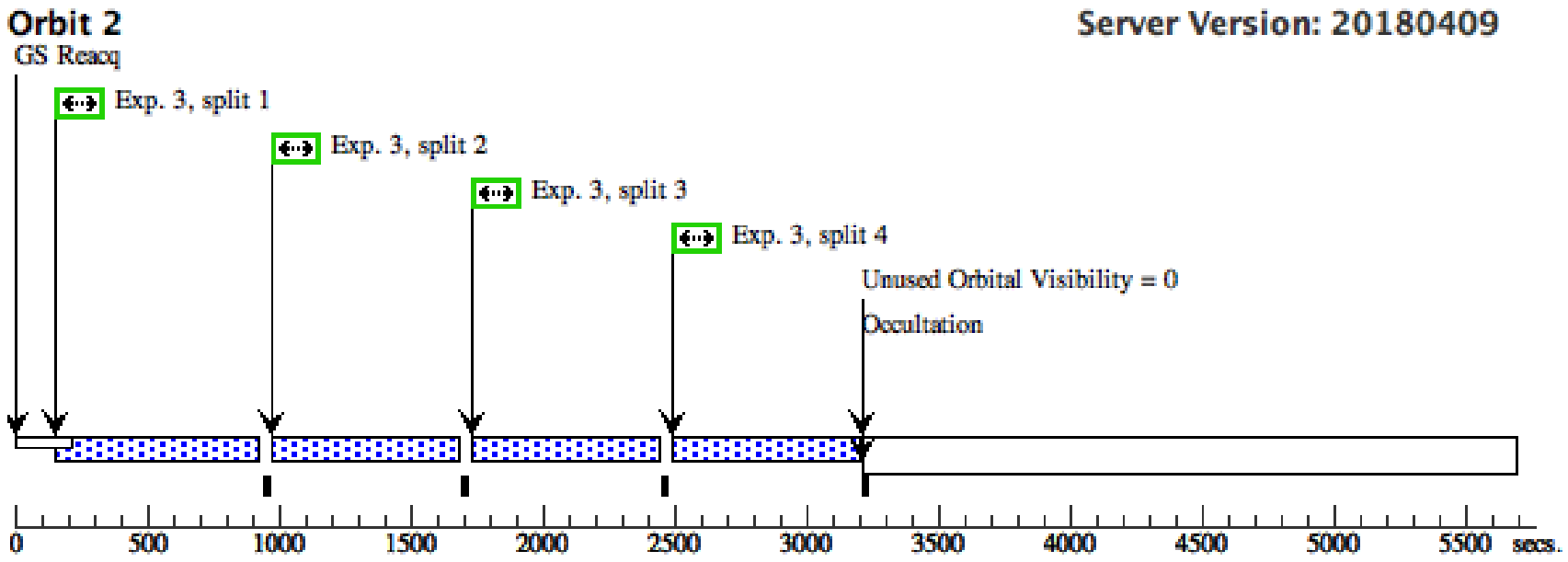
Comments:
Category=GALAXY
Description=[DWARF COMPACT]
Extended=YES

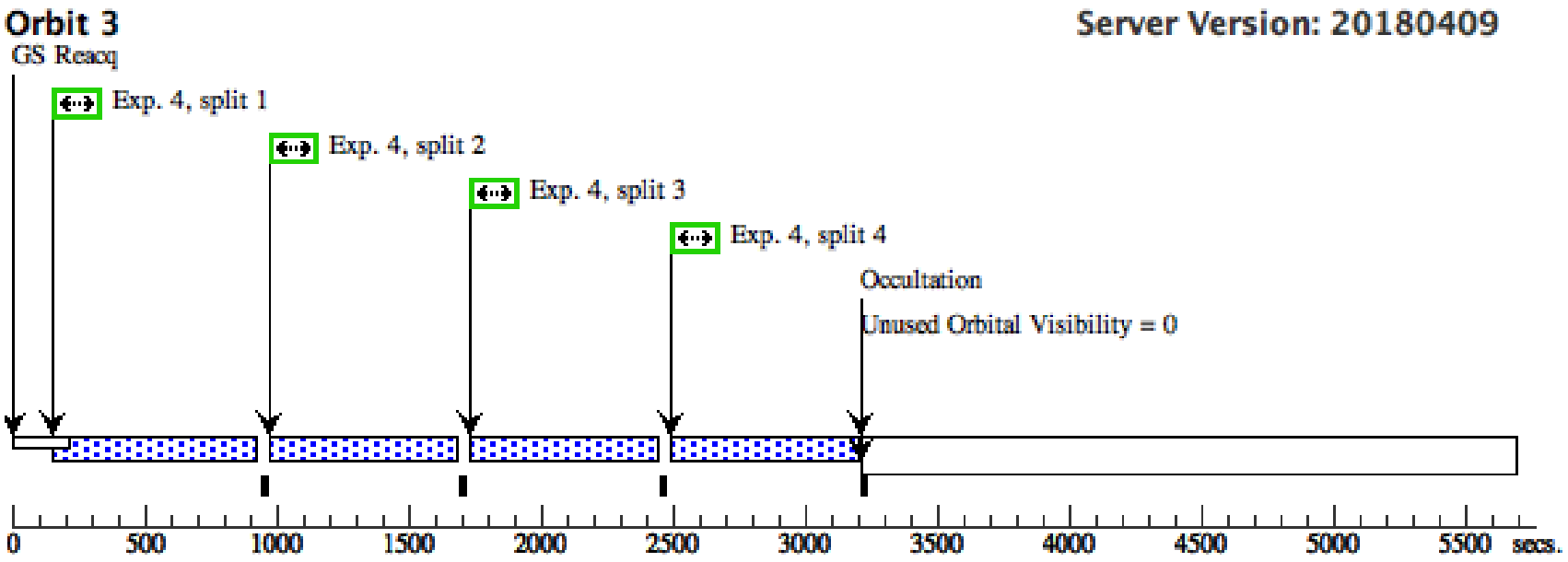
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (821799)	(2) J141851	COS/NUV, ACQ/IMAGE, PSA	MIRRORA		GS ACQ SCENARIO BASE1B3		153 Secs (153 Secs) *[==>]*	***[1]***
2	Science (1155171)	(2) J141851	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=31682			1846 Secs (1908 Secs) *[==>477.0 Secs (Split 1)]* *[==>477.0 Secs (Split 2)]* *[==>477.0 Secs (Split 3)]* *[==>477.0 Secs (Split 4)]*	***[1]***
3	Science (1155171)	(2) J141851	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=31682			1846 Secs (2616 Secs) *[==>654.0 Secs (Split 1)]* *[==>654.0 Secs (Split 2)]* *[==>654.0 Secs (Split 3)]* *[==>654.0 Secs (Split 4)]*	***[2]***
4	Science (1155171)	(2) J141851	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=31682			1846 Secs (2616 Secs) *[==>654.0 Secs (Split 1)]* *[==>654.0 Secs (Split 2)]* *[==>654.0 Secs (Split 3)]* *[==>654.0 Secs (Split 4)]*	***[3]***
5	Science (1155171)	(2) J141851	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=31682			1846 Secs (2616 Secs) *[==>654.0 Secs (Split 1)]* *[==>654.0 Secs (Split 2)]* *[==>654.0 Secs (Split 3)]* *[==>654.0 Secs (Split 4)]*	***[4]***
6	Science (1155171)	(2) J141851	COS/FUV, TIME-TAG, PSA	G160M 1589 A	SEGMENT=BOTH; FLASH=YES; FP-POS=ALL; BUFFER-TIME=31682			1846 Secs (2616 Secs) *[==>654.0 Secs (Split 1)]* *[==>654.0 Secs (Split 2)]* *[==>654.0 Secs (Split 3)]* *[==>654.0 Secs (Split 4)]*	***[5]***

Orbit Structure






Orbit 3
Server Version: 20180409
GS Reacq
Exp. 4, split 1
Exp. 4, split 2
Exp. 4, split 3
Exp. 4, split 4
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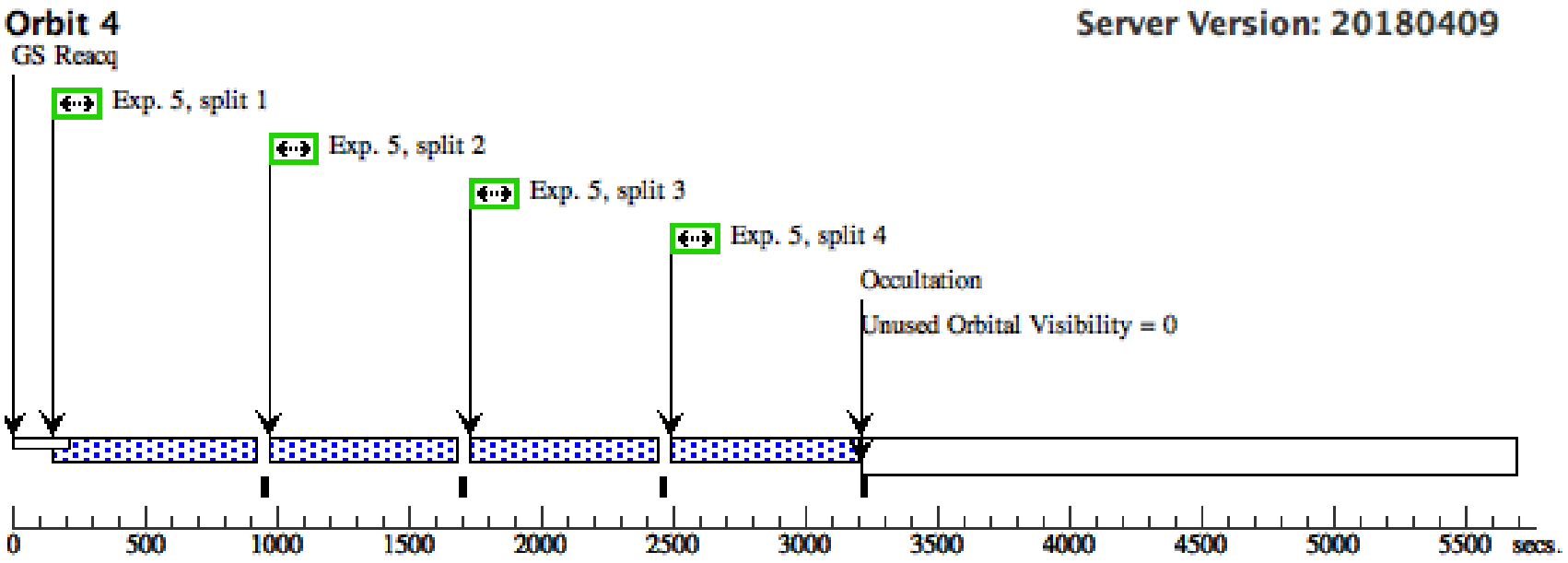
secs.


Orbit 4
Server Version: 20180409
GS Reacq
Exp. 5, split 1
Exp. 5, split 2
Exp. 5, split 3
Exp. 5, split 4
Occultation
Unused Orbital Visibility = 0
0
500
1000
1500
2000
2500
3000
3500
4000
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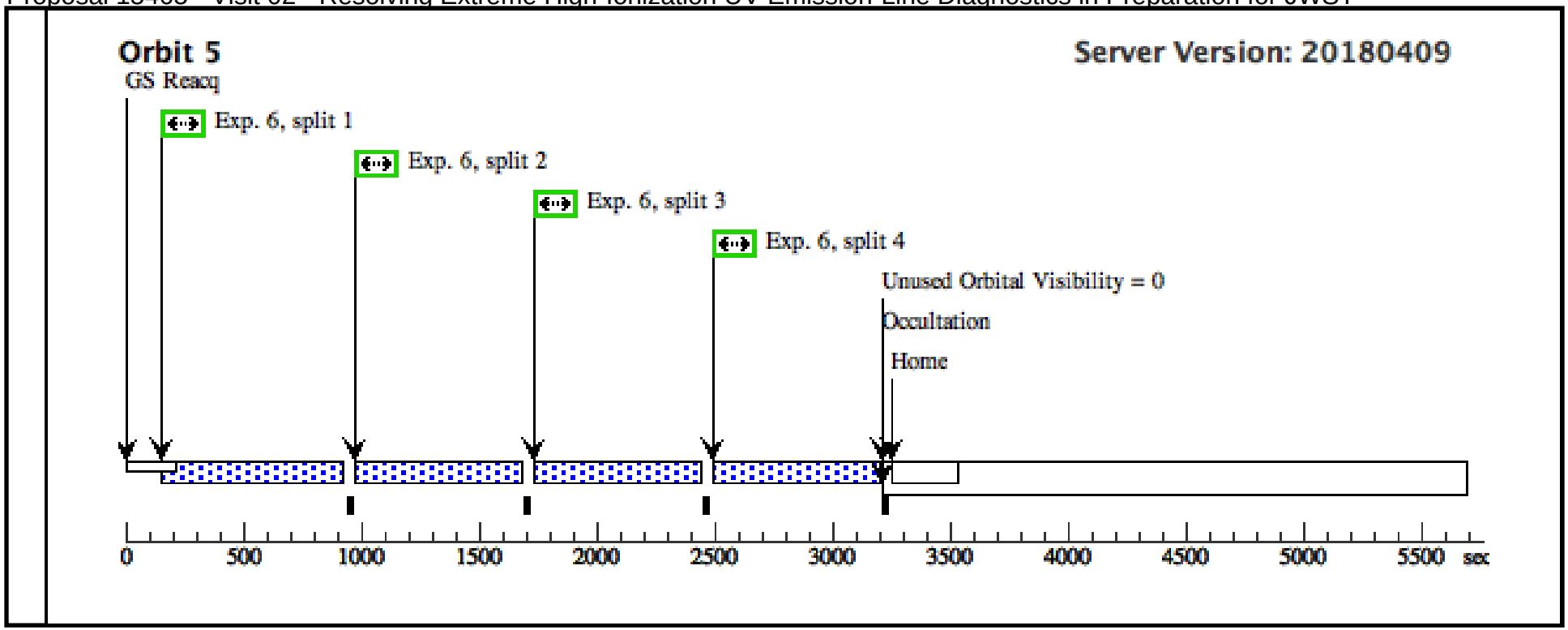
5000
5500
secs.


Orbit 5
Server Version: 20180409
GS Reacq
Exp. 6, split 1
Exp. 6, split 2
Exp. 6, split 3
Exp. 6, split 4
Unused Orbital Visibility = 0
Occultation
Home
0
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec