17138 - Studying ionizing photon escape from a bright gravitationally lensed reionization era analog at z=1.43

Cycle: 30, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Ramesh Mainali (PI) (Contact)	**NASA Goddard Space Flight Center**
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Dr. Bethan Lesley James (CoI) (ESA Member)	Space Telescope Science Institute - ESA - JWST
Dr. Michelle Berg (CoI)	University of Texas at Austin

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) CSWA-20	WFC3/UVIS	4	14-Jun-2023 14:00:12.0	yes
02	(1) CSWA-20	WFC3/UVIS	3	14-Jun-2023 14:00:13.0	yes
03	(1) CSWA-20	WFC3/UVIS	3	14-Jun-2023 14:00:14.0	yes

10 Total Orbits Used

ABSTRACT

We propose WFC3 UVIS/G280 grism observations of a bright lensed galaxy at z=1.43 to measure ionizing (LyC) photons escaping from the system. The combination of unique brightness (g=20.7) and lensing magnification allows measurement of ionizing photon escape at sub-kpc level. The existing ground-based spectroscopy shows spectral features similar to a reionization-era galaxies. Furthermore, the galaxy shows tell-tale signs of

ionizing photon production and escape. Based on the newly developed indirect measure of LyC photons using Mg II emission lines, we estimate ionizing photons escape fraction (dust corrected) of 36+/-11%. Our proposed observations will help understand (i) the connection between Mg II emission and LyC photons, (ii) the effects of stellar feedback on LyC photon escape, and (iii) allow spatially resolved Lyman-alpha map in a reionization era analog. This source is one of three at any redshift where a spatially resolved study of LyC photons is possible. This study will add to the extremely rare class of bright lensed systems showing LyC leakage, which will provide further insight to the LyC escape. Our observations will exploit the ultraviolet capability of HST allowing the study of production and escape of ionizing photons from an exceptionally bright z=1.43 galaxy that is representative of reionization epoch.

OBSERVING DESCRIPTION

We will use WFC3 UVIS G280 grism to obtain Lyman continuum and Lyman-alpha in a bright gravitationally lensed arc (r=20.7) at z=1.43. We select the coordinates of the brightest star forming region as the RA/DEC and place it at the center of chip2 in order to boost the QE and flux calibration at shorter wavelengths. We split total 10 orbits into 3 visits (4 orbits, 3 orbits and 3 orbits) to improve schedulability. Prior to each visit, we will obtain two direct imaging using F300X with integration time of 200s each. For undispersed imaging, we will use G280-REF as an aperture. Following suggestion from the Instrument Scientist, we will use post-flash for the F300X images to achieve a background of ~20 electron/pix. In order to avoid contamination from a bright source, we request an ORIENT angle of 36 degree. This will ensure non contamination of spectra by nearby bright sources around the wavelength of interests.

Visit

Proposal 17138, Visit 01, completed Wed Jun 14 18:00:14 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 150D TO 156 D; ORIENT 330D TO 336 D

Fixed Targets

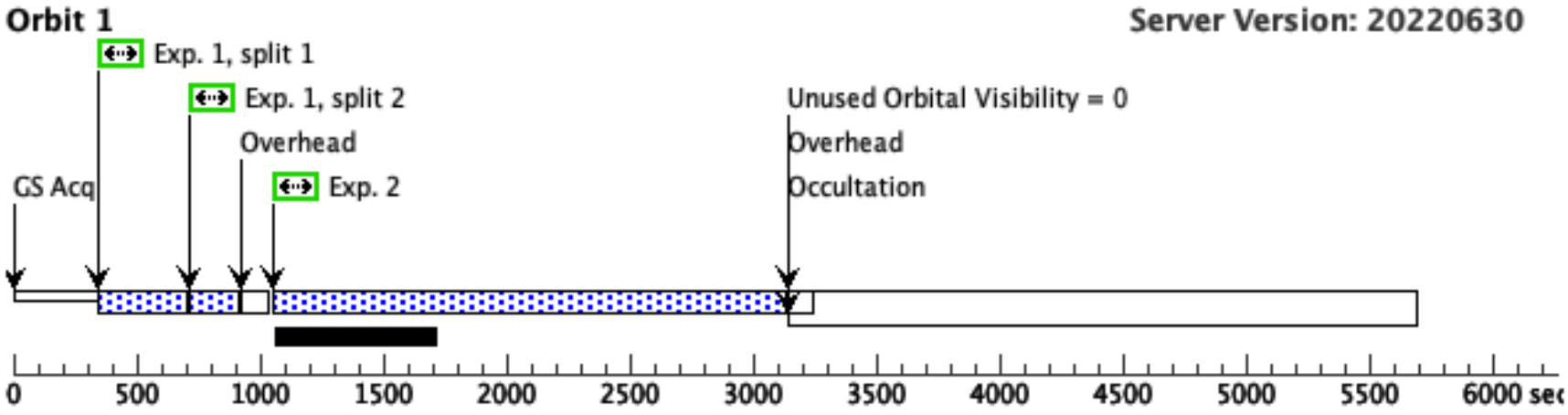
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CSWA-20	RA: 14 41 49.1500 (220.4547917d) Dec: +14 41 20.60 (14.68906d) Equinox: J2000	Redshift: 1.43	V=20.7+/-0.1	Reference Frame: ICRS

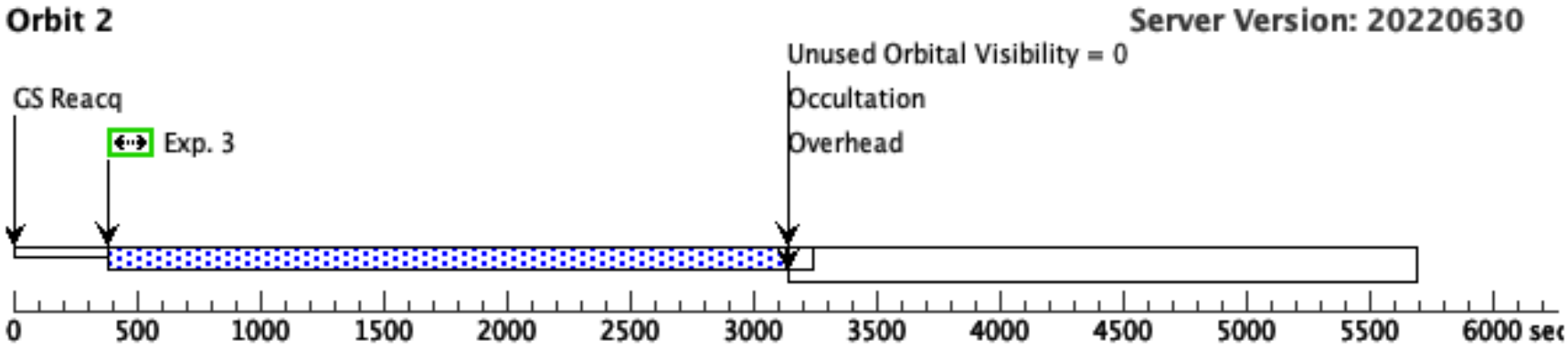
Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

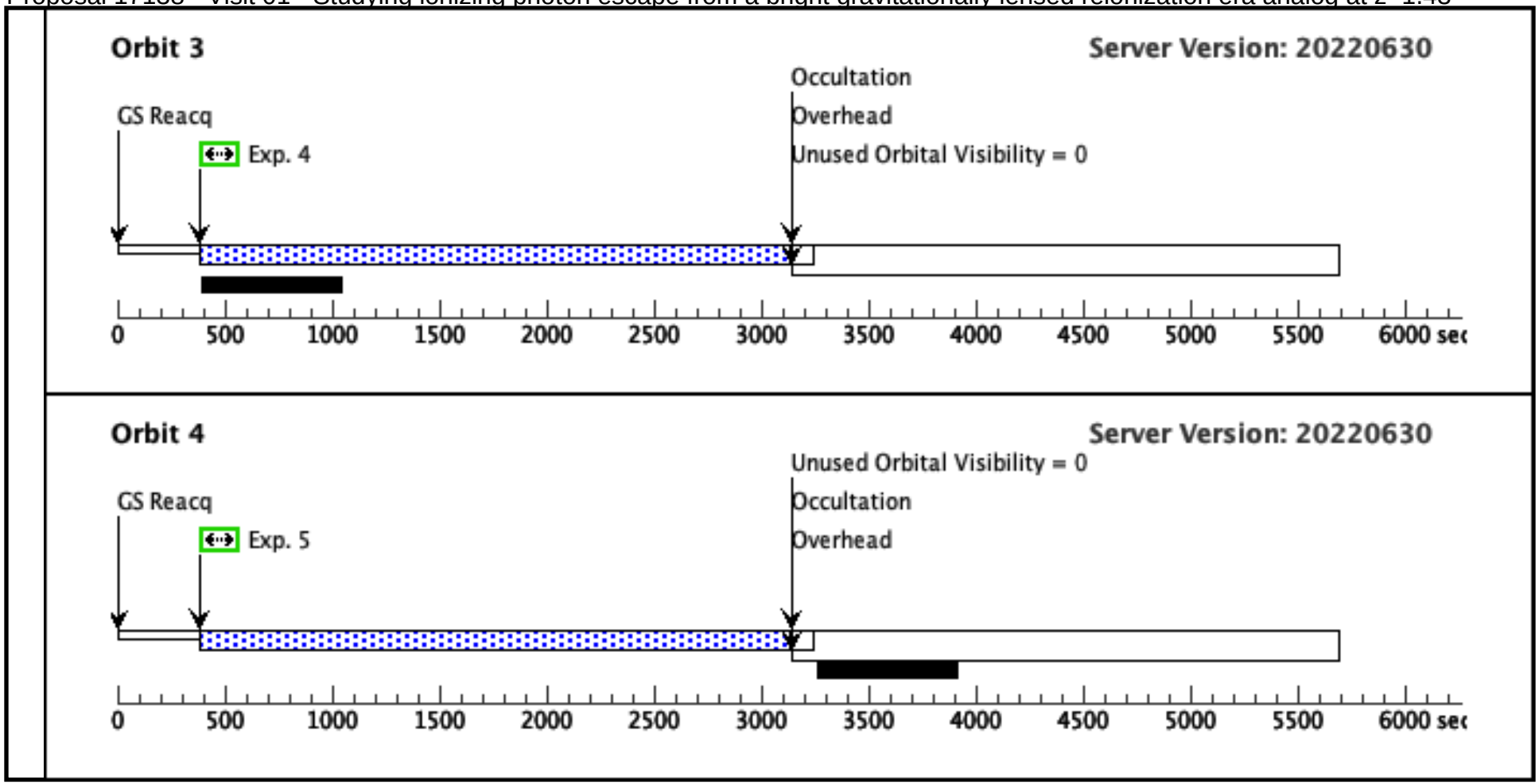
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Undespersed	(1) CSWA-20	WFC3/UVIS, ACCUM, G280-REF	F300X	CR-SPLIT=2; FLASH=19	POS TARG null,-50		400 Secs (400 Secs) *[==>(Split 1)]* *[==>(Split 2)]*	***[1]***
2	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG null,-50		2074 Secs (2074 Secs) *[==>]*	***[1]***
3	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG null,-50		2740 Secs (2749 Secs) *[==>2749.0 Secs]*	***[2]***
4	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG null,-50		2700 Secs (2749 Secs) *[==>2749.0 Secs]*	***[3]***
5	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG null,-50		2700 Secs (2749 Secs) *[==>2749.0 Secs]*	***[4]***

Orbit Structure



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GS Reacq
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Visit

Proposal 17138, Visit 02, scheduling Wed Jun 14 18:00:14 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 145D TO 145 D

Fixed Targets

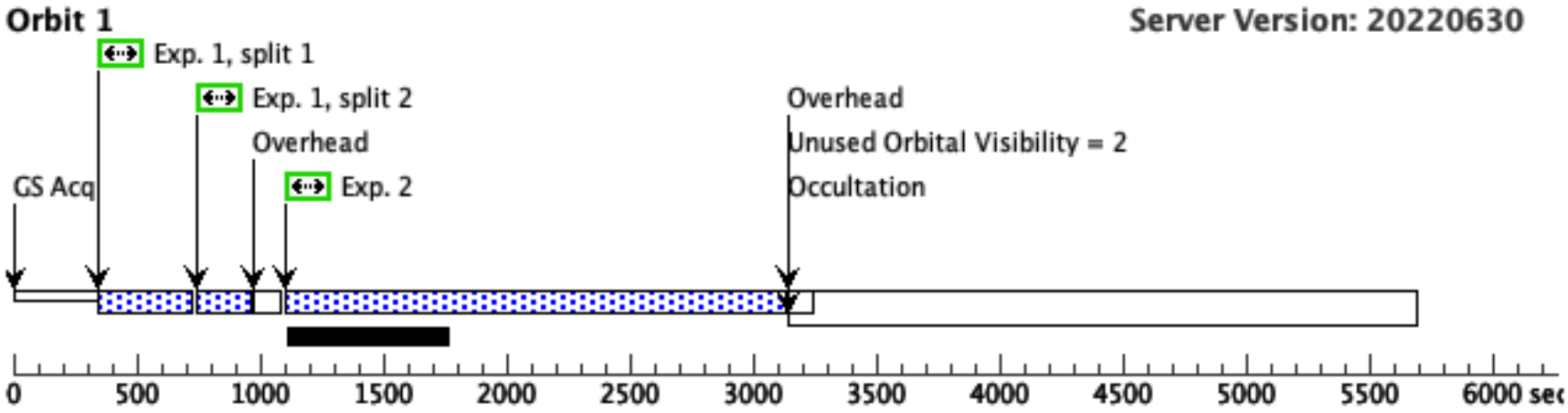
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CSWA-20	RA: 14 41 49.1500 (220.4547917d) Dec: +14 41 20.60 (14.68906d) Equinox: J2000	Redshift: 1.43	V=20.7+/-0.1	Reference Frame: ICRS

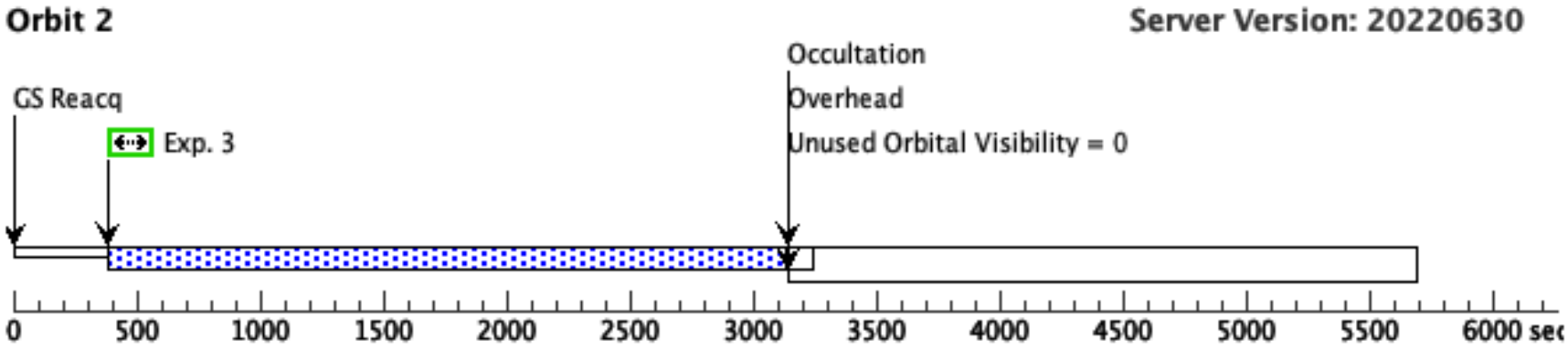
Comments:
Category=GALAXY
Description=[GRAVITATIONAL LENS, HIGH REDSHIFT GALAXY]

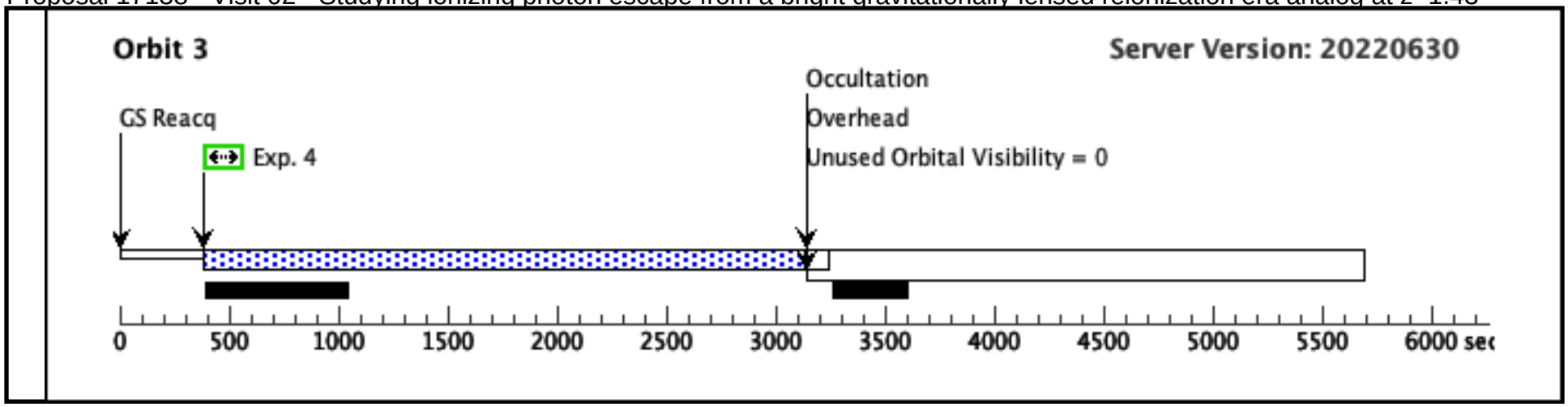
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Undespersed	(1) CSWA-20	WFC3/UVIS, ACCUM, G280-REF	F300X	CR-SPLIT=2; FLASH=19	POS TARG -0.092,-50.098		400 Secs (448 Secs) *[==>224.0 Secs (Split 1)]* *[==>224.0 Secs (Split 2)]*	***[1]***
2	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG -0.092,-50.098		2000 Secs (2024 Secs) *[==>2024.0 Secs]*	***[1]***
3	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG -0.092,-50.098		2700 Secs (2749 Secs) *[==>2749.0 Secs]*	***[2]***
4	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG -0.092,-50.098		2700 Secs (2749 Secs) *[==>2749.0 Secs]*	***[3]***

Orbit Structure



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Visit

Proposal 17138, Visit 03, scheduling Wed Jun 14 18:00:14 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 145D TO 145 D

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CSWA-20	RA: 14 41 49.1500 (220.4547917d) Dec: +14 41 20.60 (14.68906d) Equinox: J2000	Redshift: 1.43	V=20.7+/-0.1	Reference Frame: ICRS

Comments:
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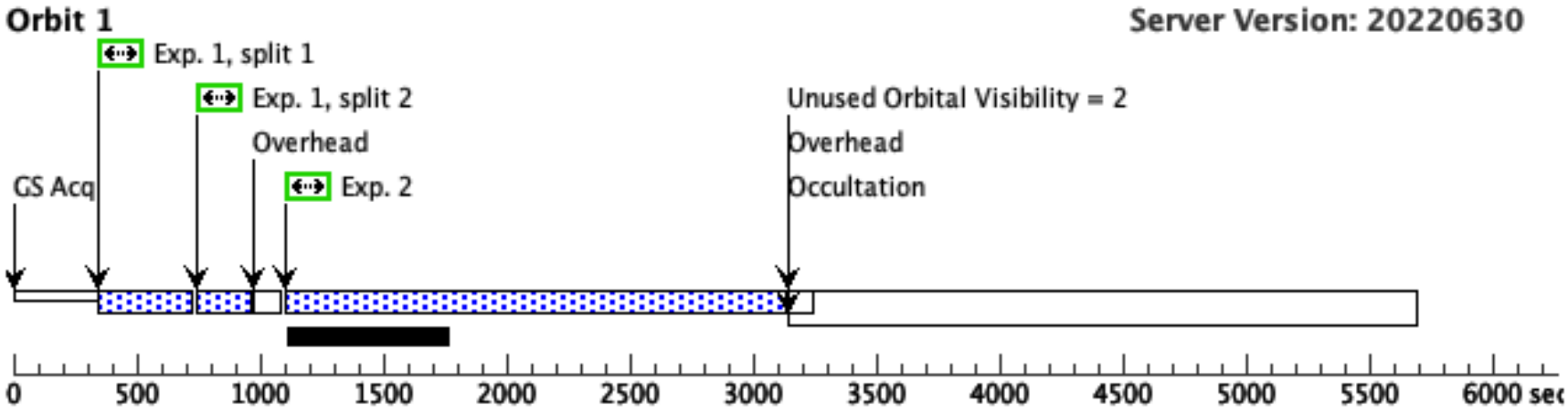
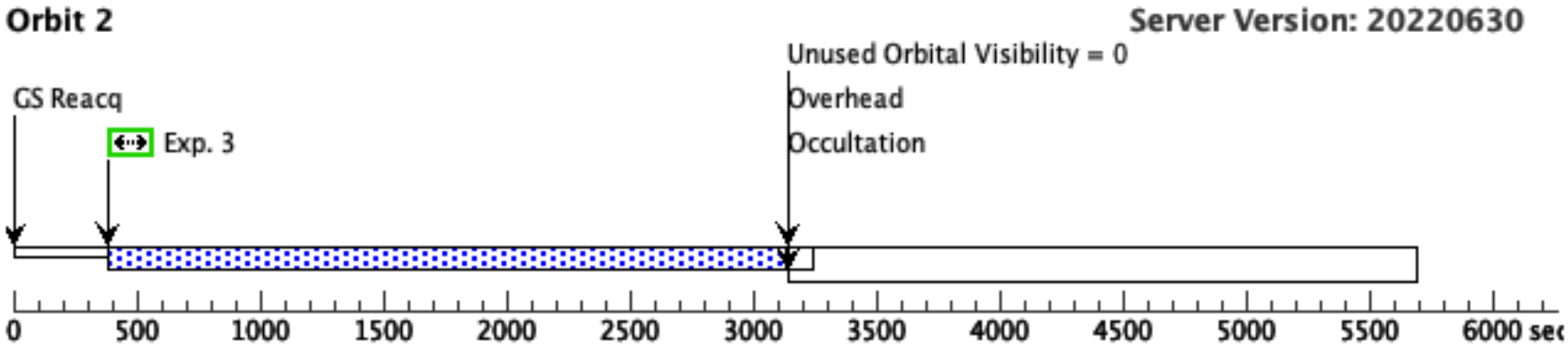
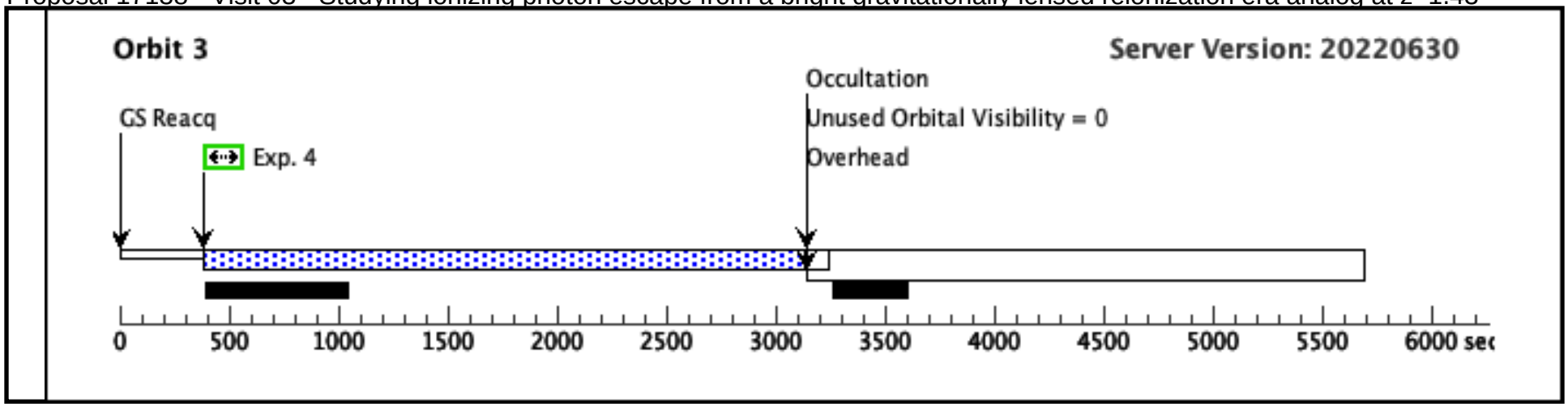
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Undespersed	(1) CSWA-20	WFC3/UVIS, ACCUM, G280-REF	F300X	CR-SPLIT=2; FLASH=19	POS TARG -0.185,-50.197		400 Secs (448 Secs) *[==>224.0 Secs (Split 1)]* *[==>224.0 Secs (Split 2)]*	***[1]***
2	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG -0.185,-50.197		2000 Secs (2024 Secs) *[==>2024.0 Secs]*	***[1]***
3	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG -0.185,-50.197		2700 Secs (2749 Secs) *[==>2749.0 Secs]*	***[2]***
4	Despersed	(1) CSWA-20	WFC3/UVIS, ACCUM, UVIS	G280		POS TARG -0.185,-50.197		2700 Secs (2749 Secs) *[==>2749.0 Secs]*	***[3]***

Orbit Structure



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