



15896 - Escaping Ionizing Radiation in Compact Star-Forming Galaxies: Probing Higher-Mass Systems

Cycle: 27, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) KISSR-847	COS/FUV COS/NUV	5	22-Jul-2019 11:02:32.0	yes
02	(2) KISSR-1516	COS/FUV COS/NUV	5	22-Jul-2019 11:02:34.0	yes
03	(3) KISSR-1759	COS/FUV COS/NUV	5	22-Jul-2019 11:02:35.0	yes
04	(4) KISSR-2042	COS/FUV COS/NUV	5	22-Jul-2019 11:02:37.0	yes
05	(5) HADOT-144	COS/FUV COS/NUV	5	22-Jul-2019 11:02:38.0	yes

25 Total Orbits Used

ABSTRACT

Understanding the mechanisms responsible for reionization in the early universe is one of the most important questions in modern extragalactic research. The commonly accepted theory is that star-forming galaxies are the main contributors to this ionizing radiation. However, the exact nature of these galaxies - high mass vs. low mass - is still being debated. Recently, a class of compact starbursting galaxies known as Green Peas have been shown to exhibit high Lyman-alpha and Lyman continuum (LyC) escape fractions. With the existence of a low-redshift population of LyC emitting galaxies confirmed, the research in this field must transition to carrying out comprehensive studies of the nature of LyC emitting galaxies. We propose to use COS to observe 5 compact star-forming galaxies selected from a complete, flux-limited sample that probes to higher galaxy masses than previous studies. This study will significantly expand the number of known LyC emitters and extend their study to include a more diverse range of galaxy properties. We will measure the Lyman-alpha line profiles and attempt to detect LyC emission from these sources. These observations will contribute to our understanding of the escape mechanisms of ionizing radiation in galaxies, as well as provide insight into the types of sources responsible for cosmic reionization.

OBSERVING DESCRIPTION

Our targets have a compact/unresolved morphology in the SDSS images (Figure 3) meaning that the 2.5 diameter COS aperture will measure the totality of the galaxy's light so that global quantities can be derived.

NUV acquisition images of the targets using excellent input coordinates from SDSS will be obtained with the standard MirrorA and the ACQ/IMAGE mode to reach a $S/N \sim 20$ inside a 9×9 pixel box centered on the brightest part of the galaxy. The total time needed for acquisition depends on the NUV flux of the object and its compactness. The NUV fluxes for our targets were obtained from the GALEX database. Using the faintest GALEX NUV magnitude in our sample, 21.64 mag, our ETC run using the "Extended source that fills the aperture (1.25 arcsec radius)" setting returned an exposure time of 1200 s. According to Cardamone et al (2009), the angular radius of compact GP-like objects at a redshift of ~ 0.35 that contains 50% of the UV light is more like 0.3 arcsec. This implies that a much shorter integration time of 300 s will still yield an image with a high S/N in excess of 20. As a bonus we will be able to study the morphology of our targets with these acquisition images.

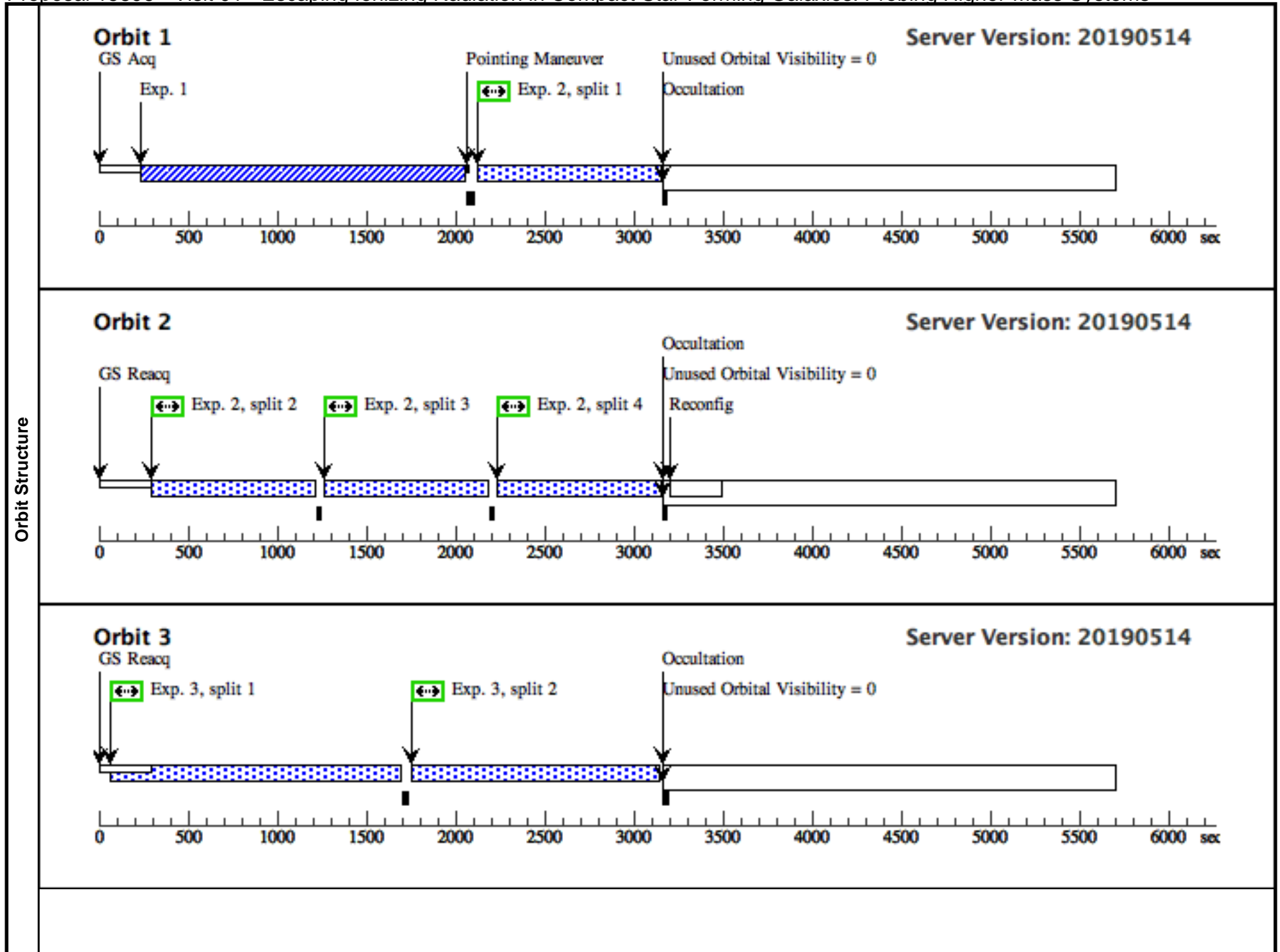
We plan to use COS in combination with two gratings: 1) the low-resolution G140L grating (770-1950 Å) to measure the LyC. We adopt a flat spectral energy distribution and use the GALEX NUV magnitude in order to calculate the required number of orbits to probe the LyC escape fraction

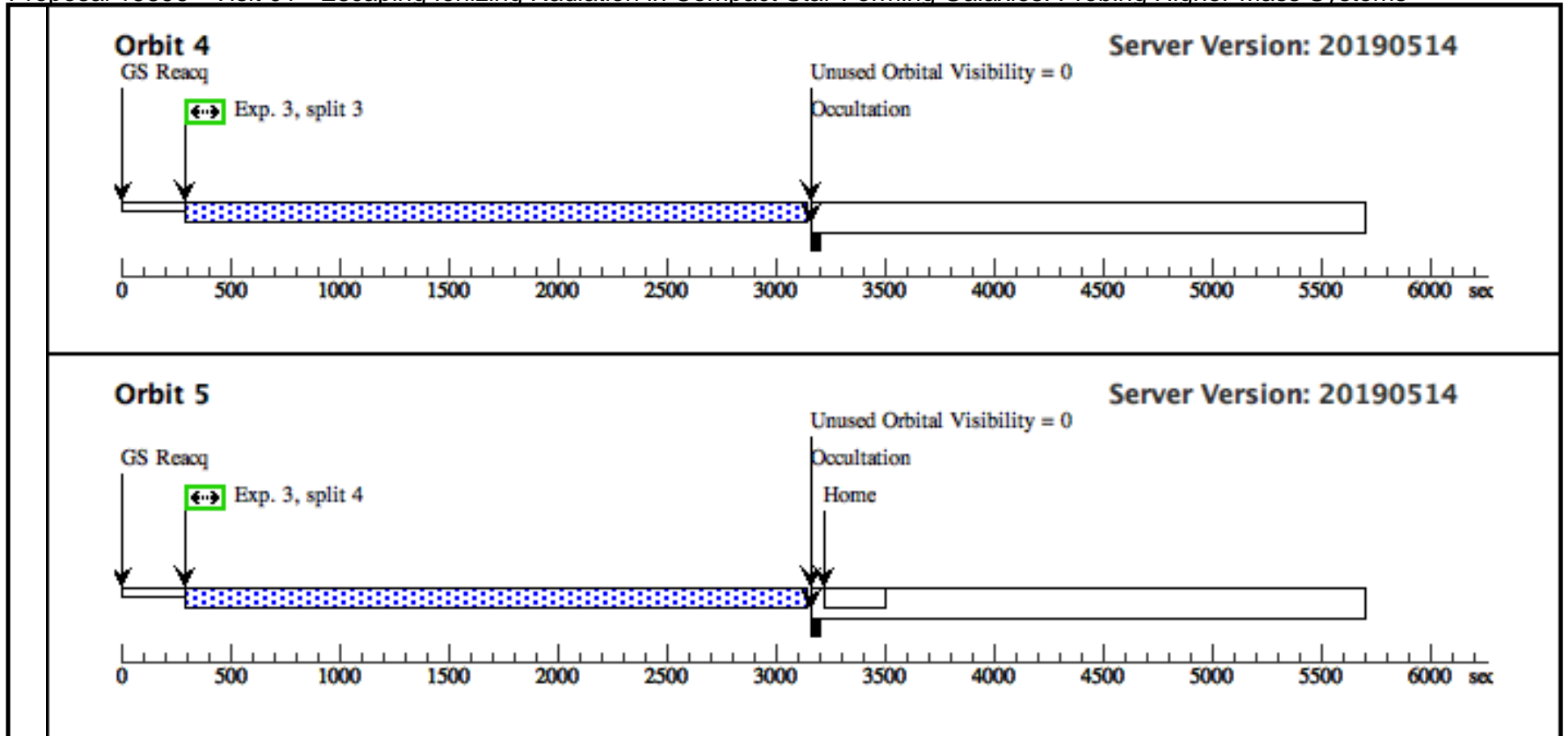
down to 2% with SNR $\sim 2-3$. 2) the medium-resolution G160M grating (1602-1772 Å) to observe the Ly-alpha line. Again, we adopt a flat spectral energy distribution and use the GALEX NUV magnitude as well as inputting a model Ly-alpha emission line to calculate for each object the required exposure time to obtain a $S/N > 5$. We check the later estimate by using our measured H-alpha line fluxes, and assume Case B recombination and a 5% Ly-alpha escape fraction to arrive at an alternate exposure time estimate. Since most of our sources exhibit negligible absorption based on their optical spectra ($c_{\text{H}\beta} \sim 0$), we simply adopt Galactic extinction, which is ~ 0.05 mag for these galaxies, in the ETC calculations. The ETC shows our count rates are safe for the instrument for all of our targets.

Proposal 15896 - Visit 01 - Escaping Ionizing Radiation in Compact Star-Forming Galaxies: Probing Higher-Mass Systems

Mon Jul 22 15:02:39 GMT 2019

Visit	Proposal 15896, Visit 01 Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
		(1)	KISSR-847	RA: 15 43 55.2400 (235.9801667d) Dec: +29 27 50.16 (29.46393d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.35575	V=21.245 NUV=22.08 +/- 0.25, FUV=22.27, g=21.62, r=21.12, i=22.13	Reference Frame: ICRS			
	<i>Comments: This object is compact. The coordinates were obtained from SDSS DR15. NUV and FUV magnitudes come from GALEX, and gri magnitudes come from SDSS DR15. Category=GALAXY Description=[STARBURST] Extended=NO</i>									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	KISS-847 A CQ (COS.ta.136 8726)	(1) KISSR-847	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				800 Secs (800 Secs) [==>]	[1]
2	KISS-847 G 160M (COS.sp.136 8331)	(1) KISSR-847	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=20 000; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			800 Secs (3402 Secs) [==>813.0 Secs (Split 1)] [==>863.0 Secs (Split 2)] [==>863.0 Secs (Split 3)] [==>863.0 Secs (Split 4)]	[1] [2]	
3	KISS-847 G 140L (COS.sp.136 8338)	(1) KISSR-847	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=10 000; FLASH=YES; FP-POS=ALL; SEGMENT=A			1500 Secs (8280 Secs) [==>1341.0 Secs (Split 1)] [==>1341.0 Secs (Split 2)] [==>2799.0 Secs (Split 3)] [==>2799.0 Secs (Split 4)]	[3] [4] [5]	

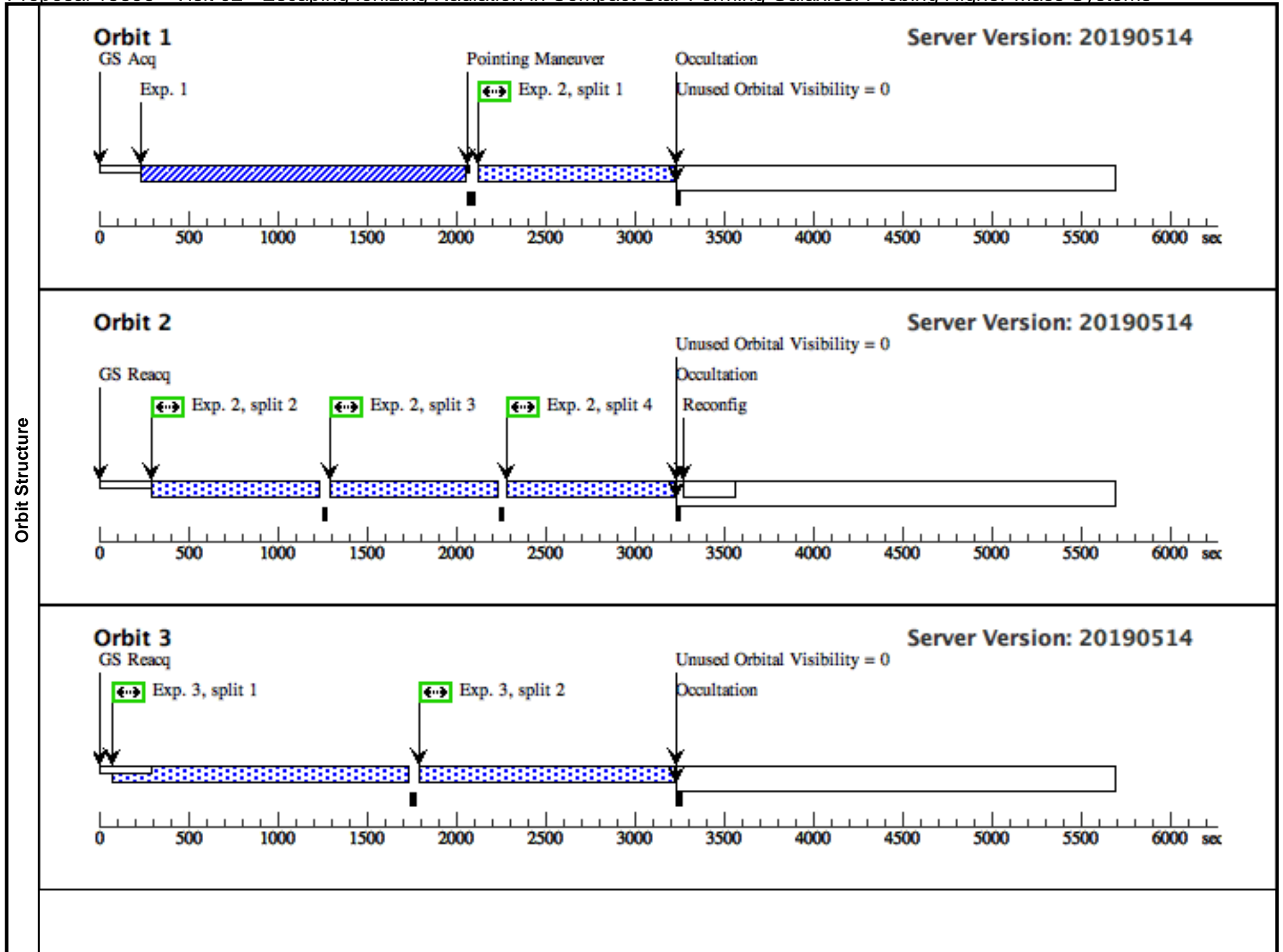


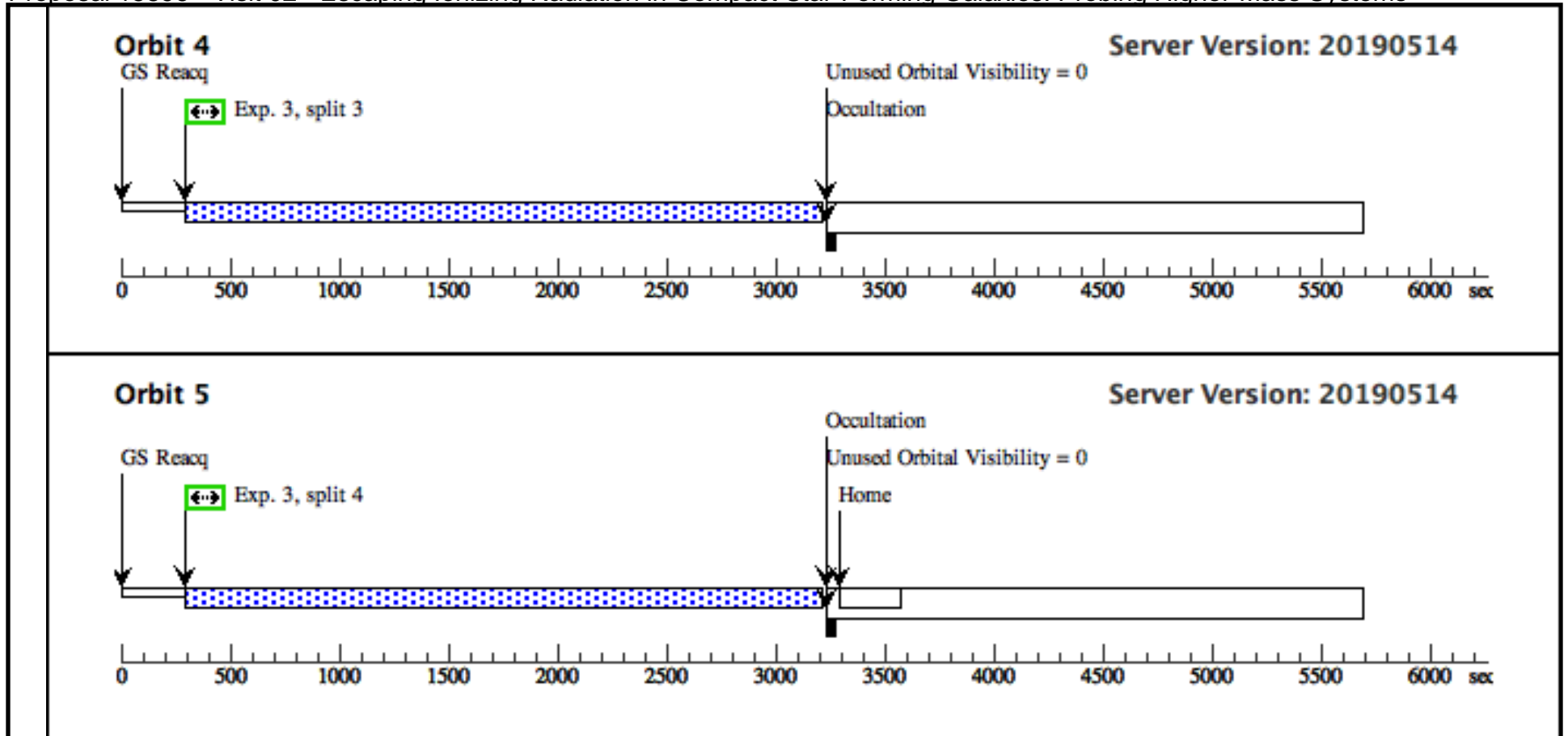


Proposal 15896 - Visit 02 - Escaping Ionizing Radiation in Compact Star-Forming Galaxies: Probing Higher-Mass Systems

Mon Jul 22 15:02:39 GMT 2019

Visit		Proposal 15896, Visit 02 Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)								
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	KISSR-1516	RA: 13 15 49.4300 (198.9559583d) Dec: +43 34 30.46 (43.57513d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.32766	V=19.353 NUV=19.67 +/- 0.03, FUV=20.66, g=19.47, r=18.96, i=19.59	Reference Frame: ICRS				
<i>Comments: This object is compact. The coordinates were obtained from SDSS DR15. NUV and FUV magnitudes come from GALEX, and gri magnitudes come from SDSS DR15. Category=GALAXY Description=[STARBURST] Extended=NO</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	KISS-1516 ACQ (COS.ta.136 8732)	(2) KISSR-1516	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				800 Secs (800 Secs) [==>]	[1]
	2	KISS-1516 G160M (COS.sp.136 8307)	(2) KISSR-1516	COS/FUV, TIME-TAG, PSA	G160M 1577 A	BUFFER-TIME=20 000;	FLASH=YES; FP-POS=ALL; SEGMENT=BOTH		800 Secs (3554 Secs) [==>892.0 Secs (Split 1)] [==>887.0 Secs (Split 2)] [==>887.0 Secs (Split 3)] [==>888.0 Secs (Split 4)]	[1] [2]
	3	KISS-1516 G140L (COS.sp.136 8340)	(2) KISSR-1516	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=10 000;	FLASH=YES; FP-POS=ALL; SEGMENT=A		1500 Secs (8499 Secs) [==>1377.0 Secs (Split 1)] [==>1378.0 Secs (Split 2)] [==>2872.0 Secs (Split 3)] [==>2872.0 Secs (Split 4)]	[3] [4] [5]

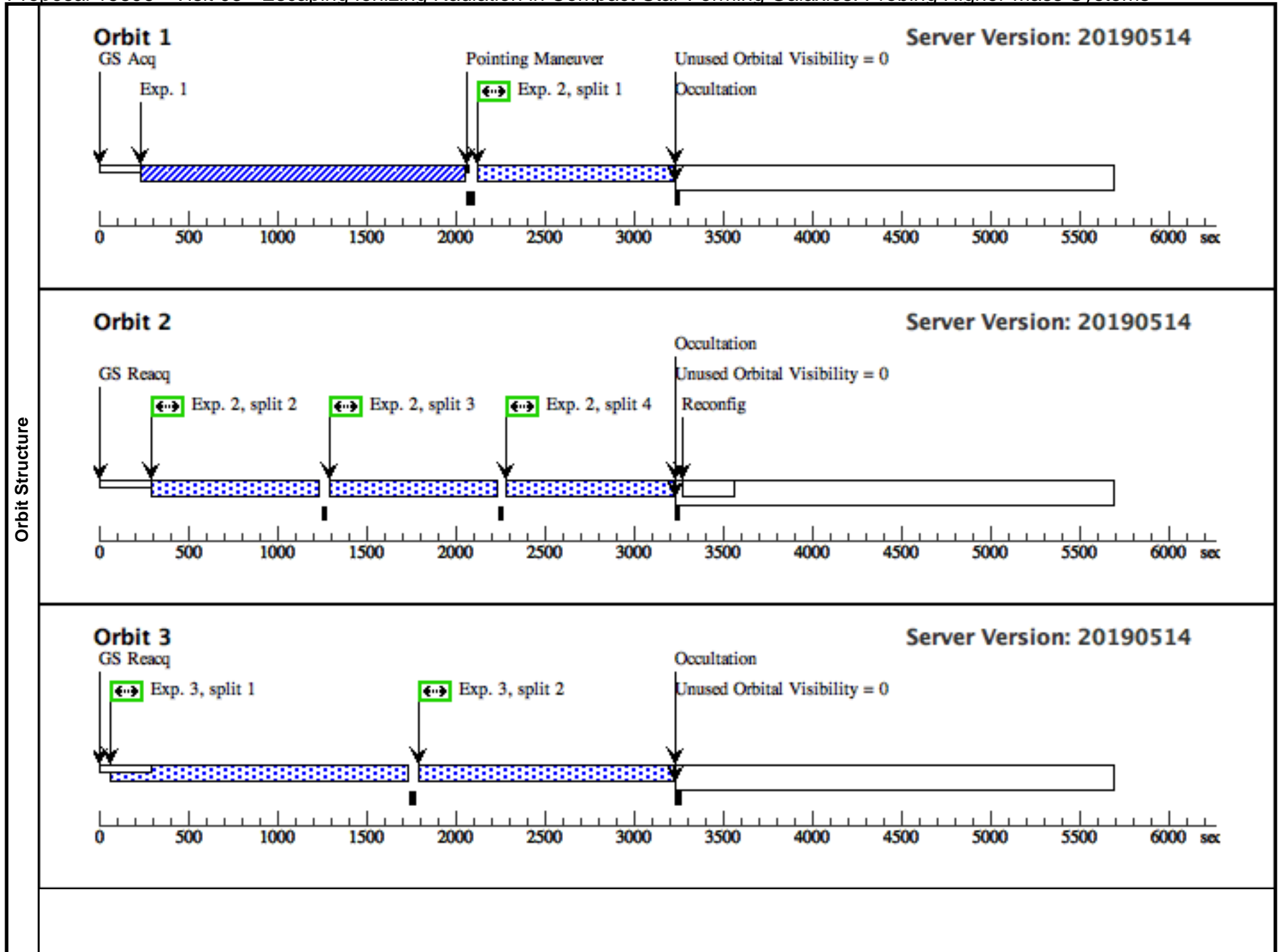


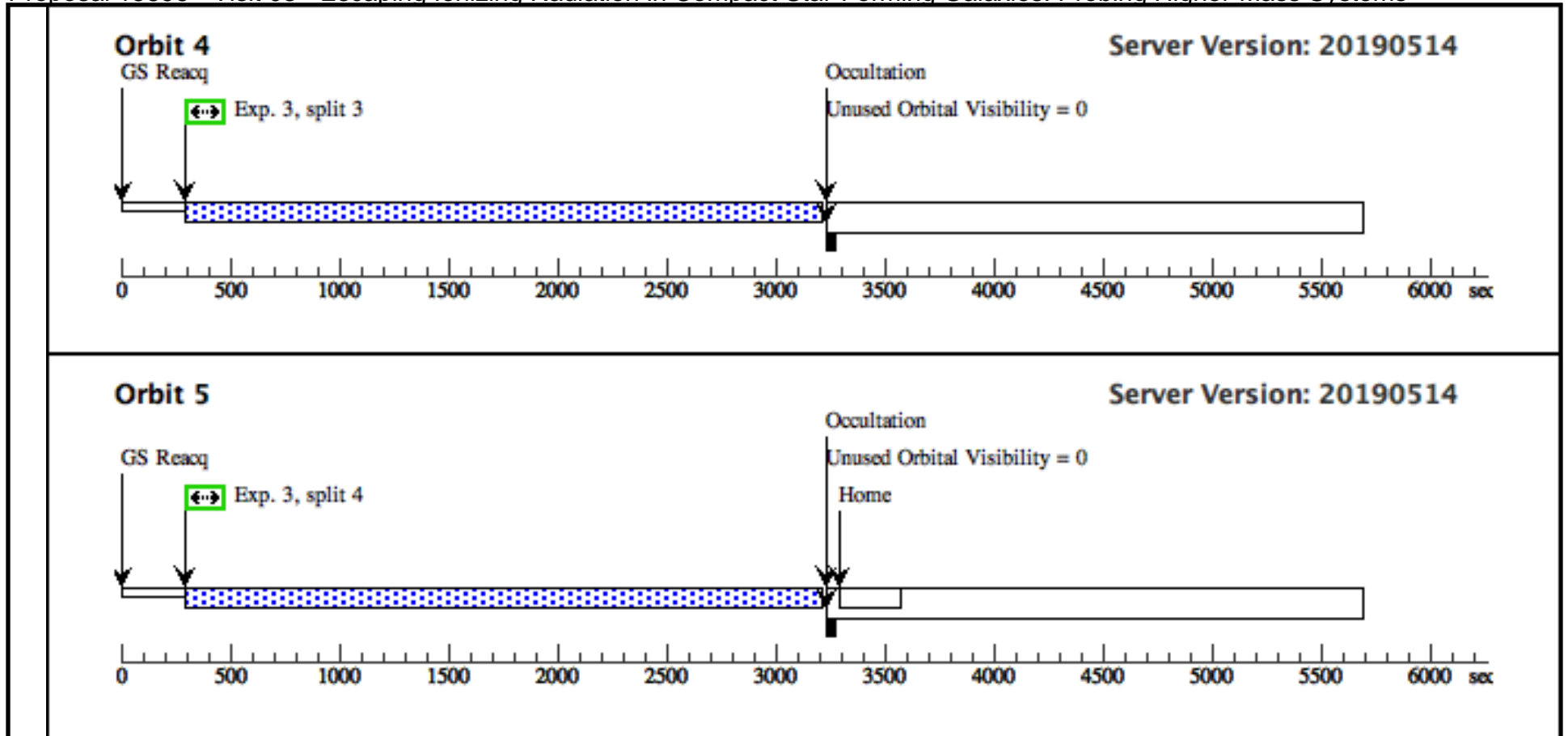


Proposal 15896 - Visit 03 - Escaping Ionizing Radiation in Compact Star-Forming Galaxies: Probing Higher-Mass Systems

Mon Jul 22 15:02:39 GMT 2019

Visit	Proposal 15896, Visit 03 Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
		(3)	KISSR-1759	RA: 14 20 38.1200 (215.1588333d) Dec: +43 43 33.13 (43.72587d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.40504	V=21.018 NUV=21.64 +/- 0.31, g=21.04, r=20.98, i=20.25	Reference Frame: ICRS			
	<i>Comments: This object is compact. The coordinates were obtained from SDSS DR15. NUV magnitude comes from GALEX, and gri magnitudes come from SDSS DR15. Category=GALAXY Description=[STARBURST] Extended=NO</i>									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	KISS-1759 ACQ (COS.ta.136 8734)	(3) KISSR-1759	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				800 Secs (800 Secs) [==>]	[1]
2	KISS-1759 G160M (COS.sp.136 8317)	(3) KISSR-1759	COS/FUV, TIME-TAG, PSA	G160M 1611 A	BUFFER-TIME=20 000; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			800 Secs (3545 Secs) [==>883.0 Secs (Split 1)] [==>887.0 Secs (Split 2)] [==>887.0 Secs (Split 3)] [==>888.0 Secs (Split 4)]	[1] [2]	
3	KISS-1759 G140L (COS.sp.136 8342)	(3) KISSR-1759	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=10 000; FLASH=YES; FP-POS=ALL; SEGMENT=A			1500 Secs (8499 Secs) [==>1377.0 Secs (Split 1)] [==>1378.0 Secs (Split 2)] [==>2872.0 Secs (Split 3)] [==>2872.0 Secs (Split 4)]	[3] [4] [5]	

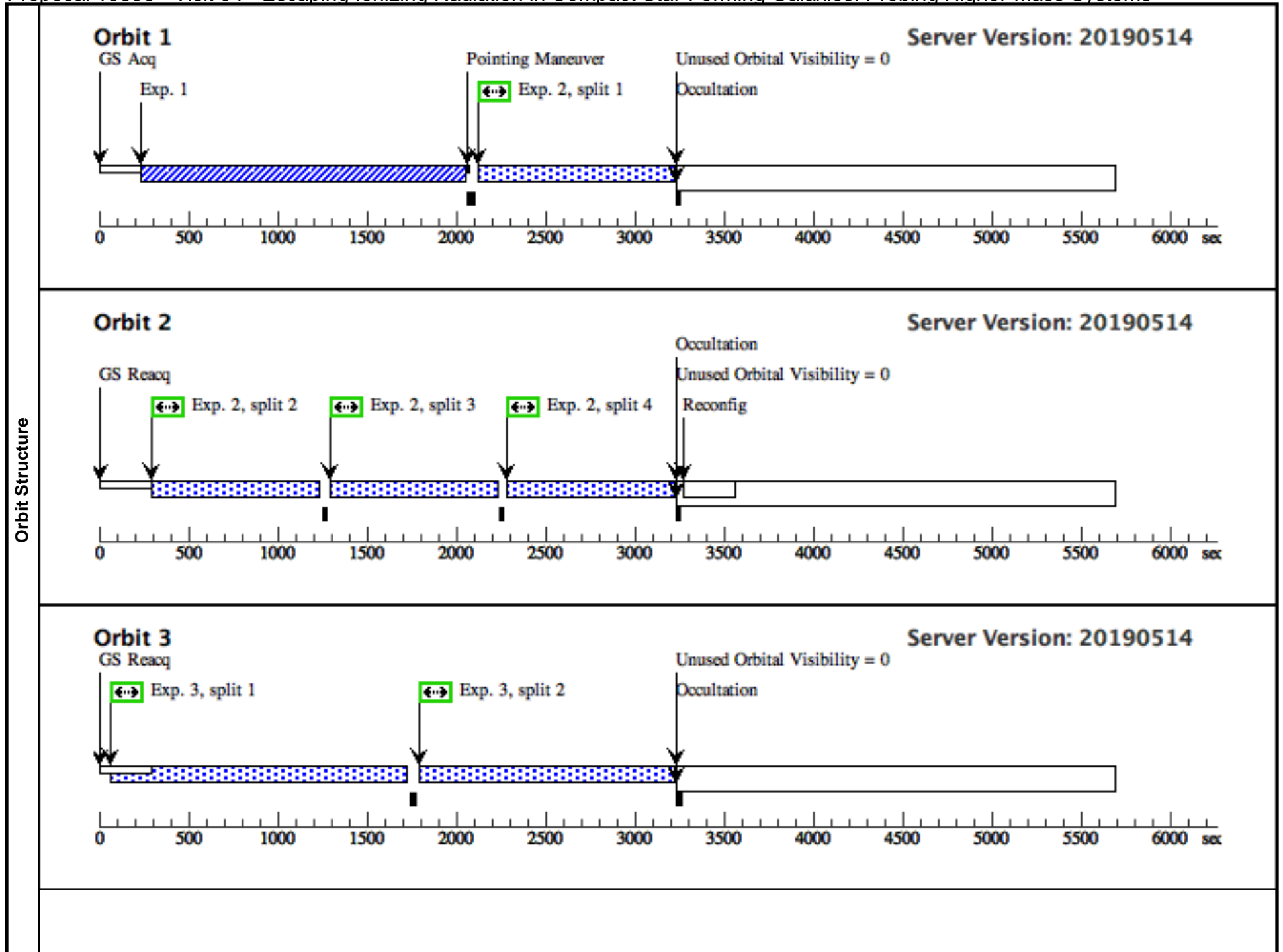


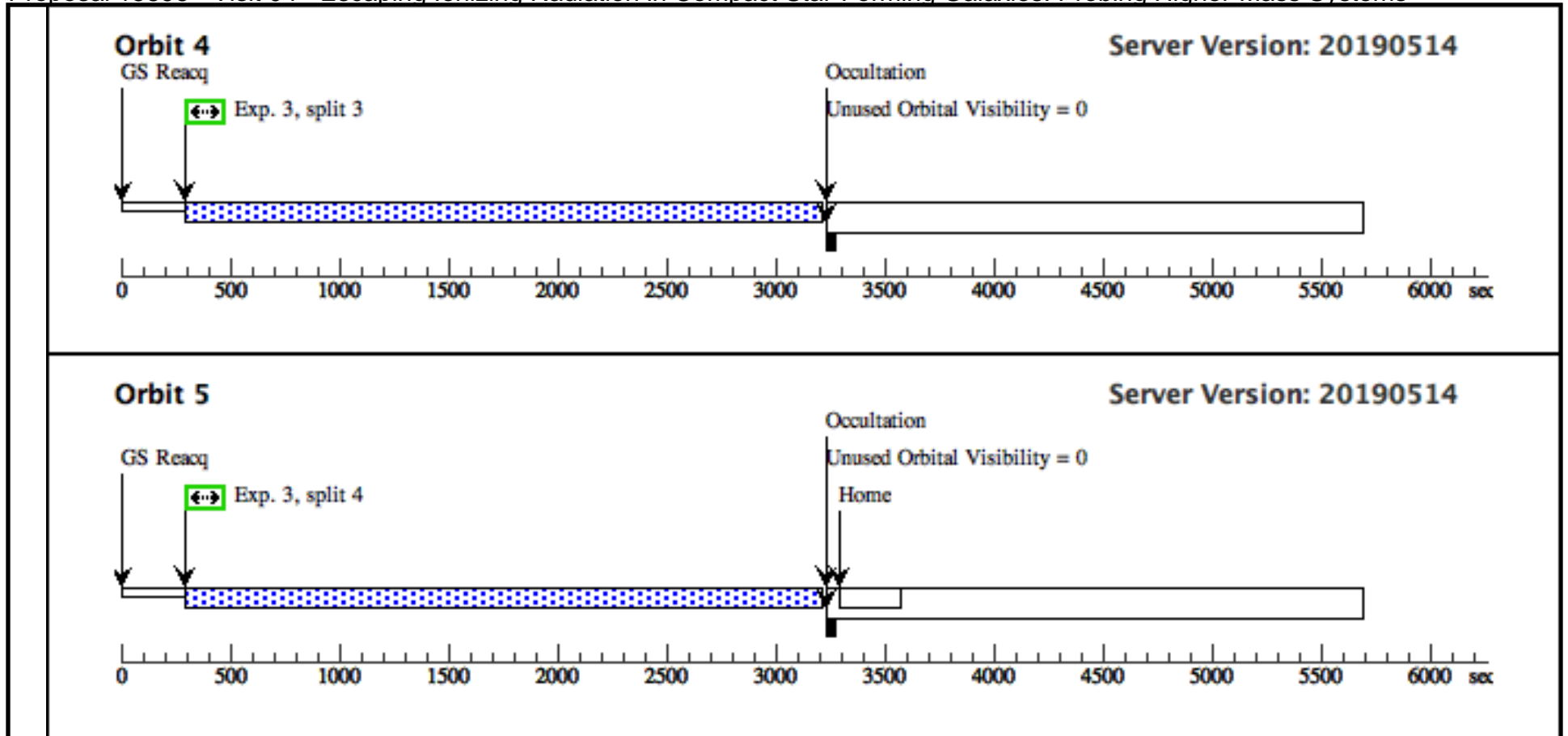


Proposal 15896 - Visit 04 - Escaping Ionizing Radiation in Compact Star-Forming Galaxies: Probing Higher-Mass Systems

Mon Jul 22 15:02:39 GMT 2019

Visit	Proposal 15896, Visit 04 Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)									
	Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
		(4)	KISSR-2042	RA: 15 49 45.5900 (237.4399583d) Dec: +43 03 25.51 (43.05709d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.35680	V=20.754 NUV=21.14 +/- 0.08, FUV=21.25, g=20.92, r=20.66, i=20.96	Reference Frame: ICRS			
	<i>Comments: This object is compact. The coordinates were obtained from SDSS DR15. NUV and FUV magnitudes come from GALEX, and gri magnitudes come from SDSS DR15. Category=GALAXY Description=[STARBURST] Extended=NO</i>									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	KISS-2042 ACQ (COS.ta.136 8735)	(4) KISSR-2042	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				800 Secs (800 Secs) [==>]	[1]
2	KISS-2042 G160M (COS.sp.136 7956)	(4) KISSR-2042	COS/FUV, TIME-TAG, PSA	G160M 1600 A	BUFFER-TIME=20 000; FLASH=YES; FP-POS=ALL; SEGMENT=BOTH			800 Secs (3548 Secs) [==>886.0 Secs (Split 1)] [==>887.0 Secs (Split 2)] [==>887.0 Secs (Split 3)] [==>888.0 Secs (Split 4)]	[1] [2]	
3	KISS-2042 G140L (COS.sp.136 8343)	(4) KISSR-2042	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=10 000; FLASH=YES; FP-POS=ALL; SEGMENT=A			1500 Secs (8499 Secs) [==>1377.0 Secs (Split 1)] [==>1378.0 Secs (Split 2)] [==>2872.0 Secs (Split 3)] [==>2872.0 Secs (Split 4)]	[3] [4] [5]	





Proposal 15896 - Visit 05 - Escaping Ionizing Radiation in Compact Star-Forming Galaxies: Probing Higher-Mass Systems

Mon Jul 22 15:02:39 GMT 2019

Visit		Proposal 15896, Visit 05 Diagnostic Status: No Diagnostics Scientific Instruments: COS/FUV, COS/NUV Special Requirements: (none)								
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(5)	HADOT-144	RA: 09 00 13.4500 (135.0560417d) Dec: +04 59 0.95 (4.98360d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.33643	V=21.10 NUV=21.59 +/- 0.34, FUV=21.91, g=21.31, r=20.50, i=21.61	Reference Frame: ICRS				
<i>Comments: This object is compact. The coordinates were obtained from SDSS DR15. NUV and FUV magnitudes come from GALEX, and gri magnitudes come from SDSS DR15. Category=GALAXY Description=[STARBURST] Extended=NO</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	HADOT-14 4 ACQ (COS.ta.136 8736)	(5) HADOT-144	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				800 Secs (800 Secs) [==>]	[1]
	2	HADOT-14 4 G160M (COS.sp.136 8327)	(5) HADOT-144	COS/FUV, TIME-TAG, PSA	G160M 1589 A	BUFFER-TIME=20 000;	FLASH=YES; FP-POS=ALL; SEGMENT=BOTH		800 Secs (3360 Secs) [==>794.0 Secs (Split 1)] [==>855.0 Secs (Split 2)] [==>855.0 Secs (Split 3)] [==>856.0 Secs (Split 4)]	[1] [2]
	3	HADOT-14 4 G140L (COS.sp.136 8344)	(5) HADOT-144	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=10 000;	FLASH=YES; FP-POS=ALL; SEGMENT=A		1500 Secs (8211 Secs) [==>1329.0 Secs (Split 1)] [==>1330.0 Secs (Split 2)] [==>2776.0 Secs (Split 3)] [==>2776.0 Secs (Split 4)]	[3] [4] [5]

