15416 - Identifying DLA Host Galaxies: The First Deep Ultraviolet Imaging of a high NHI Damped Lyman-alpha System

Cycle: 25, Proposal Category: GO

(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) J1036+2240	WFC3/UVIS	4	27-Nov-2017 18:18:24.0	yes
02	(1) J1036+2240	WFC3/UVIS	4	27-Nov-2017 18:18:25.0	yes

8 Total Orbits Used

ABSTRACT

We propose very deep imaging of the star-forming region of a high NHI z~2.4 damped Lyman-alpha system (DLA) to probe the faint galaxy population that gives rise to DLAs. We select a high NHI system to ensure detection, as it is expected to have a higher in-situ SFR. We will use a novel and proven technique that completely removes the glare of the background quasar, enabling us to reach unprecedented depths of ~0.1 Msun/yr at all impact parameters from the quasar. Specifically, we target a quasar sightline with multiple DLAs and use the higher redshift sub-DLA as a 'blocking filter' (via Lyman limit absorption) to eliminate all rest-frame FUV emission from the quasar. This enables us to search for rest-frame FUV emission from the lower redshift DLA, at wavelengths shortward of the Lyman limit of the higher redshift absorber. The high NUV throughput in F336W and high spatial resolution of WFC3/UVIS enables us to directly image the lower redshift DLA, and thus measure its star-formation rate, morphology, and impact parameter from the QSO sightline. WFC3 is the only instrument capable of directly imaging DLAs at z~2.4, where careful selection of targets, filters, and exposure times will let us measure the SFR to lower levels than previous studies. At the same time, by selecting the highest NHI system possible, its SFR will be higher, making this our best chance for imaging a DLA host galaxy. This target was identified and confirmed after the most recent proposal deadline. By studying this system, it will also pave the way to build a sample of such systems in the next cycle to learn about the DLA population as a whole, and address what type of galaxies give rise to DLAs.

OBSERVING DESCRIPTION

This program images a foreground Damped Lyman-alpha (DLA) system by using a higher redshift absorption system to block the light of the background quasar. Full orbit integrations are obtained in order to minimize post-flash and read-noise and maximize the total depth (~0.5 mag improvement). Therefore 4 orbit vists are required to enable fully cleaning the cosmic rays (as described in our phase I). Exposures are post-flashed by 4e- to help mitigate the CTE, and reach 12e- backgrounds per pixel. The dither pattern per visit is set 5 times larger than the default box pattern to help minimize the blotchy pattern observed in F336W imaging (i.e., similar to that seen in Rafelski et al. 2015, AJ, 150 31, Figure 15). Reducing CTE effects and blotchy patterns are important for our science targeting extremely faint flux from the DLA. The target is placed on chip 2 using the UVIS2-C1K1C-CTE aperture, as this places the target centered in the bottom half of chip 2 in quadrant C, which has a lower geometrical distortion and improved focus. This is done to minimize CTI and throughput in the UV. The target is >500 pixels from the bottom of the chip, which corresponds to ~160 kpc at z~2.4. The visits additionally apply a pos-targ offset to minimize a repetition of the background pattern with a 15.25 pixel shift (0.6065") for each visit.

As described in the Phase I, we wish to observe this target before the cycle 26 deadline so that we can propose for a sample of these targets in cycle

26.

Visit

Proposal 15416, Visit 01 Mon Nov 27 23:18:26 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BEFORE 01-APR-2018:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.865 Line Spacing=0.56	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)

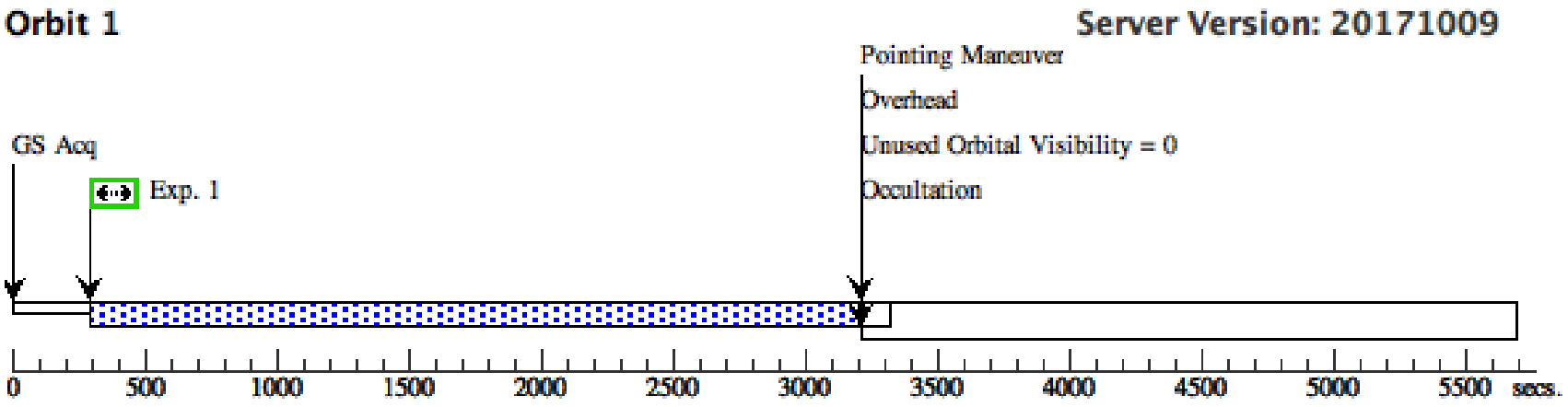
Fixed Targets

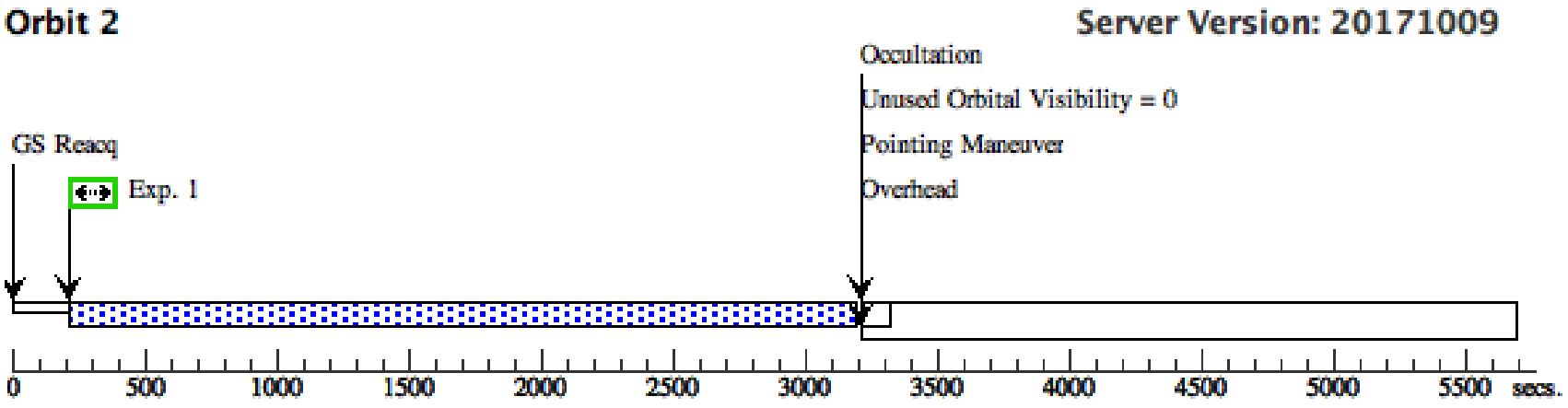
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J1036+2240	RA: 10 36 30.7500 (159.1281250d) Dec: +22 40 36.76 (22.67688d) Equinox: J2000		V=20.95+/-0.1 u=23.76	Reference Frame: ICRS

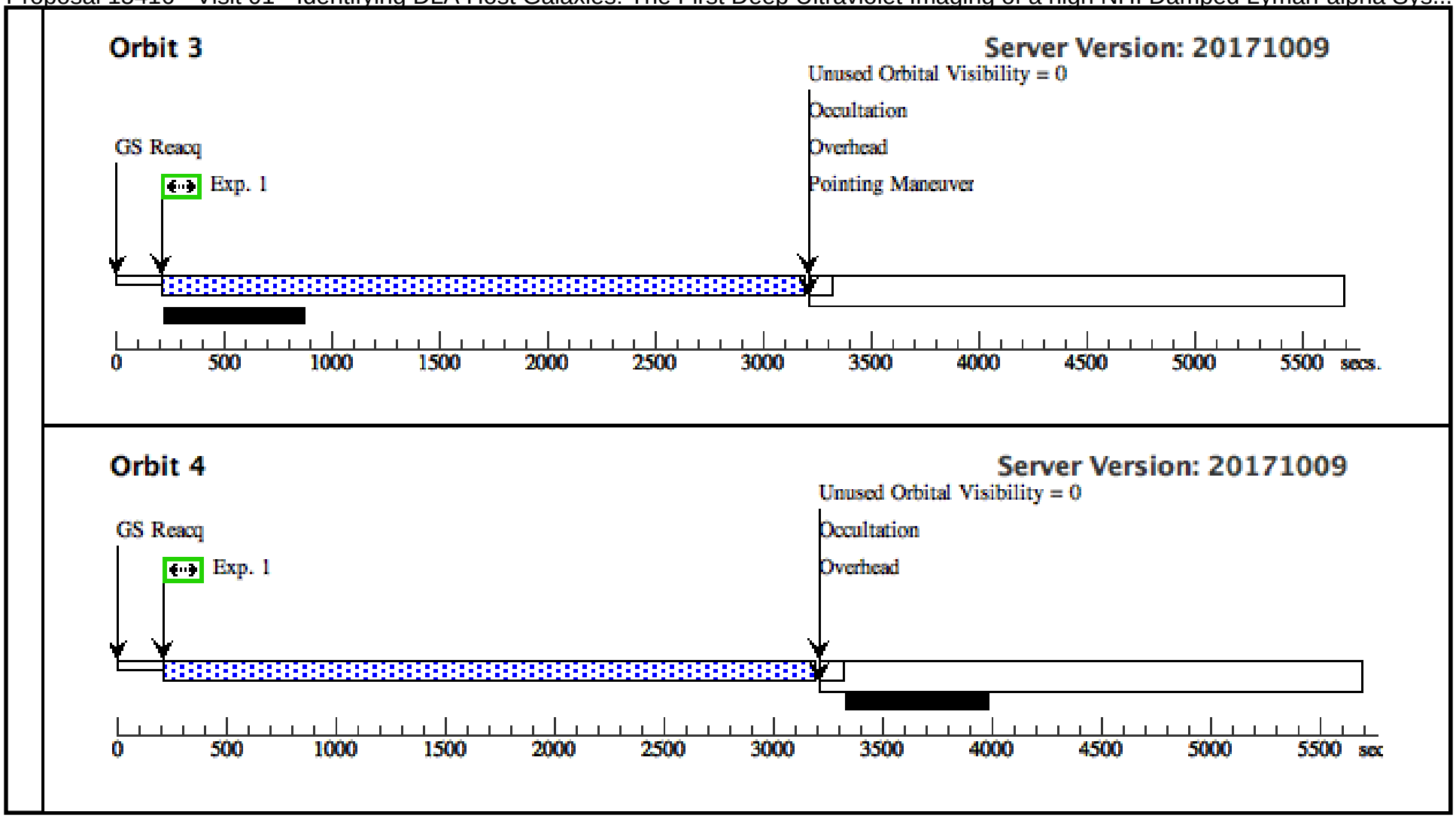
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) J1036+2240	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F336W	FLASH=4	POS TARG -0.6065, -0.6065	Pattern 1, Exps 1-1 in Visit 01 (1)	2876 Secs (11837 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>2987.0 Secs (Pattern 2)]	***[2]***
								[==>2987.0 Secs (Pattern 3)]	***[3]***
								[==>2987.0 Secs (Pattern 4)]	***[4]***

Orbit Structure






Orbit 3
Server Version: 20171009
Unused Orbital Visibility = 0
Occultation
Overhead
Pointing Maneuver
GS Reacq
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20171009
Unused Orbital Visibility = 0
Occultation
Overhead
GS Reacq
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 15416, Visit 02 Mon Nov 27 23:18:26 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BEFORE 01-APR-2018:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.865 Line Spacing=0.56	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)

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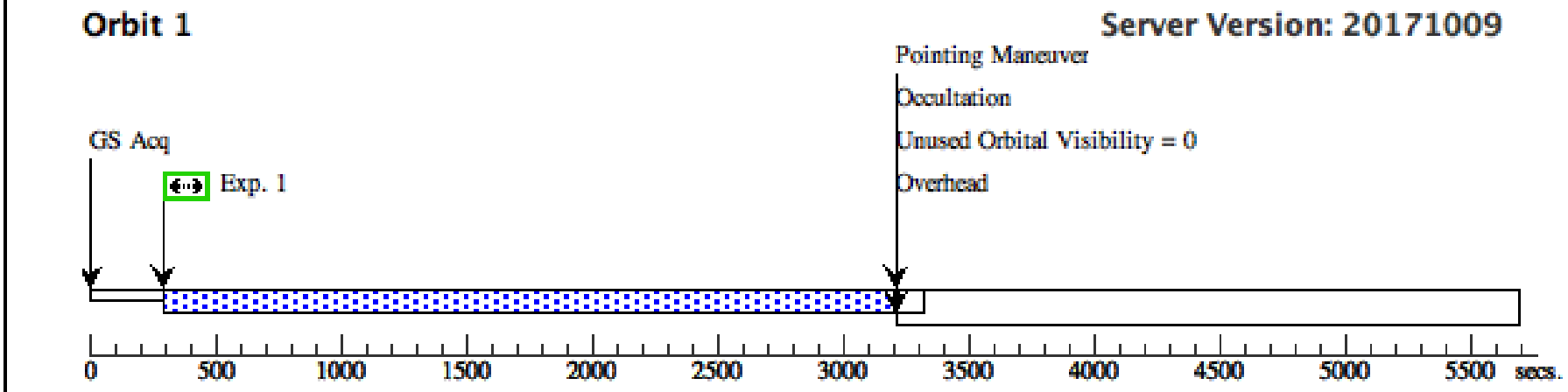
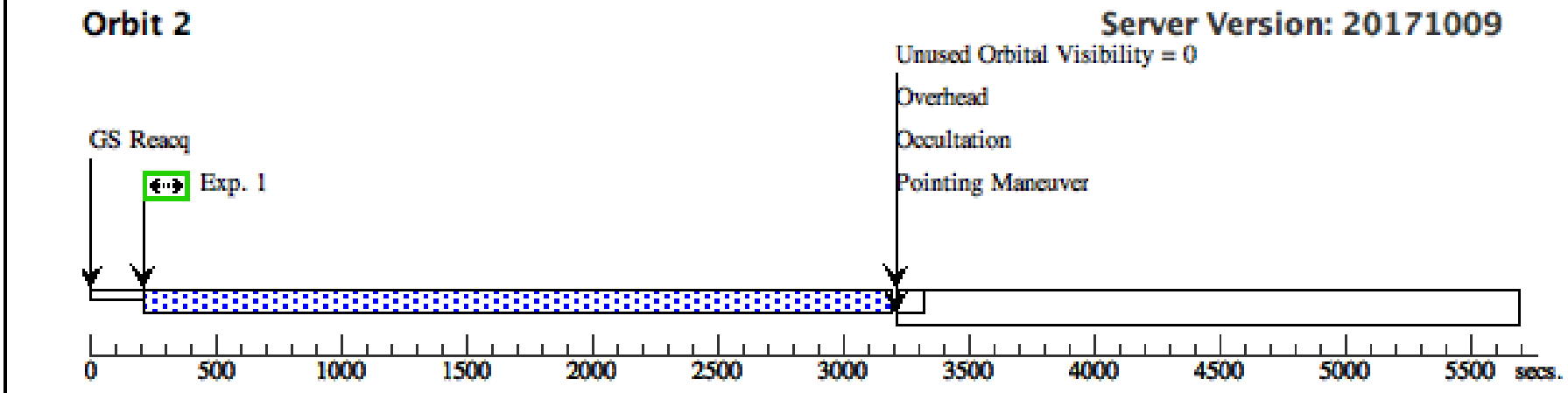
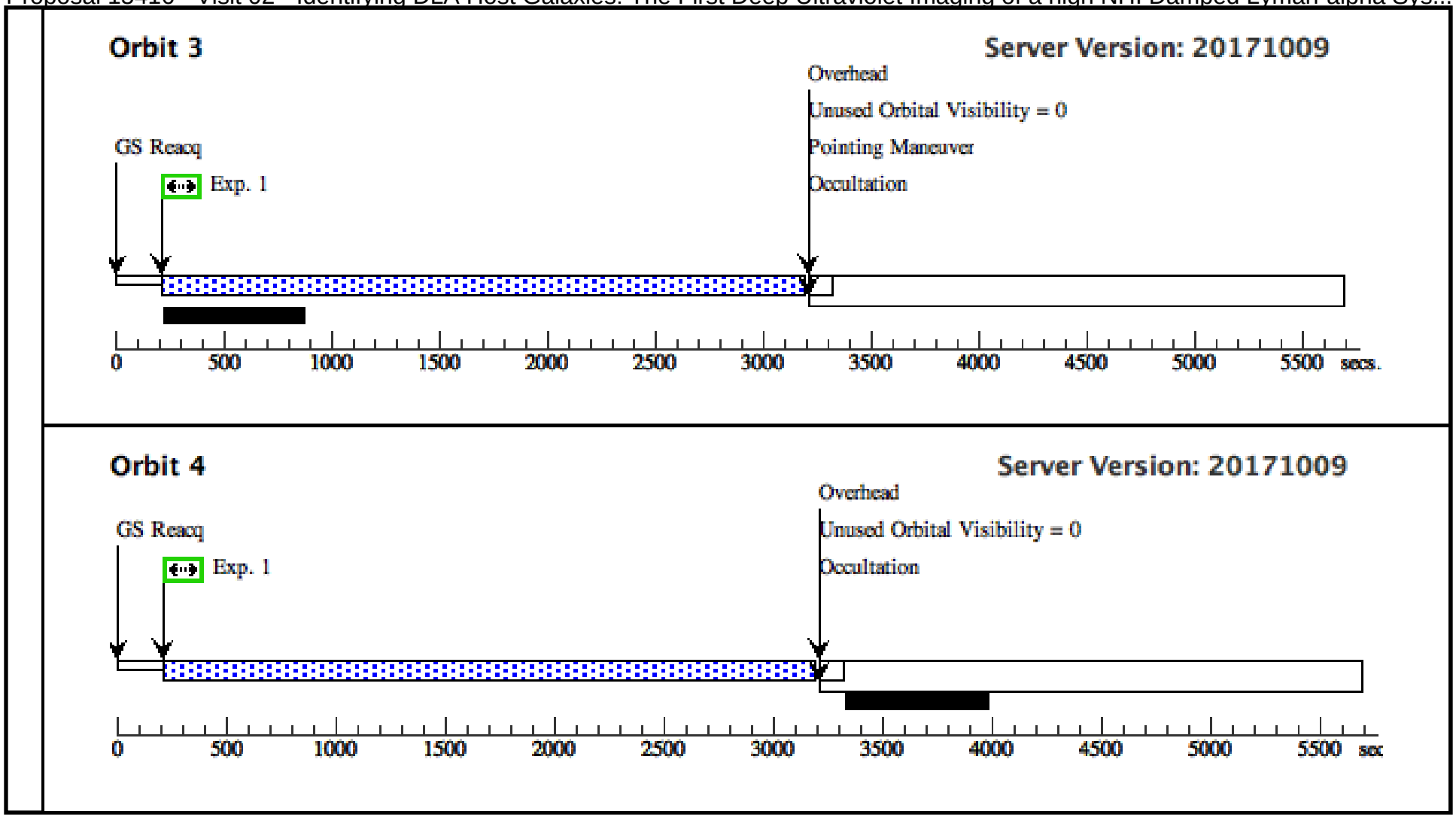
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) J1036+2240	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F336W	FLASH=4	POS TARG 0.6065,0.6065	Pattern 1, Exps 1-1 in Visit 02 (1)	2876 Secs (11837 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>2987.0 Secs (Pattern 2)]	***[2]***
								[==>2987.0 Secs (Pattern 3)]	***[3]***
								[==>2987.0 Secs (Pattern 4)]	***[4]***

Orbit Structure






Orbit 3
Server Version: 20171009
Overhead
Unused Orbital Visibility = 0
Pointing Maneuver
Occultation
GS Reacq
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20171009
Overhead
Unused Orbital Visibility = 0
Occultation
GS Reacq
Exp. 1
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec