13818 - Probing Quasar Host Galaxy of a Quasar at z=2.1 with Damped Lyman Alpha System as Coronagraph

Cycle: 22, 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) J1154-0215	WFC3/UVIS	3	02-Oct-2014 21:02:22.0	yes
02	(1) J1154-0215	WFC3/UVIS	3	02-Oct-2014 21:02:23.0	yes

6 Total Orbits Used

ABSTRACT

Fully resolving high-redshift quasar host galaxies is crucial for understanding how massive galaxies and their central black holes form and evolve. However, studies of high-redshift quasar host galaxies are hindered by difficulties in isolating the hosts and accurately subtracting the strong emission from quasar nuclei. From the SDSS-III quasar spectra library, we have discovered a number of rare occurrences where strong damped Lyman alpha absorbers (DLAs) completely block the nuclear emission from the quasar; they act as a natural coronagraph and reveal narrow Ly-alpha emission from the quasar host galaxies. We propose to carry out HST/WFC3 narrow-band imaging of one such system, J1154-0215, at z=2.1. At this redshift, the WFC3/UVIS narrow-band filter FQ387N lies perfectly within the DLA dark trough, thereby enabling us to image the quasar host galaxy without the need for PSF subtraction. The FWHM and luminosity of the narrow Ly-alpha emission detected in this DLA trough are consistent with that of Lyman break galaxies. Our ground-based deep 2-D spectrum indicates that the Ly-alpha emission is marginally resolved under the seeing of 0.6", suggesting that it is most likely powered by star formation from the quasar host galaxies. High resolution HST imaging, for the first time, will enable us to fully measure the morphology and physical properties of a type-1 quasar host down to the inner 1 kpc scale at z>2, free of PSF subtraction systematics. It will also probe florescent Ly-alpha emission from cool gas associated with the DLA, and study the gas inflows/outflows in the quasar environment to test models of feedback in quasar host galaxies and massive galaxy formation.

OBSERVING DESCRIPTION

We will use one narrowband filter FQ387N to image one quasar J1154-0215. The quasar J1154-0215 has a strong Damped Lyman Alpha (DLA) system which completely blocks the strong nuclear emission from the quasar. The DLA acts as a natural coronagraph and will reveal the Lyman alpha (Lya) emission from the quasar host galaxies.

We will observe this program with two-visit. The first visit contains 3-orbit. The second visit contains 3-orbit.

(1) In the first visit, we do a three-point-dither to populate the first 3-orbit. We split each orbit into two sub-exposure using CR-SPIT=2

(2) In the second visit, we use a same three-point-dither to populate the next 3-orbit. We split each orbit into two sub-exposure using CR-SPIT=2. We will first do a small POS-TARG offset of delta_x= 0", delta_y=-0.135 when we start the second visit.

We found that even with orbit-long individual exposure, the sky background of FQ387N narrowband will be much lower than the recommended

threshold of 12e-/pixel. This low sky background will strong affect the charge transfer efficiency of the WFC3 UVIS detector. In order to obtain a threshold of 12e-/pixel background level which will improve the charge transfer efficiency, we will use a post-flash illumination with a intensity of 10e- for our 6-orbit observations.

Visit

Proposal 13818, Visit 01 (01), implementation Fri Oct 03 01:02:25 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 2, Exps 1-1 in Visit 01 (01))) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J1154-0215	RA: 11 54 32.6700 (178.6361250d) Dec: -02 15 37.99 (-2.26055d) Equinox: J2000		V=21.4+/-0.1	Reference Frame: ICRS

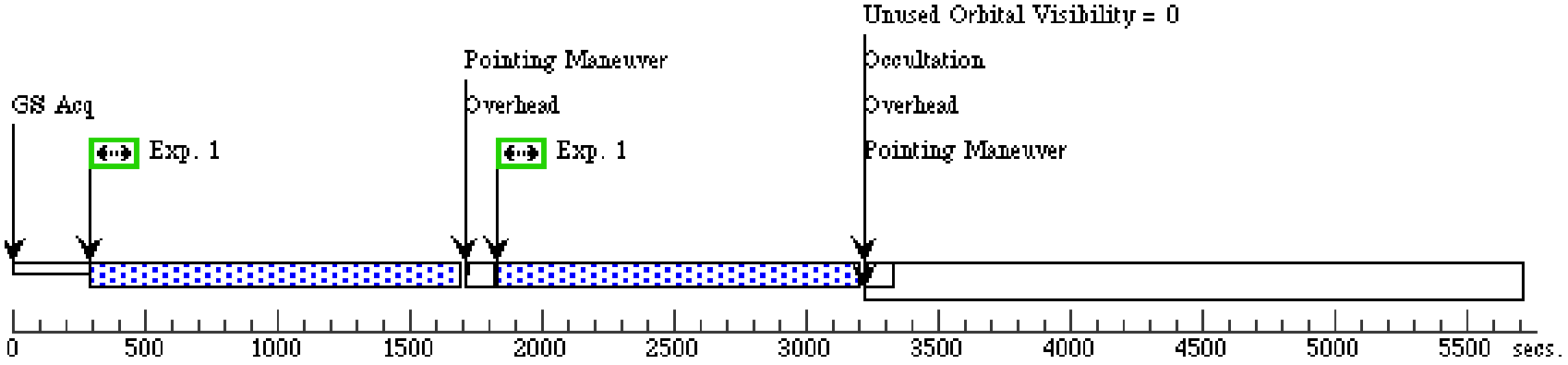
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) J1154-0215	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ387N	FLASH=10.0		Pattern 2, Exps 1-1 in Visit 01 (01) (2)	3000 Secs (8463 Secs)	
								[==>1374.0 Secs (Pattern 1,1)] *[==>1373.0 Secs (Pattern 1,2)]*	***[1]***
								[==>1429.0 Secs (Pattern 2,1)] *[==>1429.0 Secs (Pattern 2,2)]*	***[2]***
								[==>1429.0 Secs (Pattern 3,1)] *[==>1429.0 Secs (Pattern 3,2)]*	***[3]***

Orbit Structure

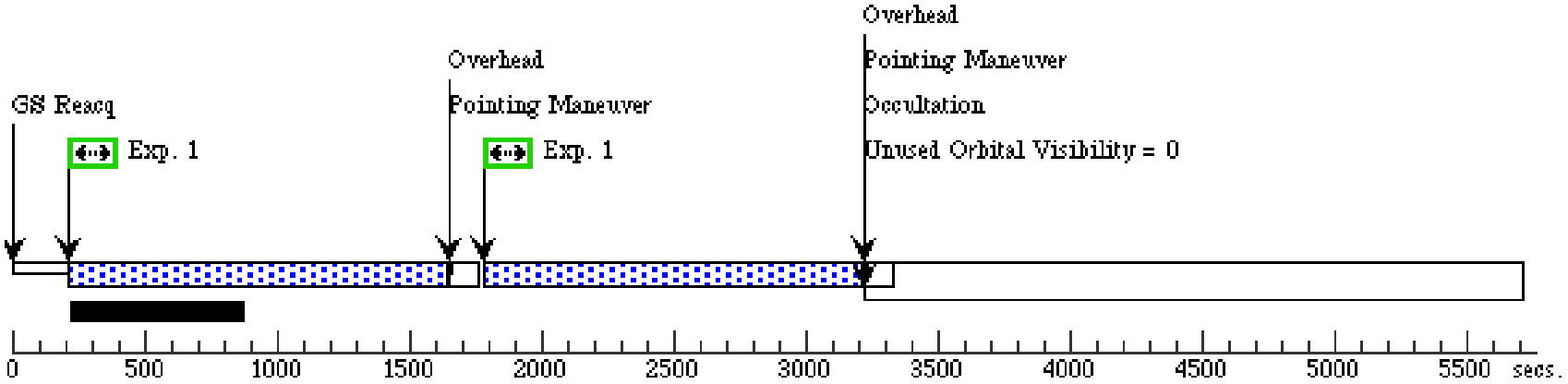
Orbit 1

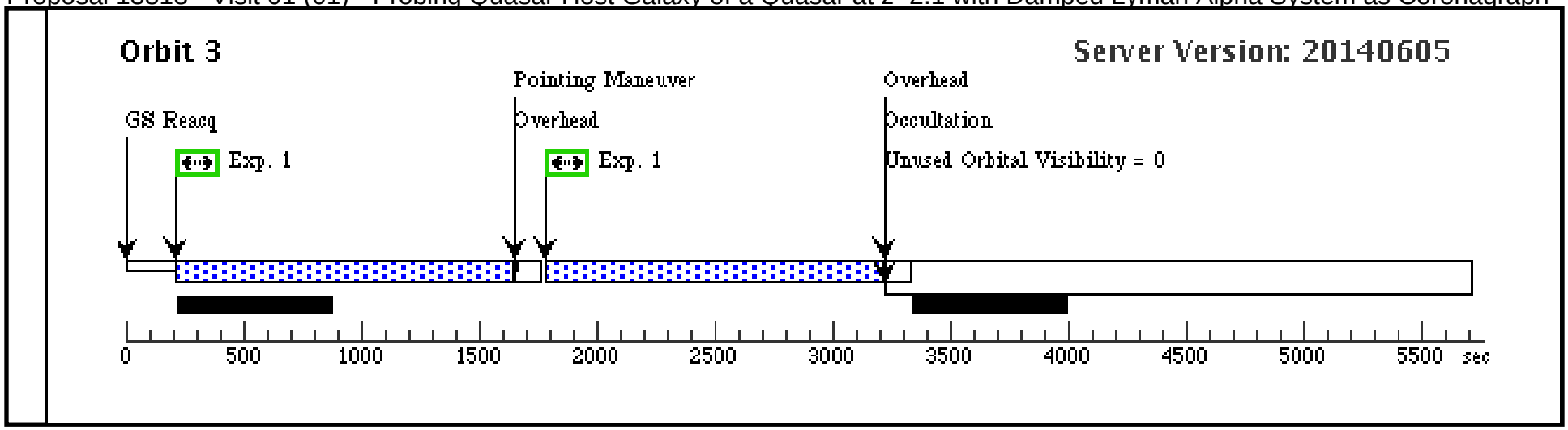
Server Version: 20140605



Orbit 2

Server Version: 20140605




Orbit 3
Server Version: 20140605
GS Reacq
Exp. 1
Pointing Maneuver
Overhead
Exp. 1
Overhead
Occultation
Unused Orbital Visibility = 0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13818, Visit 02, implementation Fri Oct 03 01:02:26 GMT 2014

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 2, Exps 1-1 in Visit 02)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false	(1)

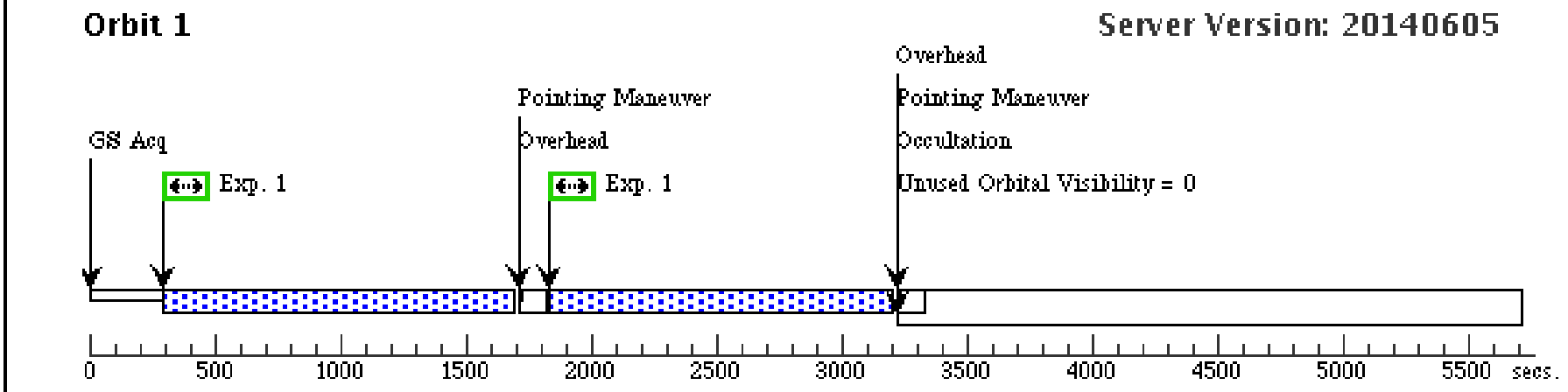
Fixed Targets

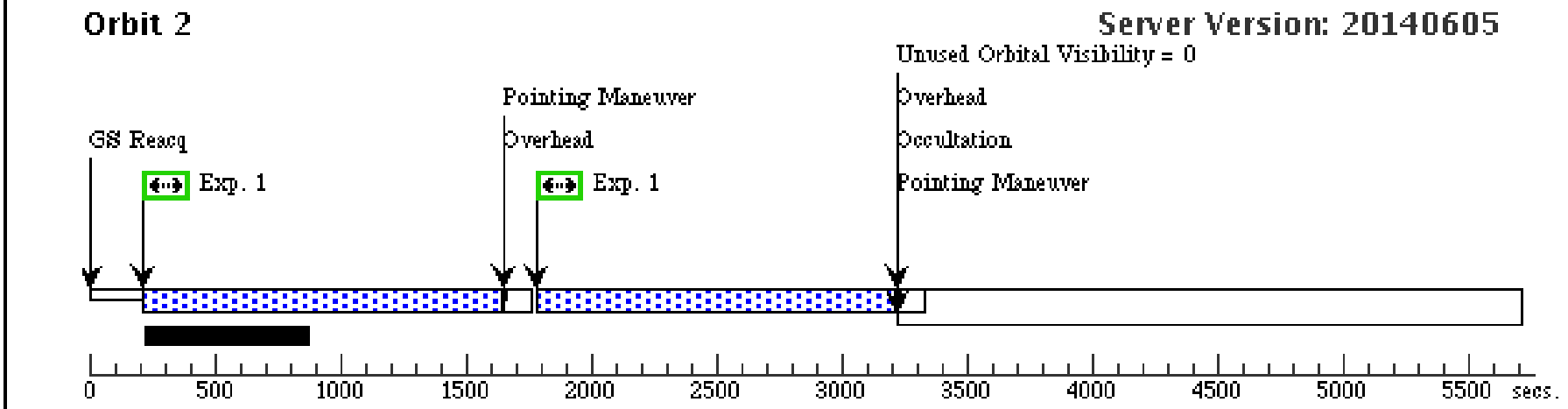
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	J1154-0215	RA: 11 54 32.6700 (178.6361250d) Dec: -02 15 37.99 (-2.26055d) Equinox: J2000		V=21.4+/-0.1	Reference Frame: ICRS

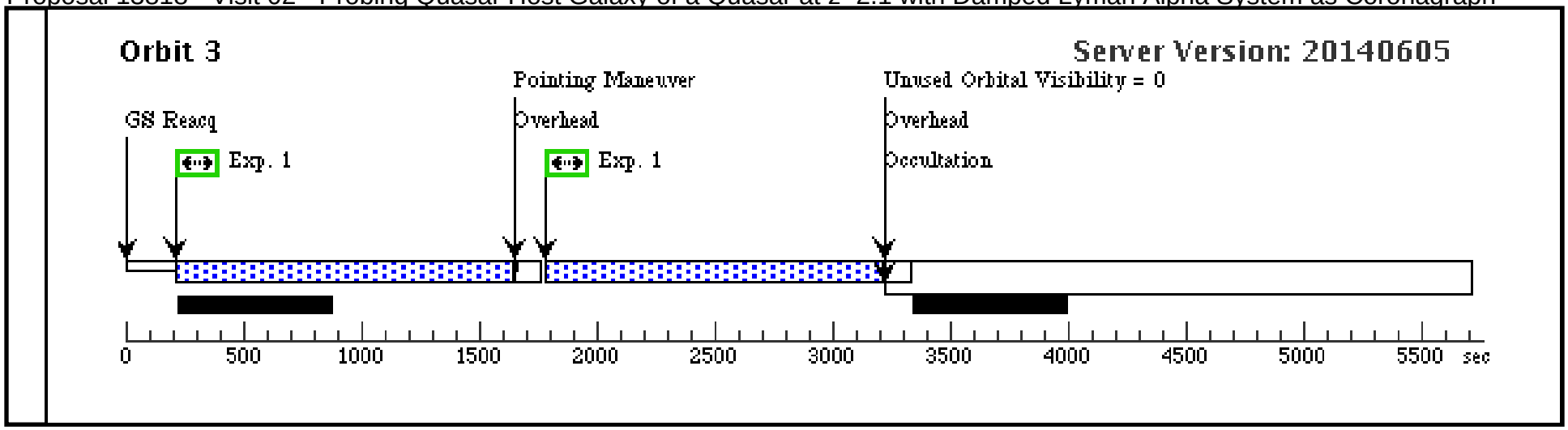
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) J1154-0215	WFC3/UVIS, ACCUM, UVIS-QUAD	FQ387N	FLASH=10.0	POS TARG 0,-0.135	Pattern 2, Exps 1-1 in Visit 02 (2)	1430 Secs (8463 Secs)	
								[==>1374.0 Secs (Pattern 1,1)] *[==>1373.0 Secs (Pattern 1,2)]*	***[1]***
								[==>1429 Secs (Pattern 2,1)] *[==>1429 Secs (Pattern 2,2)]*	***[2]***
								[==>1429 Secs (Pattern 3,1)] *[==>1429 Secs (Pattern 3,2)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20140605
Pointing Maneuver
Unused Orbital Visibility = 0
GS Reacq
Overhead
Overhead
Exp. 1
Exp. 1
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec