17912 - Mapping Spatially Resolved Neutral H In Strongly Lensed Quasar Host Galaxies With Narrowband Lyman-alpha

Cycle: 32, 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) SDSSJ1029+2623	ACS/WFC	3	05-Feb-2025 10:00:27.0	yes
02	(2) SDSSJ2222+2745	ACS/WFC	5	05-Feb-2025 10:00:28.0	yes
03	(3) SDSSJ0909+4449	ACS/WFC	5	05-Feb-2025 10:00:29.0	yes
04	(4) COOLJ0335-1927	ACS/WFC	4	05-Feb-2025 10:00:30.0	yes
05	(4) COOLJ0335-1927	ACS/WFC	4	05-Feb-2025 10:00:30.0	yes
06	(5) SDSSJ1326+4806	ACS/WFC	3	05-Feb-2025 10:00:31.0	yes

24 Total Orbits Used

ABSTRACT

Large-separation (r>10") lensed quasars are extremely rare, but provide opportunities to zoom in maximally on quasar host galaxies. With magnification factors of ~20+, these systems enable studies that are impossible with quasars in the field, or even lower magnification galaxy-quasar lens systems. Lyman-alpha emission scatters resonant off of neutral hydrogen, and so its physical extent and distribution therefore provides a direct tracer of the neutral H gas content in galaxies. We propose to leverage the uniquely powerful combination of HST optical narrowband imaging (to isolate Lyman-alpha) and strong gravitational lensing to directly image the spatial distribution of neutral H on ~<100-200 pc physical scales within five quasar host galaxies at z=1.9-3.3. Archival HST+JWST broadband imaging constrains the spatially resolved stellar populations, providing maps of ionizing photon production from the stars so that we can robustly compare Lyman-alpha production against the Lyman-alpha narrowband imaging to quantity spatially resolved Lyman-alpha escape. The extreme magnifications allows for a clean separation of quasar vs host galaxy light to within ~100-200 parsecs of the central AGN engines. The resulting high resolution narrowband Lyman-alpha imaging data will unobtainable with any near term facility once HST ceases operations, and will hold substantial legacy value that will enhance future spatially resolved NIR spectroscopic studies of these quasar host galaxies.

OBSERVING DESCRIPTION

This is a program to use the tunable ramp filters on ACS/WFC to obtai narrowband imaging of redshifted Lyman alpha from a sample of wide-separation strongly lensed quasars (WSLQs) and their host galaxies. Broadband HST imaging to measure the Lyman-alpha-free continuum emission is available in the archive for all targets.

Each target is a strong lensing system with multiple highly magnified images of background quasars, with those multiple images separated by as much as 26" on the sky. The ACS ramp filters provide uniform narrowband throughput over regions of the sky approximately 40"x60" in size, which means that all of the lensed images of each of the WSLQ targets will easily fit within the ramp filter field of view.

The observational setup for this program is fairly simple - we're taking a few long integrations on each field in the appropriate narrowband filter. Four of the five targets will be observed with half-orbit integrations, and one target (The highest redshift one) will be observed with 8 full-orbit integrations. The 8 full-orbit integrations should be sufficient to remove cosmic rays even from the very long exposures.

Visit

Proposal 17912, SDSSJ1029 - FR388N (01) Wed Feb 05 15:00:32 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(SDSSJ1029_FR388N_LyA (01.001)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.364 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

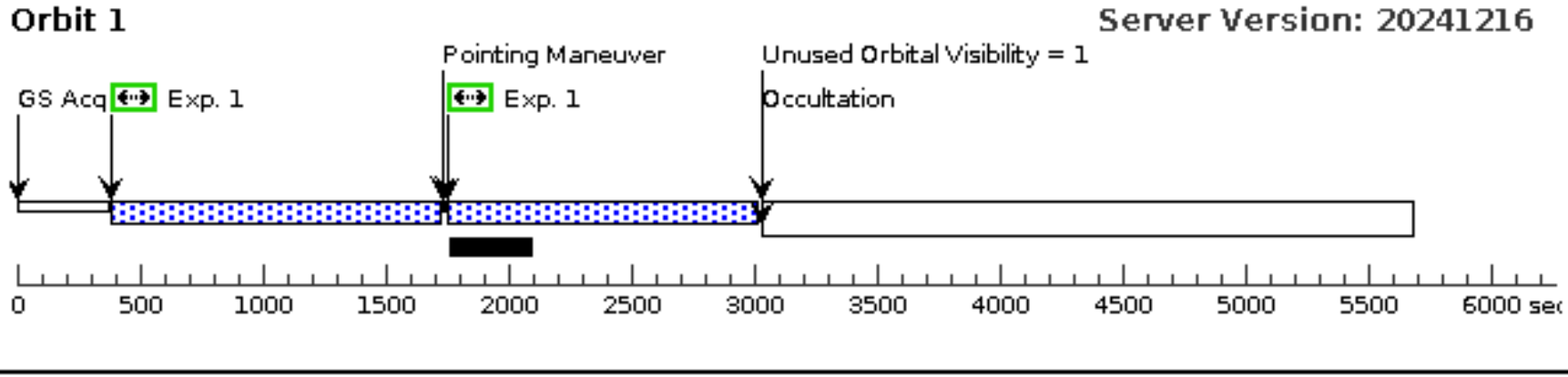
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ1029+2623	RA: 10 29 14.0600 (157.3085833d) Dec: +26 23 30.20 (26.39172d) Equinox: J2000	Epoch of Position: 2000	V=19+/-0.5 quasar brightness is time-variable, z = 2.2	Reference Frame: ICRS

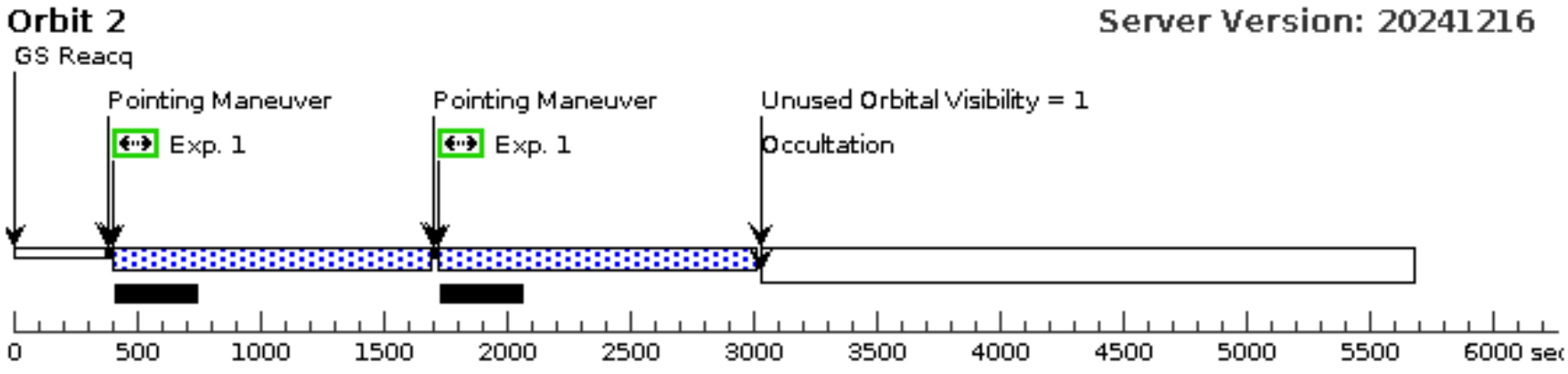
Comments:
Category=GALAXY
Description=[QUASAR]

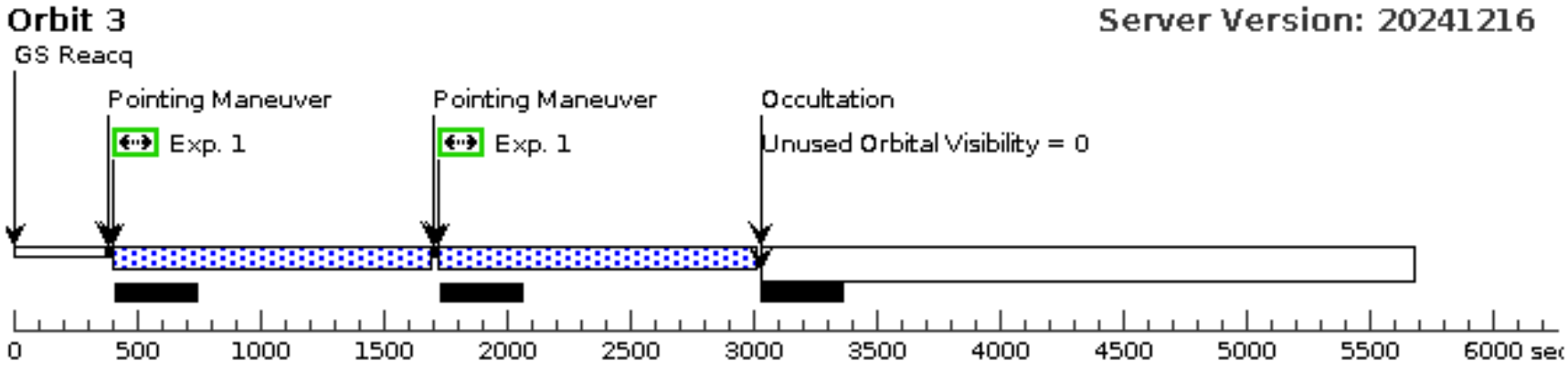
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	SDSSJ1029_FR388N_LyA	(1) SDSSJ1029+2623	ACS/WFC, ACCUM, WFC1-MRAMP	FR388N 3890 A	FLASH=11		Pattern 2, Exps 1-1 in SDSSJ1029 - FR388N (01) (2)	1200 Secs (6911 Secs)	
								[==>1132.0 Secs (Pattern 1,1)] *[==>1131.0 Secs (Pattern 1,2)]*	***[1]***
								[==>1161.0 Secs (Pattern 1,3)] *[==>1161.0 Secs (Pattern 2,1)]*	***[2]***
								[==>1163.0 Secs (Pattern 2,2)] *[==>1163.0 Secs (Pattern 2,3)]*	***[3]***

Orbit Structure







Visit

Proposal 17912, SDSSJ2222 - FR462N (02) Wed Feb 05 15:00:32 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 5, Exps 1-1 in SDSSJ2222 - FR462N (02))) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(5)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=5 Point Spacing=0.364 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

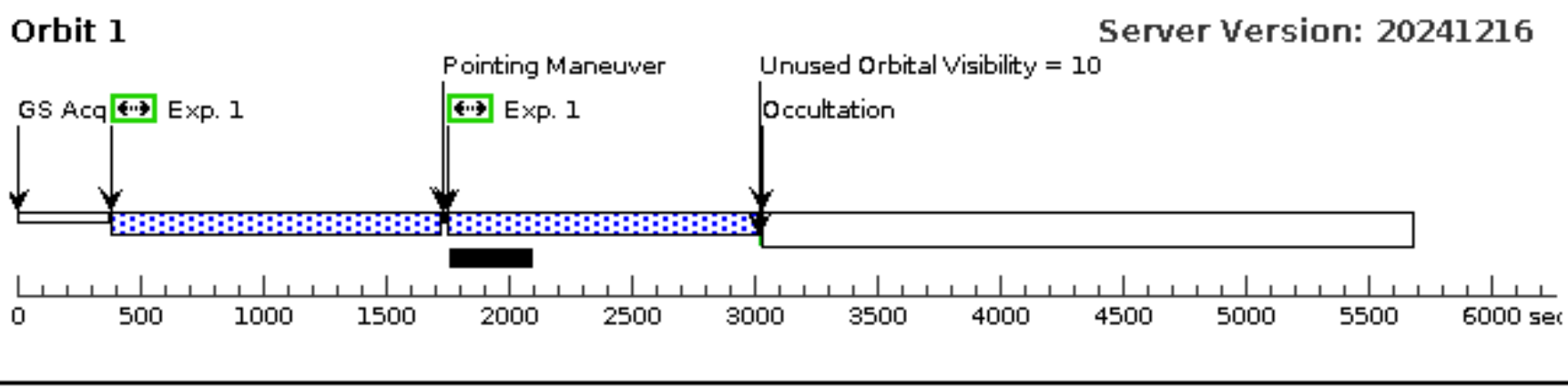
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SDSSJ2222+2745	RA: 22 22 8.5500 (335.5356250d) Dec: +27 45 38.20 (27.76061d) Equinox: J2000	Epoch of Position: 2000	V=20.0+/-0.5 quasar brightness is time-variable, z = 2.82	Reference Frame: ICRS

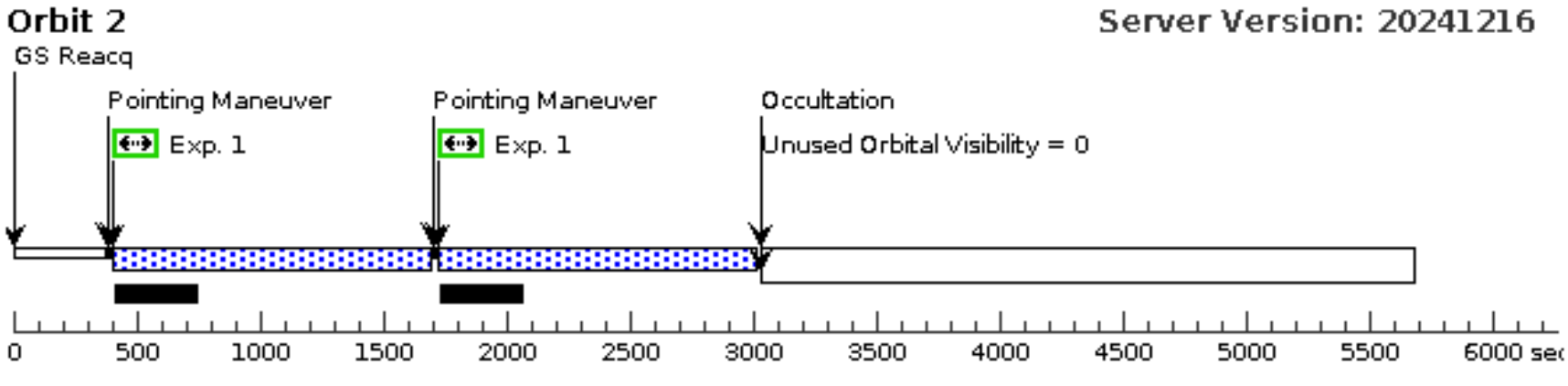
Comments:
Category=GALAXY
Description=[QUASAR]

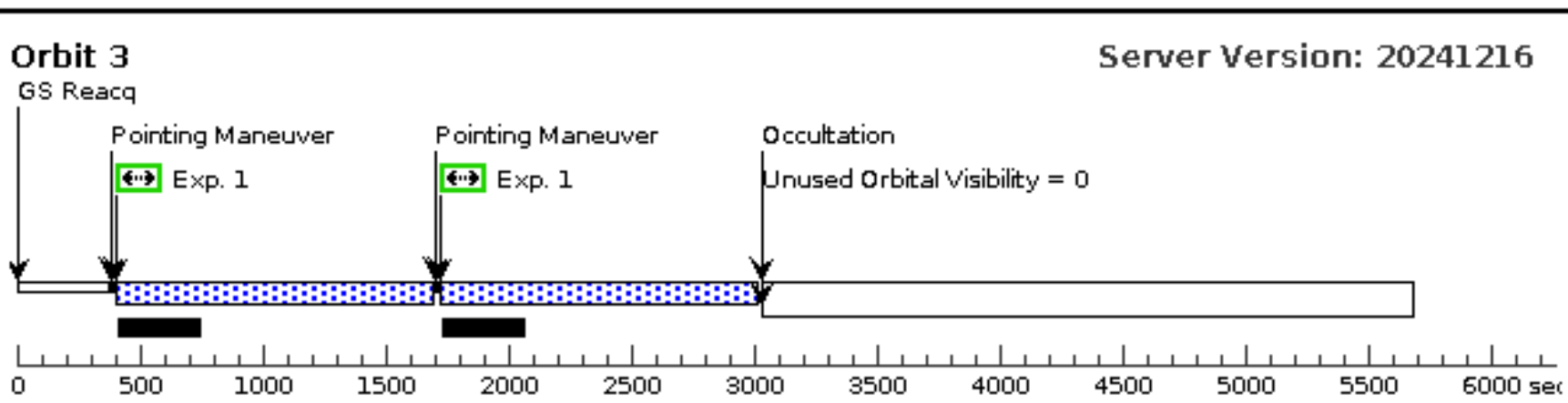
Exposures

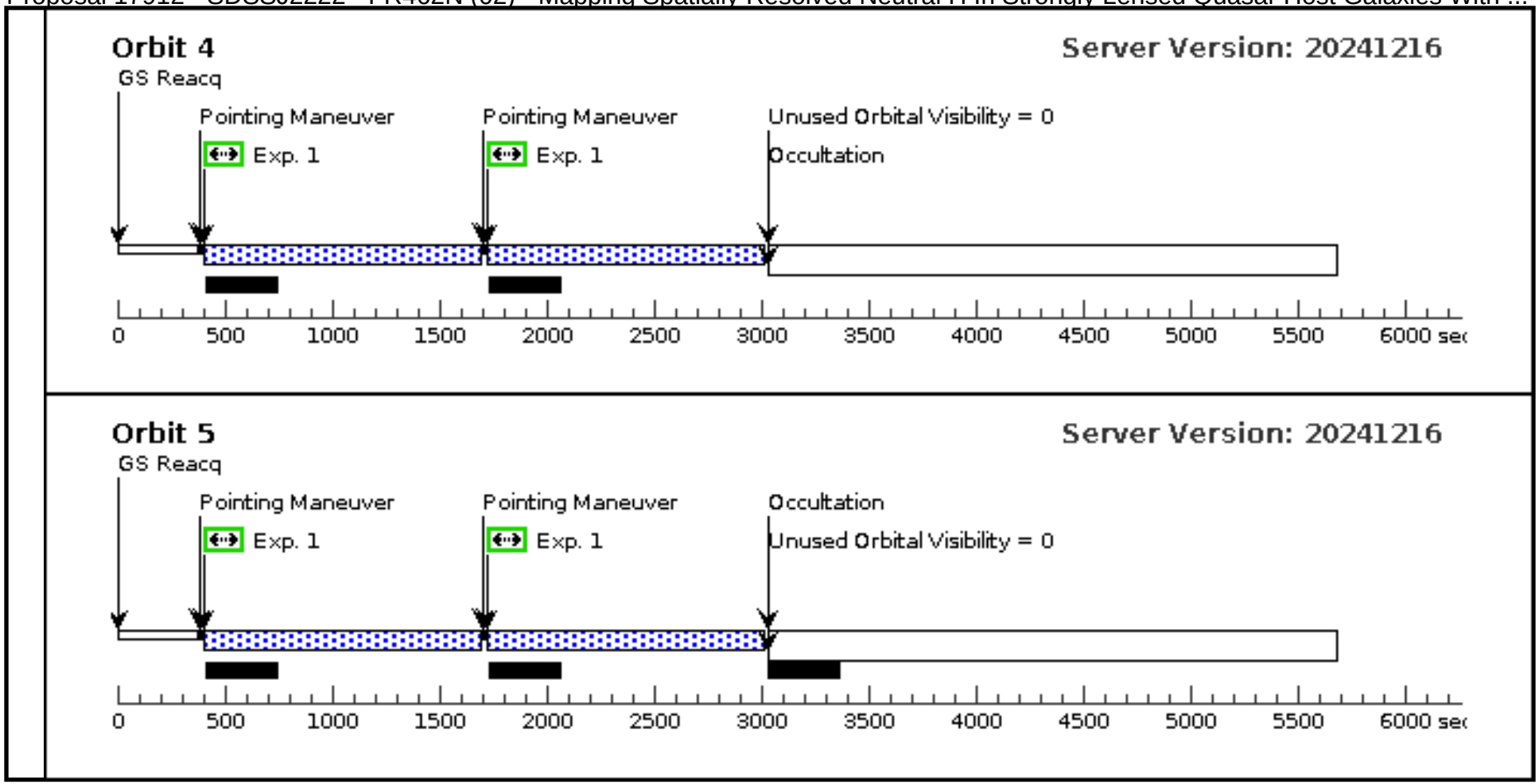
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SDSSJ2222+2745	ACS/WFC, ACCUM, WFC2-ORAMP	FR462N 4640 A	FLASH=9		Pattern 5, Exps 1-1 in SDSSJ2222 - FR462N (02) (5)	1100 Secs (11556 Secs)	
								[==>1127.0 Secs (Pattern 1,1)] *[==>1127.0 Secs (Pattern 1,2)]*	***[1]***
								[==>1163.0 Secs (Pattern 1,3)] *[==>1163.0 Secs (Pattern 1,4)]*	***[2]***
								[==>1162.0 Secs (Pattern 1,5)] *[==>1162.0 Secs (Pattern 2,1)]*	***[3]***
								[==>1163.0 Secs (Pattern 2,2)] *[==>1163.0 Secs (Pattern 2,3)]*	***[4]***
								[==>1163.0 Secs (Pattern 2,4)] *[==>1163.0 Secs (Pattern 2,5)]*	***[5]***

Orbit Structure





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Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 1
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Occultation
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2500
3000
3500
4000
4500
5000
5500
6000 sec
Orbit 5
Server Version: 20241216
GS Reacq
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 1
Occultation
Unused Orbital Visibility = 0
0
500
1000
1500
2000
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3000
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4000
4500
5000
5500
6000 sec

Visit

Proposal 17912, SDSSJ0909 - FR462N (03) Wed Feb 05 15:00:32 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 5, Exps 1-1 in SDSSJ0909 - FR462N (03))) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(5)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=5 Point Spacing=0.364 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

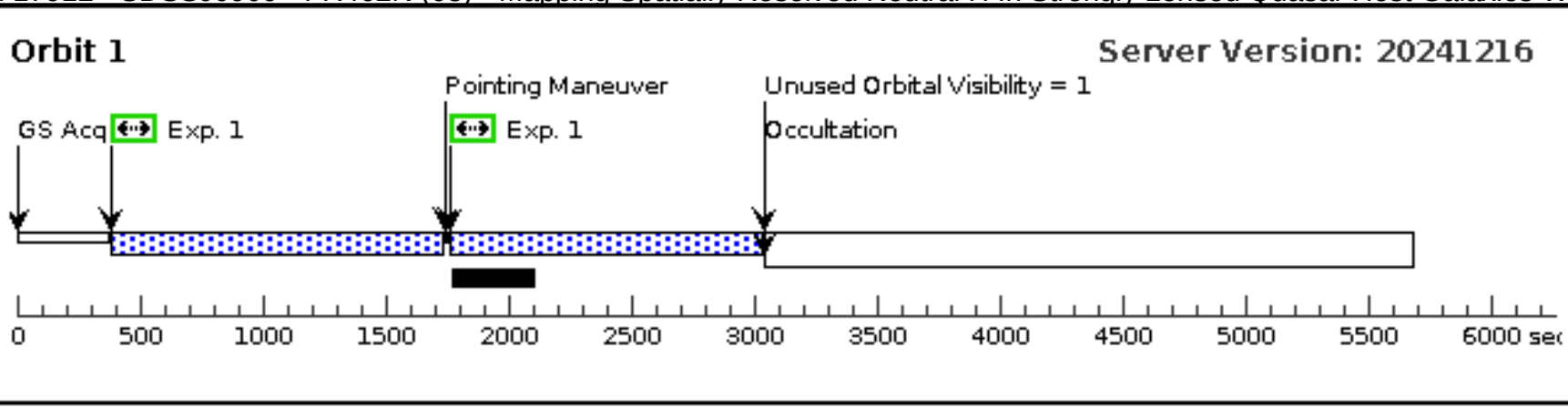
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSSJ0909+4449	RA: 09 09 45.3400 (137.4389167d) Dec: +44 49 53.90 (44.83164d) Equinox: J2000	Epoch of Position: 2000	V=21.4+/-0.5 quasar brightness is time-variable, z=2.788	Reference Frame: ICRS

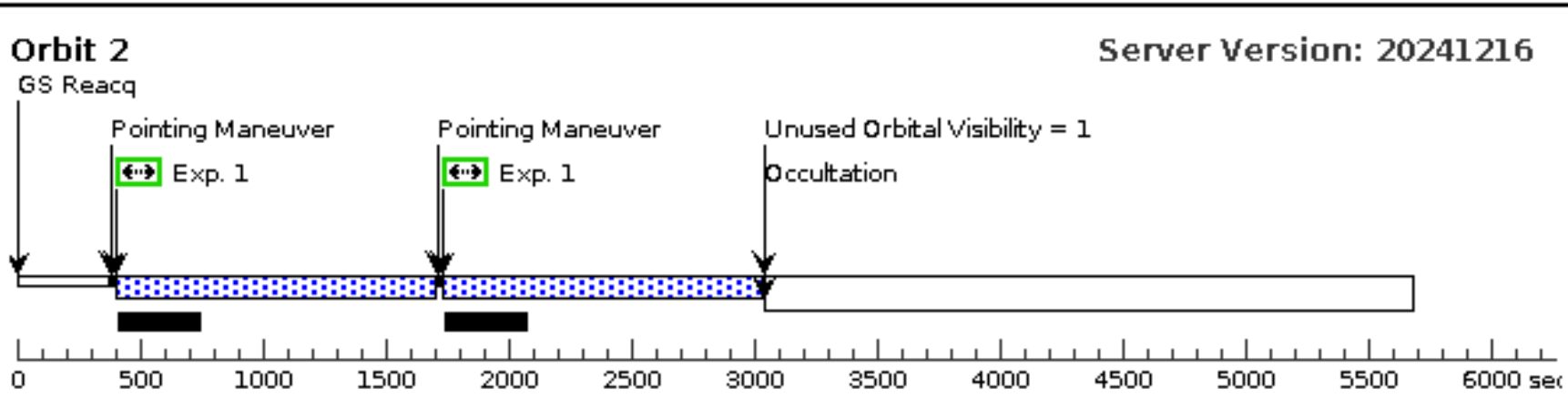
Comments:
Category=GALAXY
Description=[QUASAR]

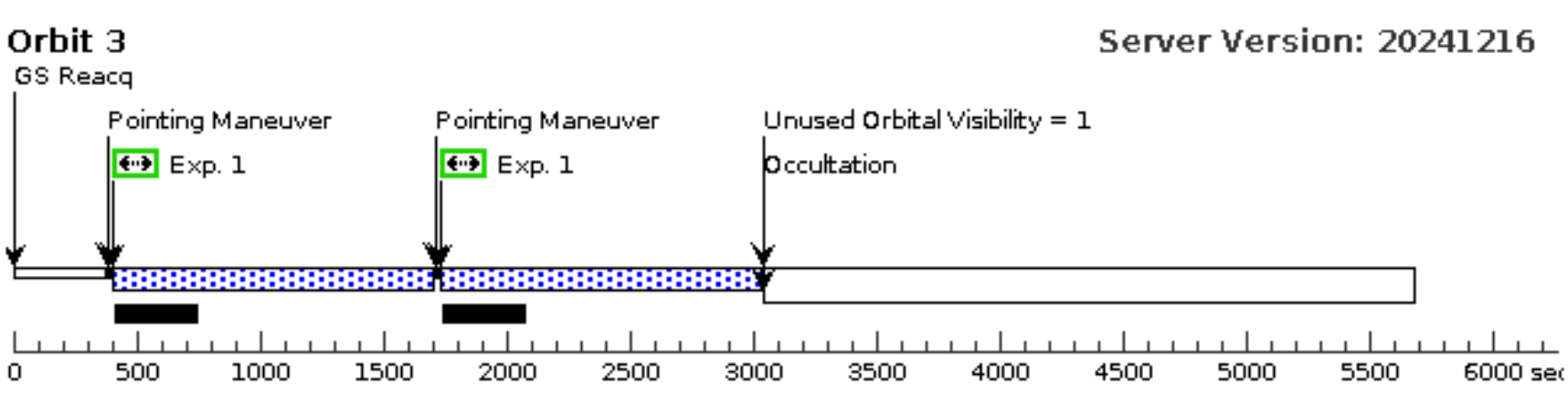
Exposures

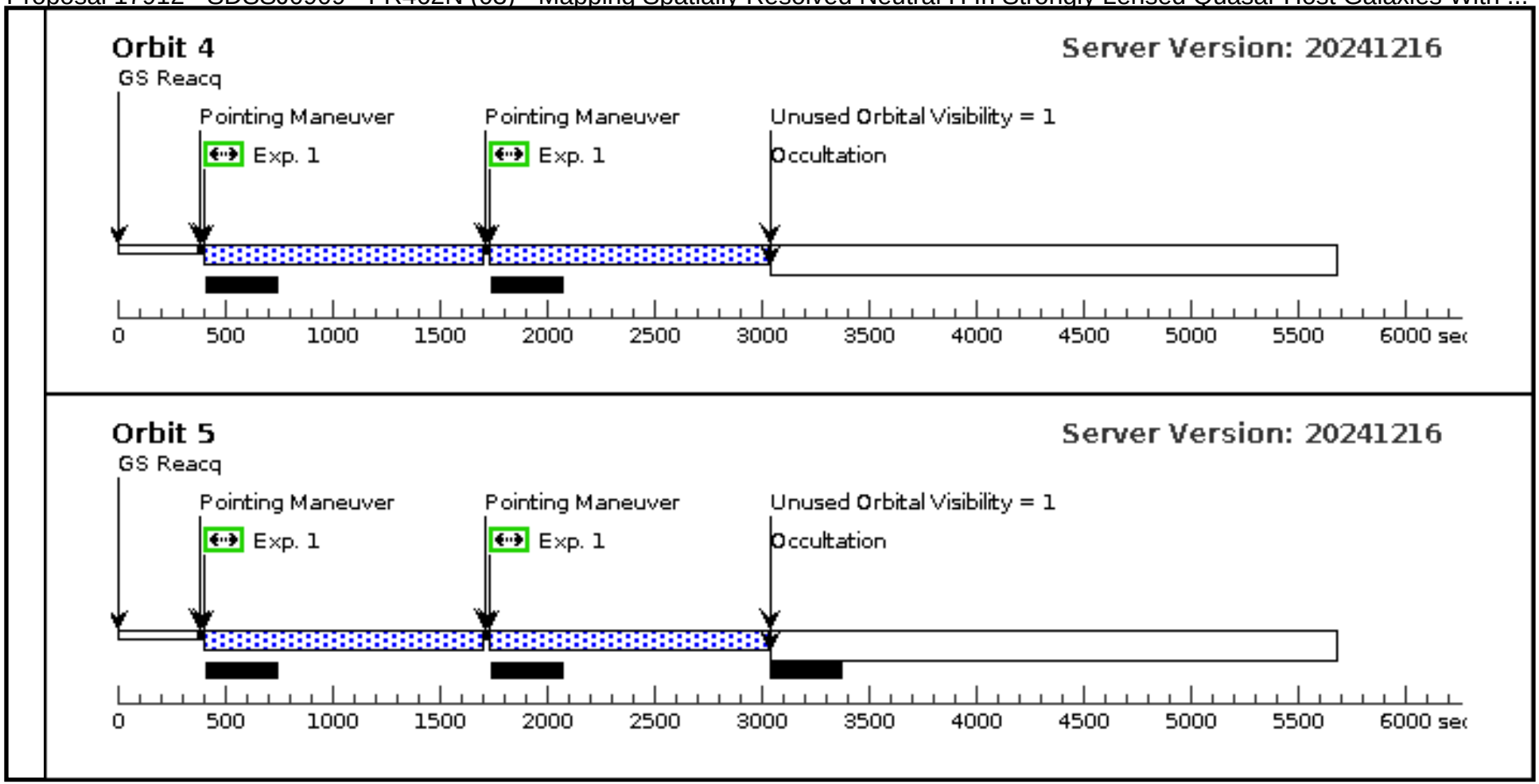
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SDSSJ0909+4449	ACS/WFC, ACCUM, WFC2-ORAMP	FR462N 4600 A	FLASH=9		Pattern 5, Exps 1-1 in SDSSJ0909 - FR462N (03) (5)	1100 Secs (11646 Secs)	
								[==>1140.0 Secs (Pattern 1,1)] *[==>1140.0 Secs (Pattern 1,2)]*	***[1]***
								[==>1171.0 Secs (Pattern 1,3)] *[==>1171.0 Secs (Pattern 1,4)]*	***[2]***
								[==>1170.0 Secs (Pattern 1,5)] *[==>1170.0 Secs (Pattern 2,1)]*	***[3]***
								[==>1171.0 Secs (Pattern 2,2)] *[==>1171.0 Secs (Pattern 2,3)]*	***[4]***
								[==>1171.0 Secs (Pattern 2,4)] *[==>1171.0 Secs (Pattern 2,5)]*	***[5]***

Orbit Structure





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Exp. 1
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4500
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5500
6000 sec
Orbit 5
Server Version: 20241216
GS Reacq
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 1
Unused Orbital Visibility = 1
Occultation
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1000
1500
2000
2500
3000
3500
4000
4500
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5500
6000 sec

Visit

Proposal 17912, COOLJ0335 - FR505N Visit A (04) Wed Feb 05 15:00:32 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 1, Exps 1-1 in COOLJ0335 - FR505N Visit A (04))) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.2637 Line Spacing=0.1856	Coordinate Frame=POS-TARG Pattern Orientation=20.7 Angle Between Sides=69.02 Center Pattern=false		(1)

Fixed Targets

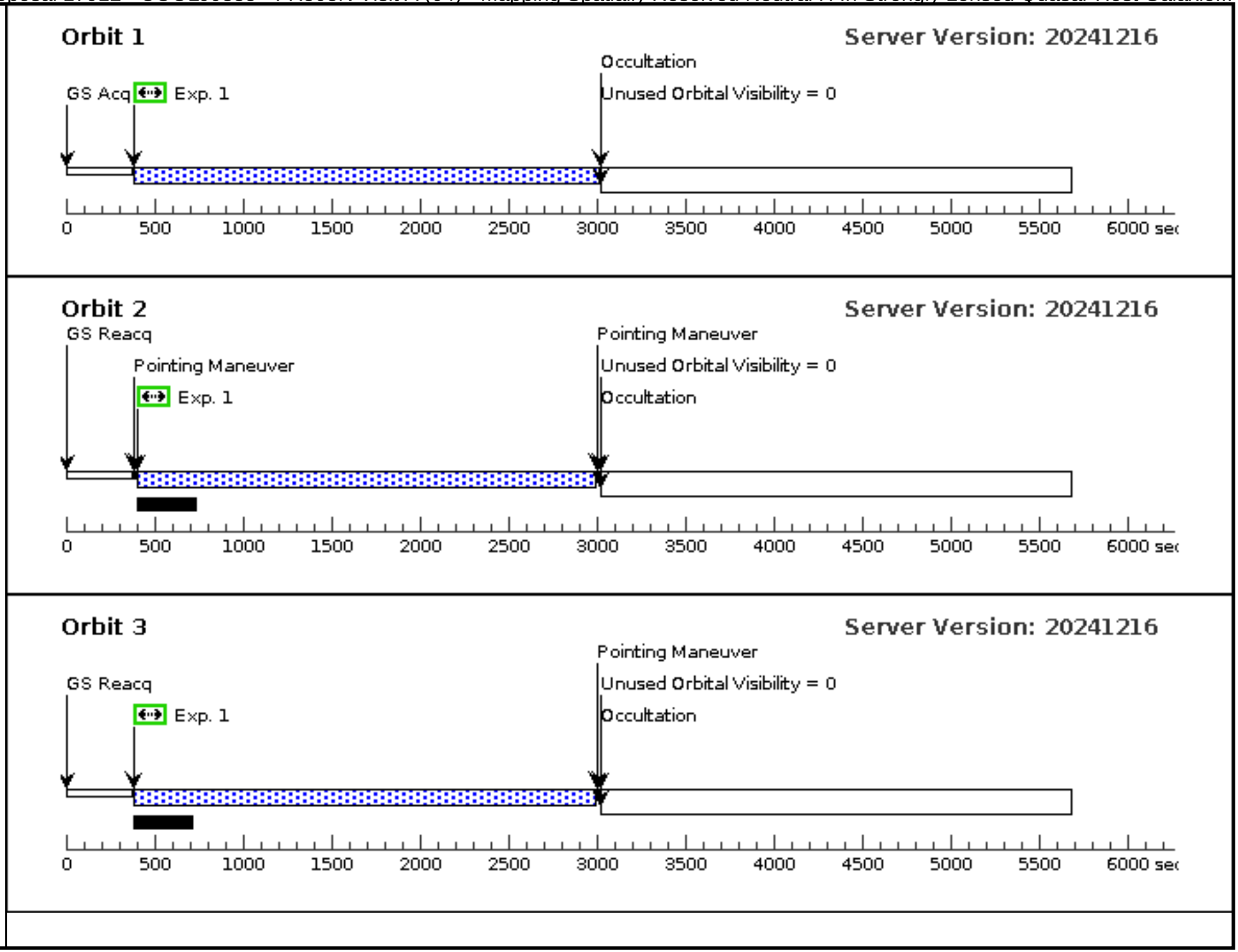
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	COOLJ0335-1927	RA: 03 35 4.0100 (53.7667083d) Dec: -19 27 51.20 (-19.46422d) Equinox: J2000	Epoch of Position: 2000	V=21.5+/-0.5 quasar brightness is time-variable, z=3.27	Reference Frame: ICRS

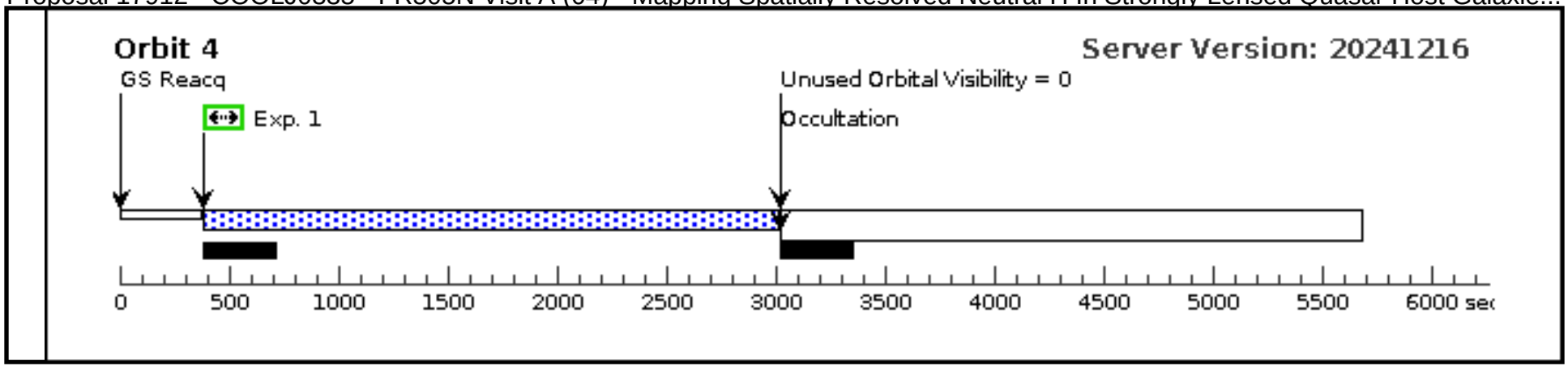
Comments:
Category=GALAXY
Description=[QUASAR]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) COOLJ0335-1927	ACS/WFC, ACCUM, WFC1-MRAMP	FR505N 5190 A			Pattern 1, Exps 1-1 in COOLJ0335 - FR505N Visit A (04) (1)	2200 Secs (9878 Secs)	
								[==>2423.0 Secs (Pattern 1)]	***[1]***
								[==>2465.0 Secs (Pattern 2)]	***[2]***
								[==>2485.0 Secs (Pattern 3)]	***[3]***
								[==>2505.0 Secs (Pattern 4)]	***[4]***

Orbit Structure




Orbit 4
Server Version: 20241216
GS Reacq
Exp. 1
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1000
1500
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3500
4000
4500
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5500
6000 sec

Visit

Proposal 17912, COOLJ0335 - FR505N Visit B (05) Wed Feb 05 15:00:32 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 1, Exps 1-1 in COOLJ0335 - FR505N Visit B (05))) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.2637 Line Spacing=0.1856	Coordinate Frame=POS-TARG Pattern Orientation=20.7 Angle Between Sides=69.02 Center Pattern=false		(1)

Fixed Targets

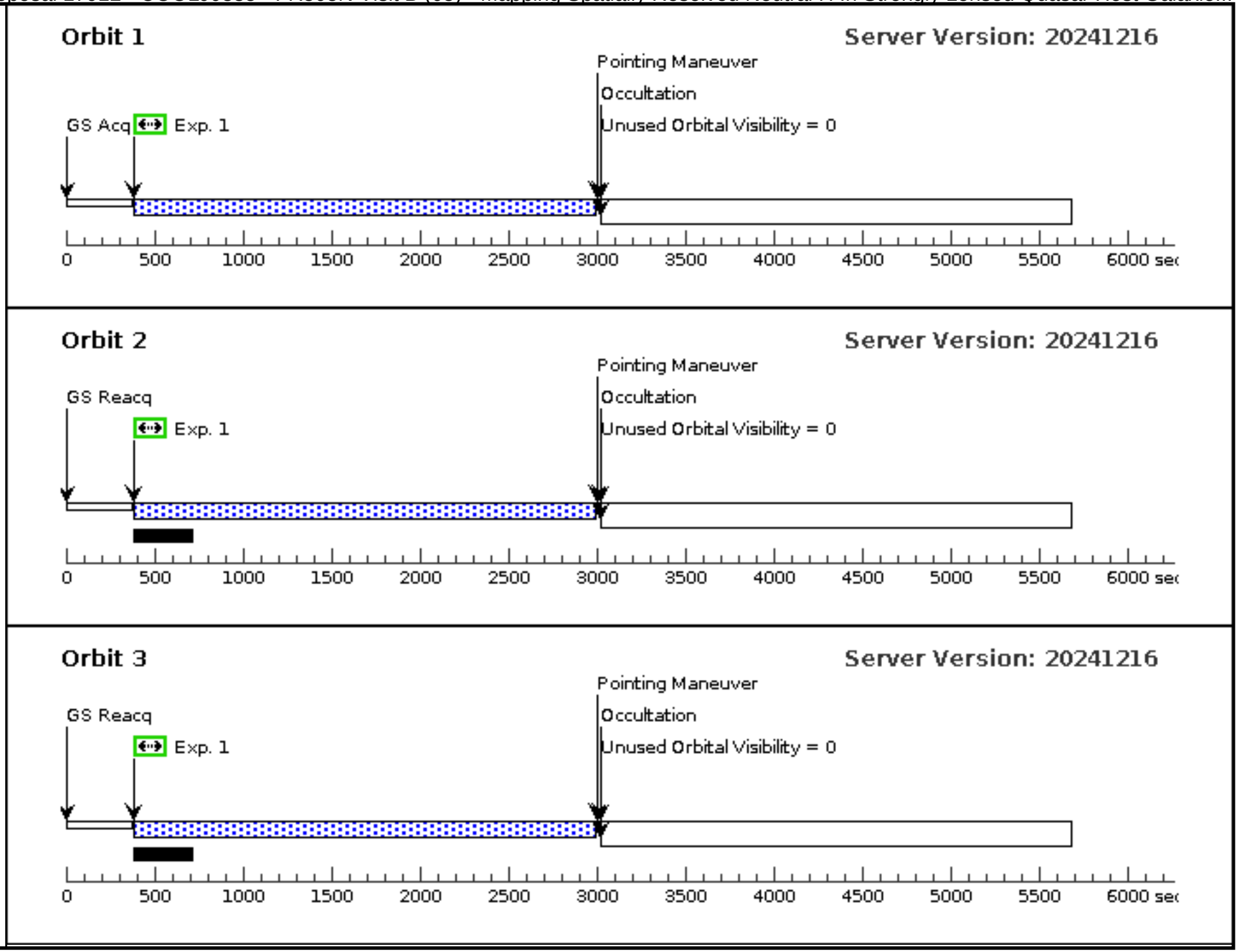
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	COOLJ0335-1927	RA: 03 35 4.0100 (53.7667083d) Dec: -19 27 51.20 (-19.46422d) Equinox: J2000	Epoch of Position: 2000	V=21.5+/-0.5 quasar brightness is time-variable, z=3.27	Reference Frame: ICRS

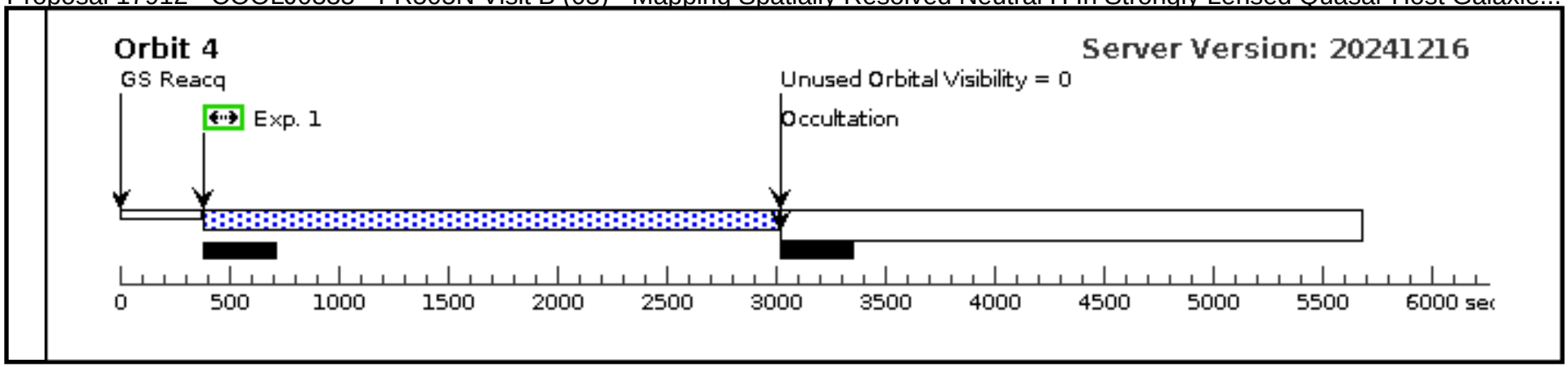
Comments:
Category=GALAXY
Description=[QUASAR]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) COOLJ0335-1927	ACS/WFC, ACCUM, WFC1-MRAMP	FR505N 5190 A			Pattern 1, Exps 1-1 in COOLJ0335 - FR505N Visit B (05) (1)	2200 Secs (9878 Secs)	
								[==>2403.0 Secs (Pattern 1)]	***[1]***
								[==>2485.0 Secs (Pattern 2)]	***[2]***
								[==>2485.0 Secs (Pattern 3)]	***[3]***
								[==>2505.0 Secs (Pattern 4)]	***[4]***

Orbit Structure

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Server Version: 20241216
GS Reacq
Exp. 1
Unused Orbital Visibility = 0
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3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 17912, SDSSJ1326 - FR388N (06) Wed Feb 05 15:00:32 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 2, Exps 1-1 in SDSSJ1326 - FR388N (06))) Warning (Form): POS TARG & PATTERN should be used carefully with ACS ramp filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=3.034 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.29 Angle Between Sides= Center Pattern=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=0.364 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	SDSSJ1326+4806	RA: 13 25 59.7000 (201.4987500d) Dec: +48 06 46.50 (48.11292d) Equinox: J2000	Epoch of Position: 2000	V=21.0 quasar brightness is time-variable, z=2.08	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[QUASAR]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(5) SDSSJ1326+4806	ACS/WFC, ACCUM, WFC1-MRAMP	FR388N 3740 A	FLASH=11		Pattern 2, Exps 1-1 in SDSSJ1326 - FR388N (06) (2)	1100 Secs (6992 Secs)	
								[==>1142.0 Secs (Pattern 1,1)] *[==>1142.0 Secs (Pattern 1,2)]*	***[1]***
								[==>1176.0 Secs (Pattern 1,3)] *[==>1176.0 Secs (Pattern 2,1)]*	***[2]***
								[==>1178.0 Secs (Pattern 2,2)] *[==>1178.0 Secs (Pattern 2,3)]*	***[3]***

Orbit Structure