18072 - The Fate of the Leading Arm of the Magellanic Stream

Cycle: 33, Proposal Category: GO

(UV Initiative)

(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) PQSJ105251.04-272716.	COS/FUV COS/NUV	3	15-Aug-2025 15:01:21.0	yes
02	(2) PQSJ103236.07-281326.9	COS/FUV COS/NUV	3	15-Aug-2025 15:01:22.0	yes
03	(3) PQSJ102239.94-302930.6	COS/FUV COS/NUV	3	15-Aug-2025 15:01:24.0	yes
04	(3) PQSJ102239.94-302930.6	COS/FUV COS/NUV	2	15-Aug-2025 15:01:25.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
05	(3) PQSJ102239.94-302930.6	COS/FUV COS/NUV	2	15-Aug-2025 15:01:26.0	yes
06	(4) PQSJ100159.80-443802.0	COS/FUV COS/NUV	3	15-Aug-2025 15:01:27.0	yes
07	(4) PQSJ100159.80-443802.0	COS/FUV COS/NUV	3	15-Aug-2025 15:01:29.0	yes
08	(4) PQSJ100159.80-443802.0	COS/FUV COS/NUV	3	15-Aug-2025 15:01:30.0	yes

22 Total Orbits Used

ABSTRACT

The Leading Arm (LA) is a fragmented, multiphase gaseous region of the Magellanic System resulting from tidal and hydrodynamic interactions between the Large and Small Magellanic Clouds (LMC and SMC). It traces the orbital trajectory of the LMC-SMC system and also serves as a potential reservoir of cold gas accreting onto the MW fuel that could sustain ongoing star formation in our Galaxy. Unlike the trailing Magellanic Stream, the LA leads the Magellanic Clouds and is the only Magellanic component currently interacting with the MW disk offering an opportunity to study active gas accretion. However once this gas plunges through the MW disk, how it survives or succumbs to the harsh ionizing environment of the MW remains unclear. We propose studying two regions, LA II and LA III, to investigate the survival of this gas by measuring ionization levels. We request 22 orbits of HST/COS G130M spectroscopy to observe four quasars. Together with three archival sightlines, these observations will map the LA III region over 20 degrees on the sky, sampling a range of distances from the MW disk. Our goals are: (1) calculate the ionized-to-neutral hydrogen ratio, (2) investigate spatial variations in gas properties, and (3) compare our findings with simulations. This study will enhance our understanding of satellite gas accretion, its role in sustaining star formation in the MW, and overall the mechanisms through which galaxies acquire and utilize baryonic matter.

OBSERVING DESCRIPTION

This is a COS FUV program to observe four QSO targets on the Leading Arm III using G130M. The science goal is to estimate the effect of MW ionizing radiation on to the accreting gas from the Leading Arm by detecting Si metal absorption lines. Each target will be acquired with a NUV ACQ/IMAGE with the PSA and MIRRORB, followed by science observations with the G130M/1291 setting. We used two FP-POS 3 and 4 in each visit. These four objects are spread across 8 visits. All visits are up to 3 orbits in length, following the guidance from the PC.

Visit

Proposal 18072, Object1-Visit1-PQSJ105251 (01) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

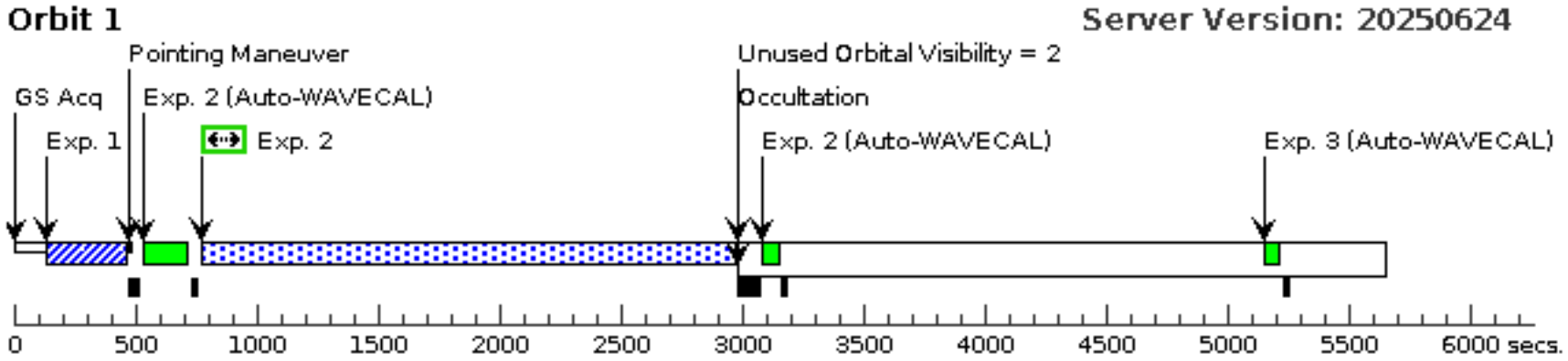
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PQSJ105251.04-272716.	RA: 10 52 51.0194 (163.2125808d) Dec: -27 27 17.07 (-27.45474d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.20700	V=15.8 FUV = 16.44	Reference Frame: ICRS

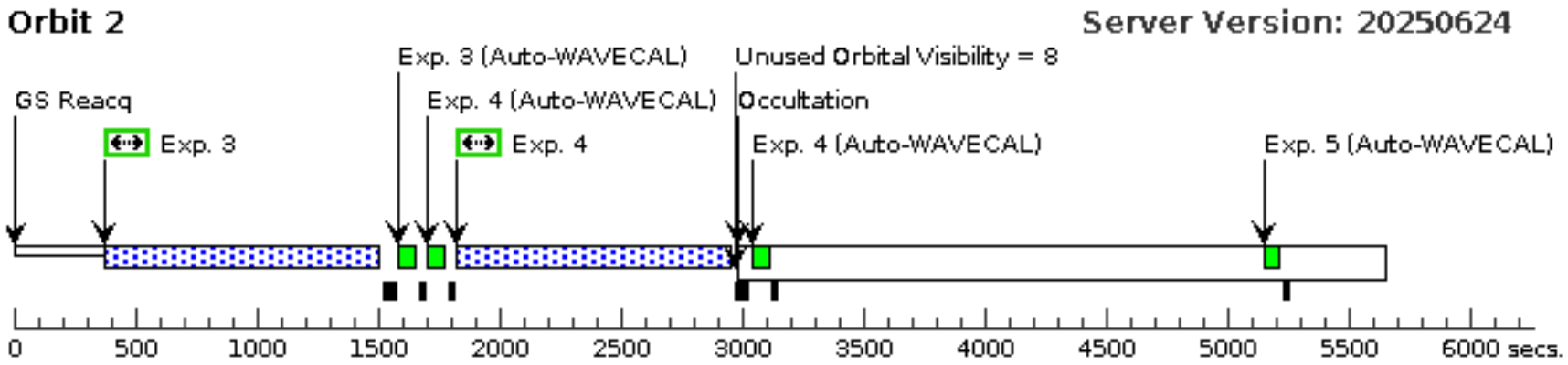
Comments:
Category=GALAXY
Description=[QSO, QUASAR]
Extended=NO

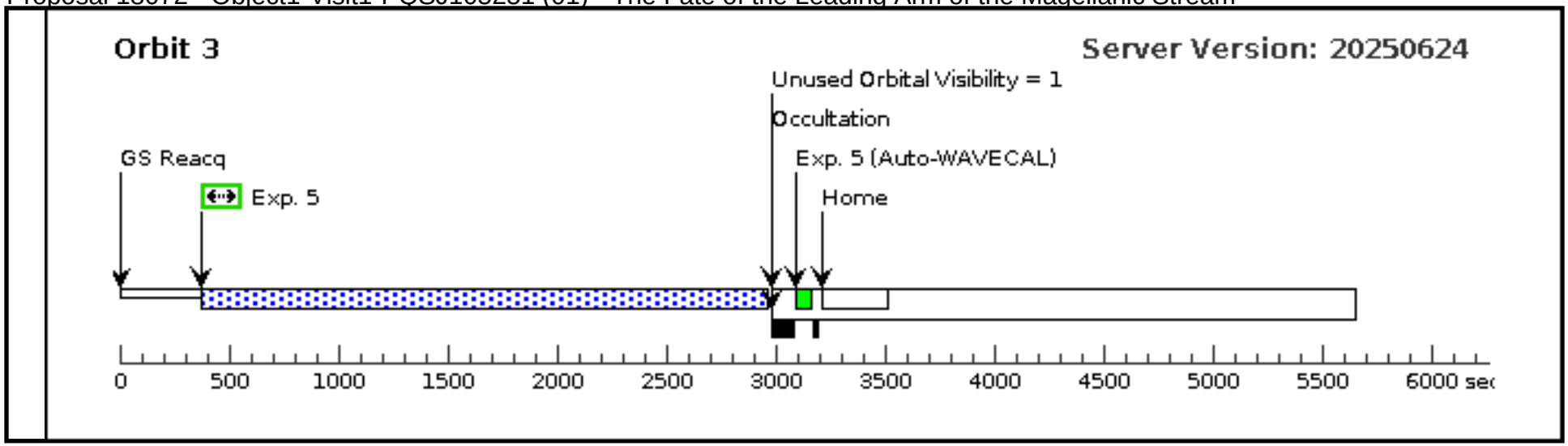
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2023505)	(1) PQSJ105251.04-272716.	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				13 Secs (13 Secs) *[==>]*	*[1]*
2	G130M/1291-FPPOS3 (1963140)	(1) PQSJ105251.04-272716.	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=2641			2145 Secs (2145 Secs) *[==>]*	*[1]*
3	G130M/1291-FPPOS3 (1963140)	(1) PQSJ105251.04-272716.	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=2641			1081 Secs (1081 Secs) *[==>]*	*[2]*
4	G130M/1291-FPPOS4 (1963140)	(1) PQSJ105251.04-272716.	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=2641			1081 Secs (1081 Secs) *[==>]*	*[2]*
5	G130M/1291-FPPOS4 (1963140)	(1) PQSJ105251.04-272716.	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=2641			2542 Secs (2542 Secs) *[==>]*	*[3]*

Orbit Structure






Orbit 3
Server Version: 20250624
Unused Orbital Visibility = 1
Occultation
GS Reacq
Exp. 5
Exp. 5 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18072, Object2-Visit1-PQSJ103236 (02) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

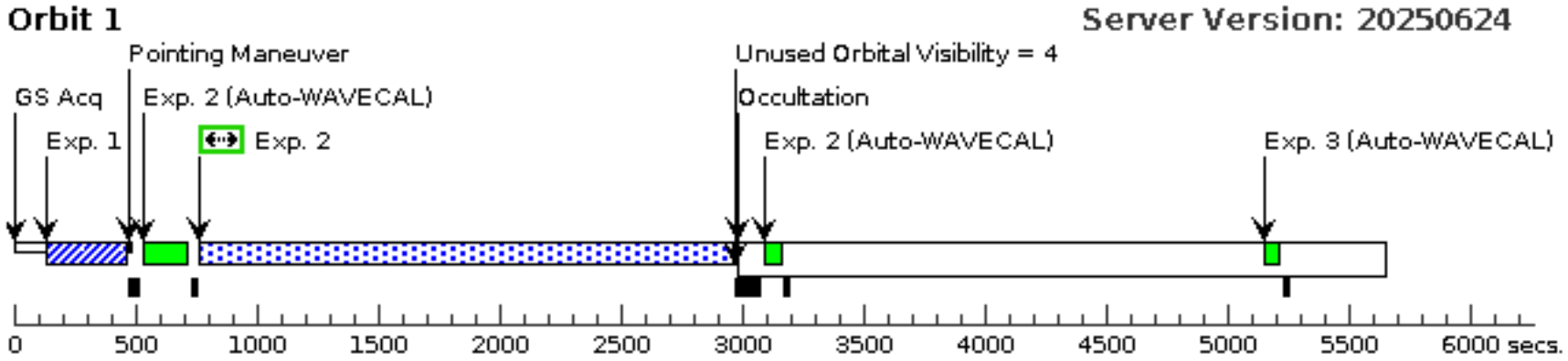
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	PQSJ103236.07-281326.9	RA: 10 32 36.0792 (158.1503300d) Dec: -28 13 26.89 (-28.22414d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.14844	V=16.0 FUV =16.50	Reference Frame: ICRS

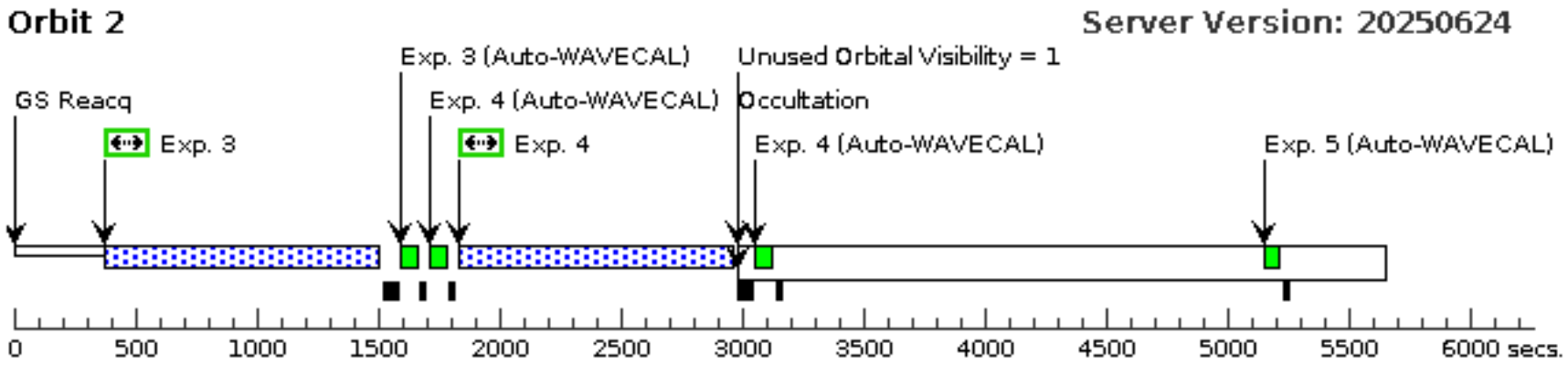
Comments:
Category=ISM
Description=[ABSORPTION LINE SYSTEM, ABSORPTION LINE SYSTEM - GALACTIC, HALO]
Extended=NO

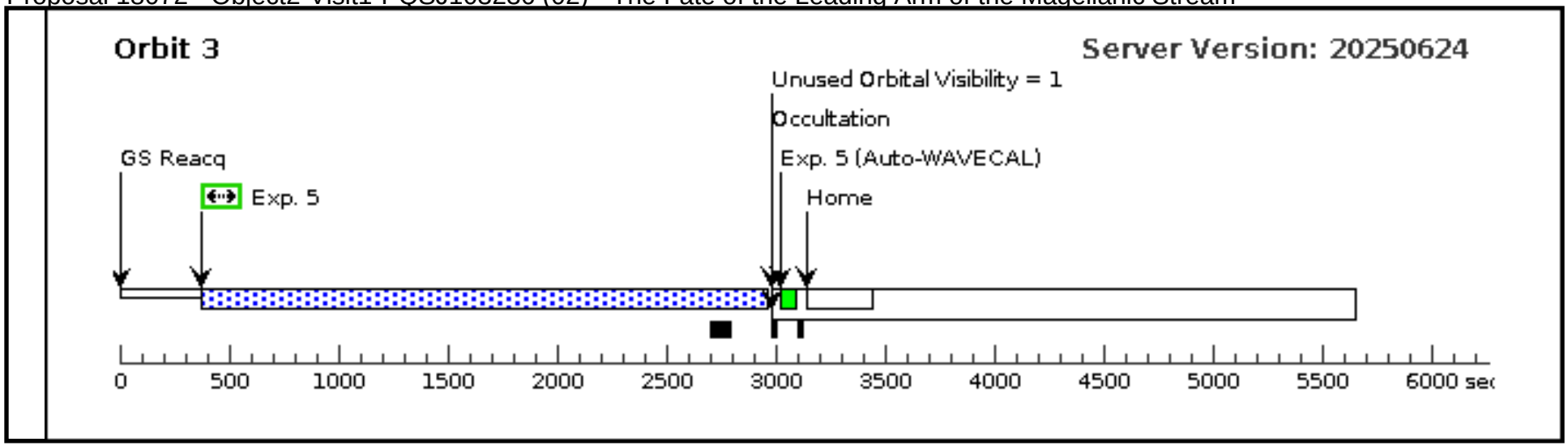
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2024136)	(2) PQSJ103236.07-281326.9	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				12 Secs (12 Secs) *[==>]*	 ***[1]***
2	G130M/1291-FPPOS3 (1963141)	(2) PQSJ103236.07-281326.9	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=2295			2145 Secs (2145 Secs) *[==>]*	 ***[1]***
3	G130M/1291-FPPOS3 (1963141)	(2) PQSJ103236.07-281326.9	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=2295			1080 Secs (1080 Secs) *[==>]*	 ***[2]***
4	G130M/1291-FPPOS4 (1963141)	(2) PQSJ103236.07-281326.9	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=2295			1080 Secs (1080 Secs) *[==>]*	 ***[2]***
5	G130M/1291-FPPOS4 (1963141)	(2) PQSJ103236.07-281326.9	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=2295			2542 Secs (2542 Secs) *[==>]*	 ***[3]***

Orbit Structure






Orbit 3
Server Version: 20250624
Unused Orbital Visibility = 1
Occultation
GS Reacq
Exp. 5 (Auto-WAVECAL)
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18072, Object3-Visit1-PQSJ102239 (03) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

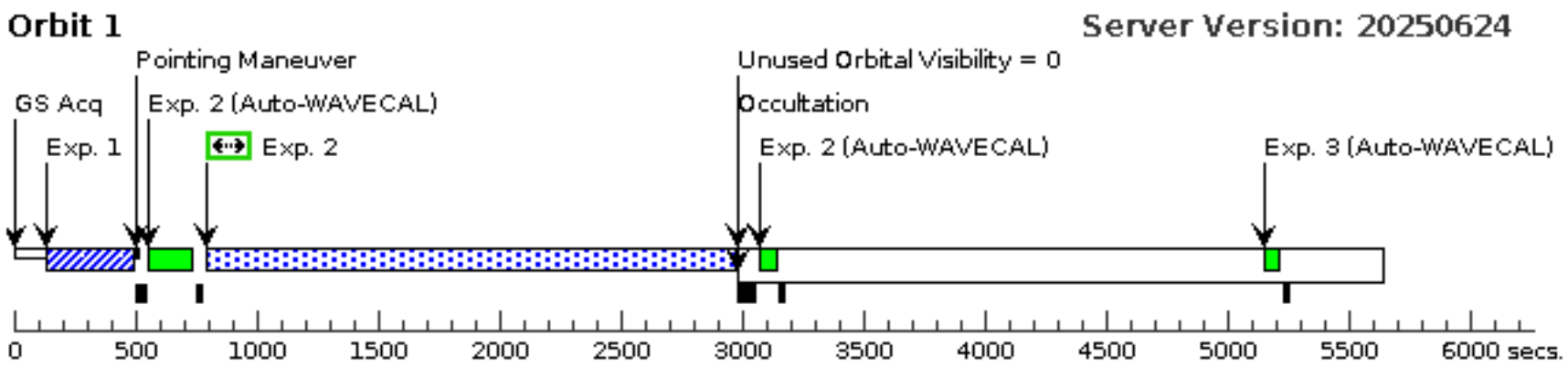
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	PQSJ102239.94-302930.6	RA: 10 22 39.9446 (155.6664358d) Dec: -30 29 30.59 (-30.49183d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.31654	V=17.41 FUV =17.66	Reference Frame: ICRS

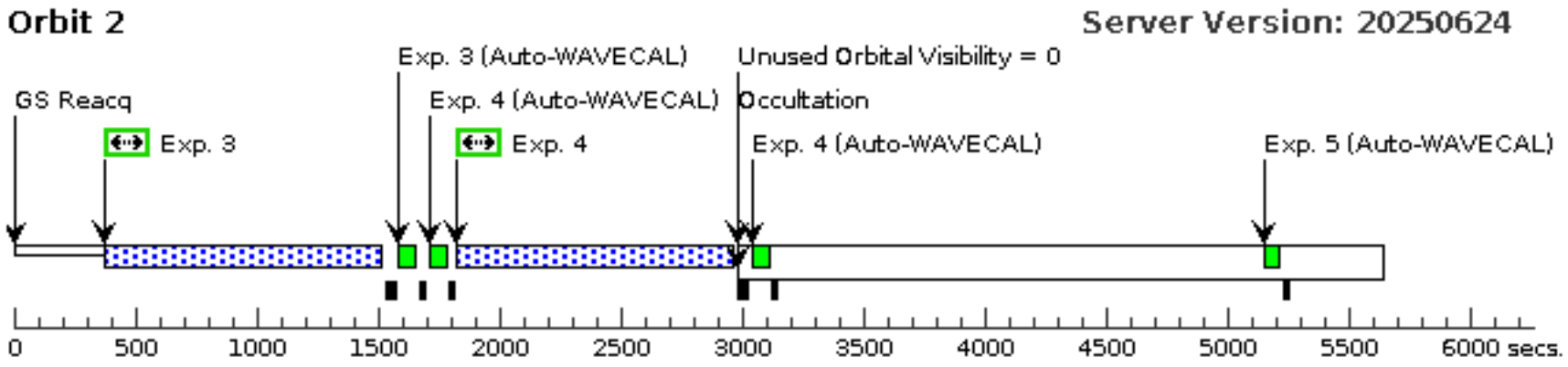
Comments: magnitude given is R-band
Category=GALAXY
Description=[QSO, QUASAR]
Extended=NO

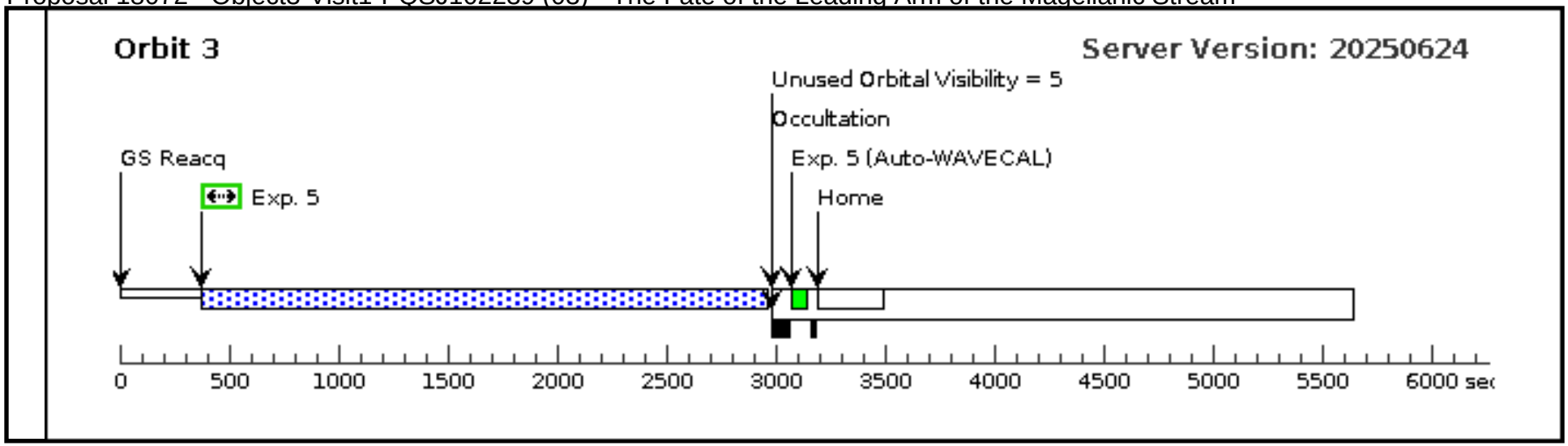
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2024150)	(3) PQSJ102239.94-302930.6	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				25 Secs (25 Secs) *[==>]*	***[1]***
2	G130M/1291-FPPOS3 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3700			2127 Secs (2127 Secs) *[==>]*	***[1]***
3	G130M/1291-FPPOS3 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3700			1092 Secs (1092 Secs) *[==>]*	***[2]***
4	G130M/1291-FPPOS4 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3700			1092 Secs (1092 Secs) *[==>]*	***[2]***
5	G130M/1291-FPPOS4 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3700			2542 Secs (2542 Secs) *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20250624
Unused Orbital Visibility = 5
Occultation
GS Reacq
Exp. 5 (Auto-WAVECAL)
Exp. 5
Home
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500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18072, Object3-Visit2-PQSJ102239 (04) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

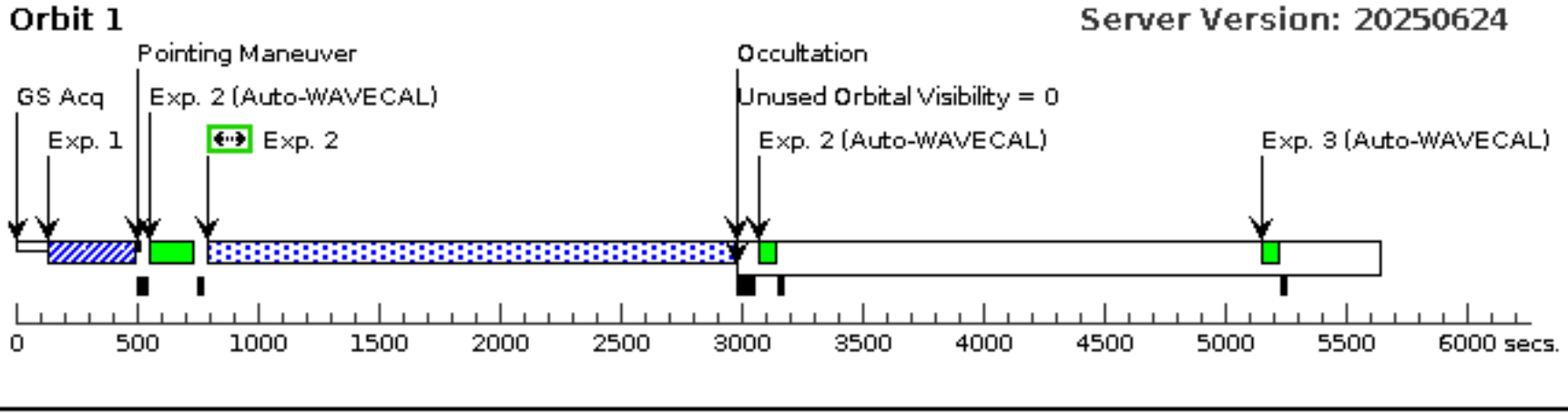
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	PQSJ102239.94-302930.6	RA: 10 22 39.9446 (155.6664358d) Dec: -30 29 30.59 (-30.49183d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.31654	V=17.41 FUV =17.66	Reference Frame: ICRS

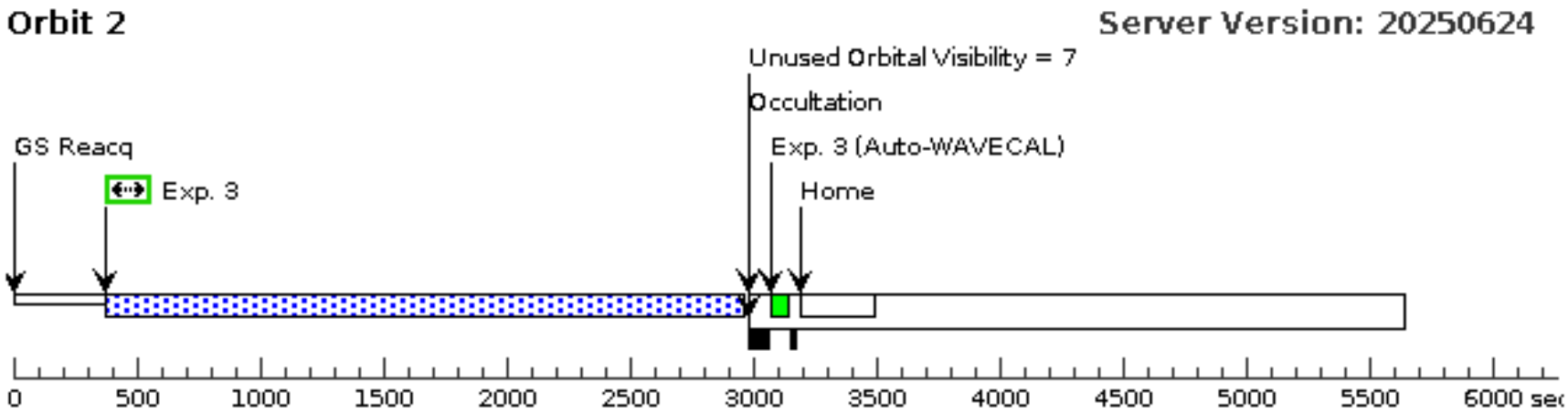
Comments: magnitude given is R-band
Category=GALAXY
Description=[QSO, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2024150)	(3) PQSJ102239.94-302930.6	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				25 Secs (25 Secs) *[==>]*	 ***[1]***
2	G130M/1291-FPPOS3 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3700			2127 Secs (2127 Secs) *[==>]*	 ***[1]***
3	G130M/1291-FPPOS4 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3700			2540 Secs (2540 Secs) *[==>]*	 ***[2]***

Orbit Structure





Visit

Proposal 18072, Object3-Visit3-PQSJ102239 (05) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

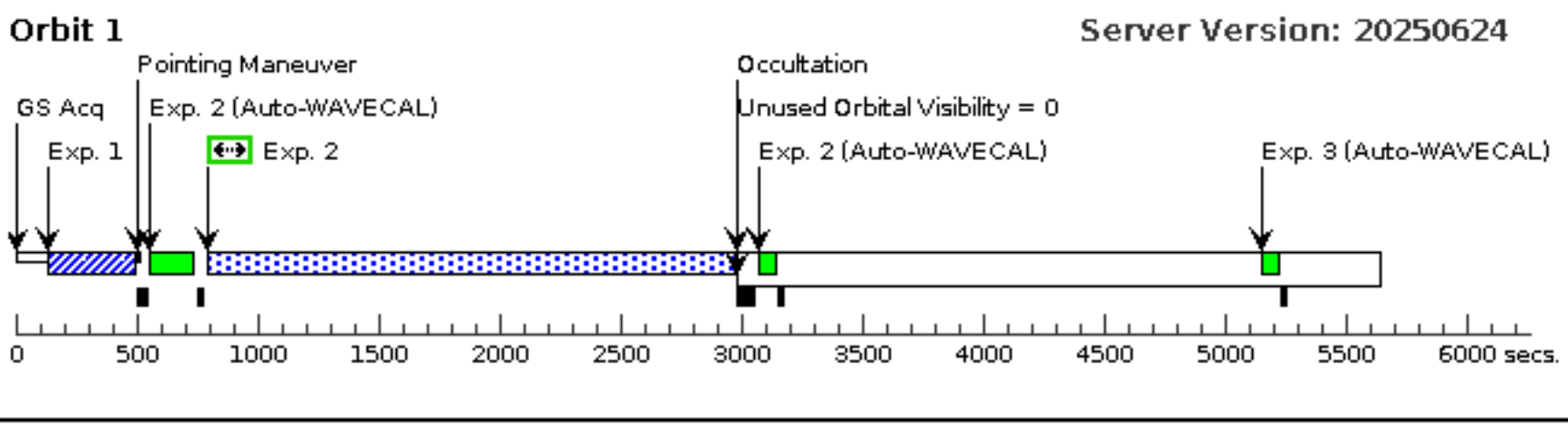
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	PQSJ102239.94-302930.6	RA: 10 22 39.9446 (155.6664358d) Dec: -30 29 30.59 (-30.49183d) Equinox: J2000	Epoch of Position: 2000 Redshift: 0.31654	V=17.41 FUV =17.66	Reference Frame: ICRS

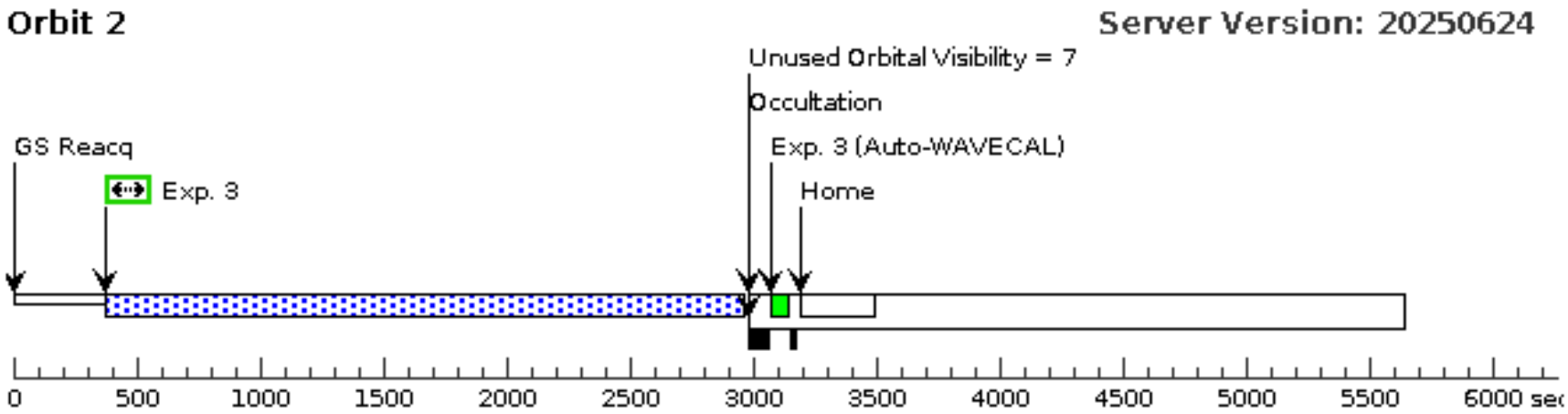
Comments: magnitude given is R-band
Category=GALAXY
Description=[QSO, QUASAR]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2024150)	(3) PQSJ102239.94-302930.6	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				25 Secs (25 Secs) *[==>]*	***[1]***
2	G130M/1291-FPPOS3 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3700			2127 Secs (2127 Secs) *[==>]*	***[1]***
3	G130M/1291-FPPOS4 (1963142)	(3) PQSJ102239.94-302930.6	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3700			2540 Secs (2540 Secs) *[==>]*	***[2]***

Orbit Structure





Visit

Proposal 18072, Object4-Visit1-PQSJ100159 (06) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

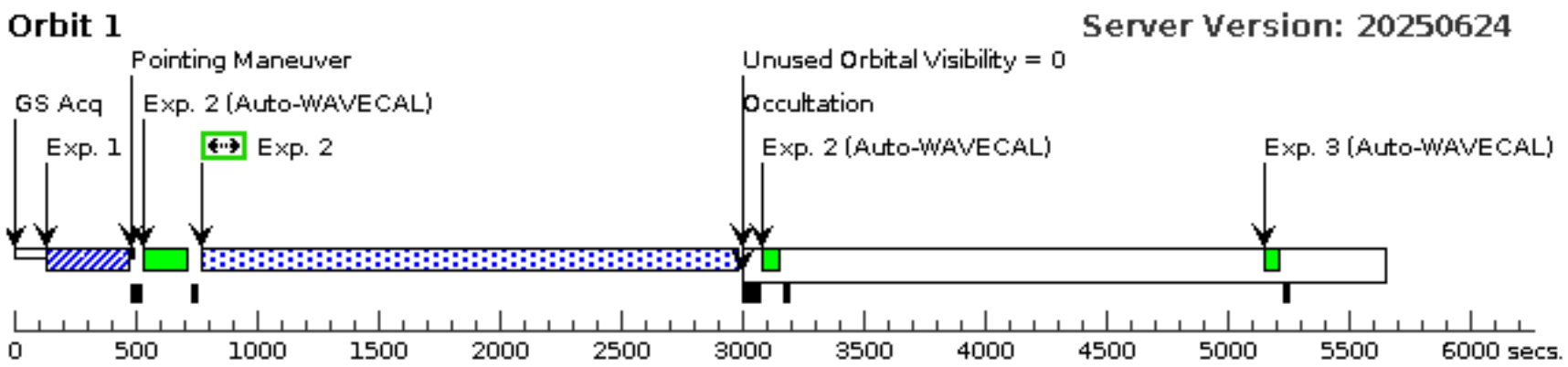
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	PQSJ100159.80-443802.0	RA: 10 01 59.9080 (150.4996167d) Dec: -44 38 0.60 (-44.63350d) Equinox: J2000	Epoch of Position: 2000	V=15.9 FUV = 18.00	Reference Frame: ICRS

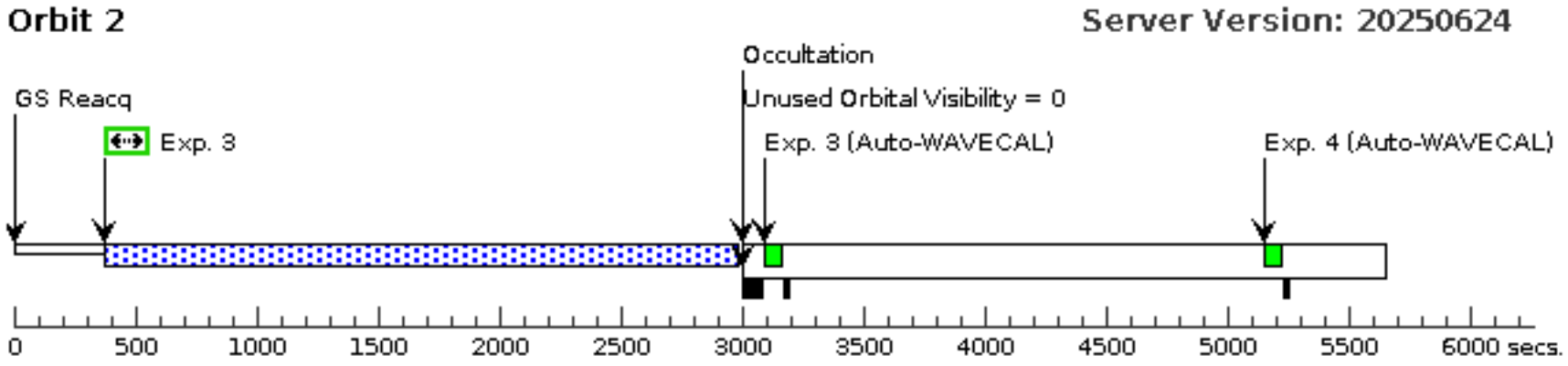
Comments:
Category=GALAXY
Description=[QSO, QUASAR]
Extended=NO

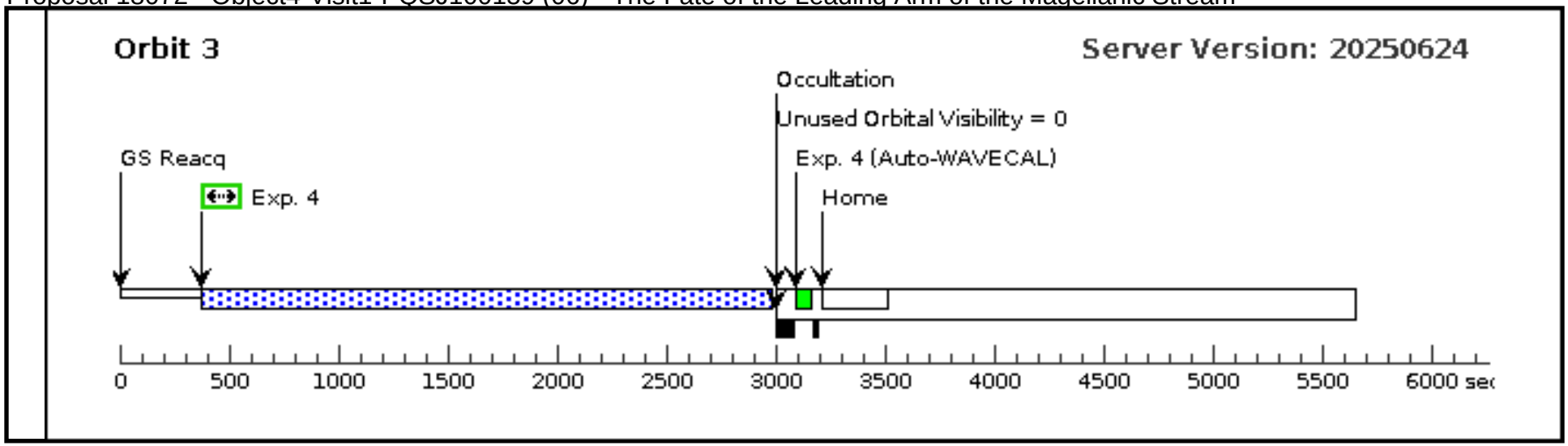
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2024175)	(4) PQSJ100159.80-443802.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				15 Secs (15 Secs) *[==>]*	***[1]***
2	G130M/1291-FPPOS3 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3767			2161 Secs (2161 Secs) *[==>]*	***[1]***
3	G130M/1291-FPPOS3 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3767			2561 Secs (2561 Secs) *[==>]*	***[2]***
4	G130M/1291-FPPOS4 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3767			2561 Secs (2561 Secs) *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20250624
Occultation
Unused Orbital Visibility = 0
GS Reacq
Exp. 4 (Auto-WAVECAL)
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18072, Object4-Visit2-PQSJ100159 (07) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

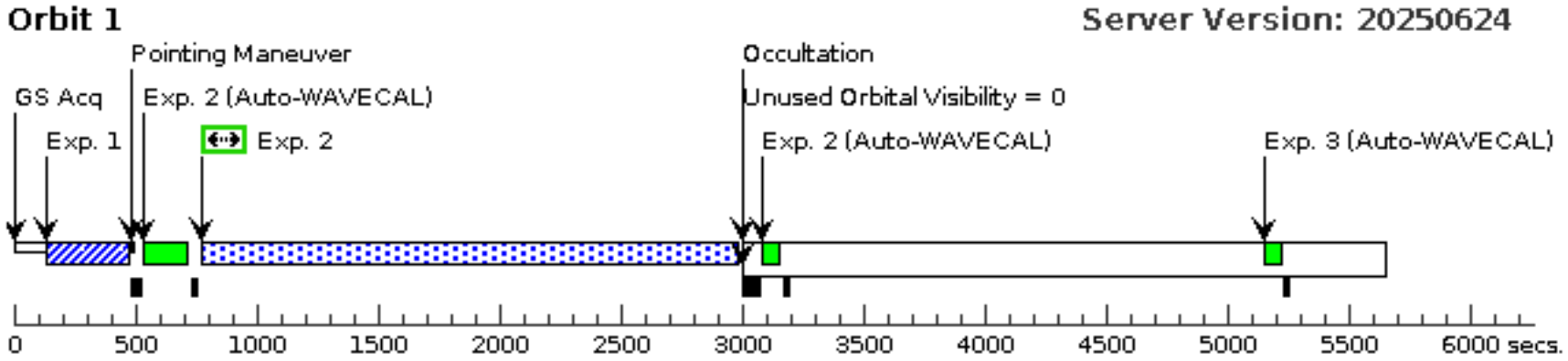
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	PQSJ100159.80-443802.0	RA: 10 01 59.9080 (150.4996167d) Dec: -44 38 0.60 (-44.63350d) Equinox: J2000	Epoch of Position: 2000	V=15.9 FUV = 18.00	Reference Frame: ICRS

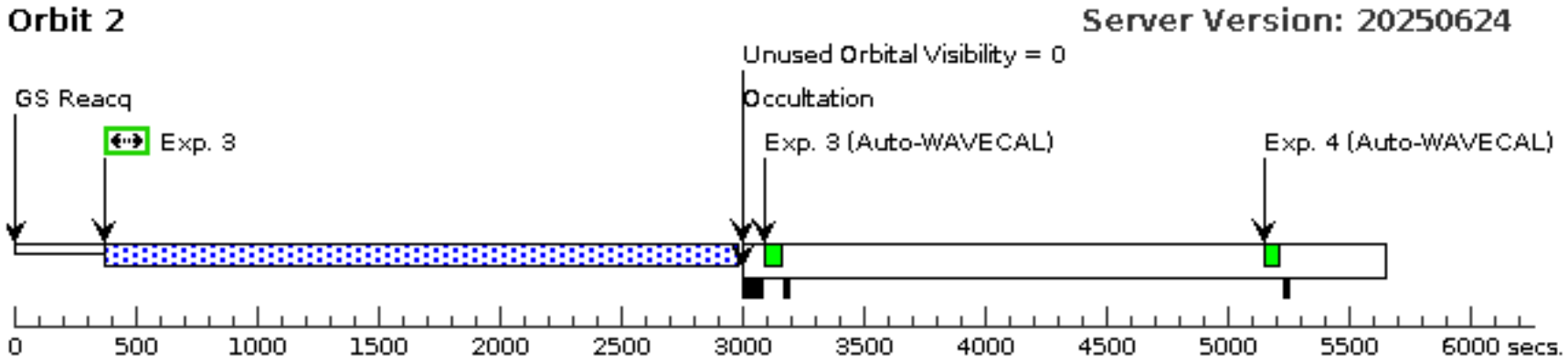
Comments:
Category=GALAXY
Description=[QSO, QUASAR]
Extended=NO

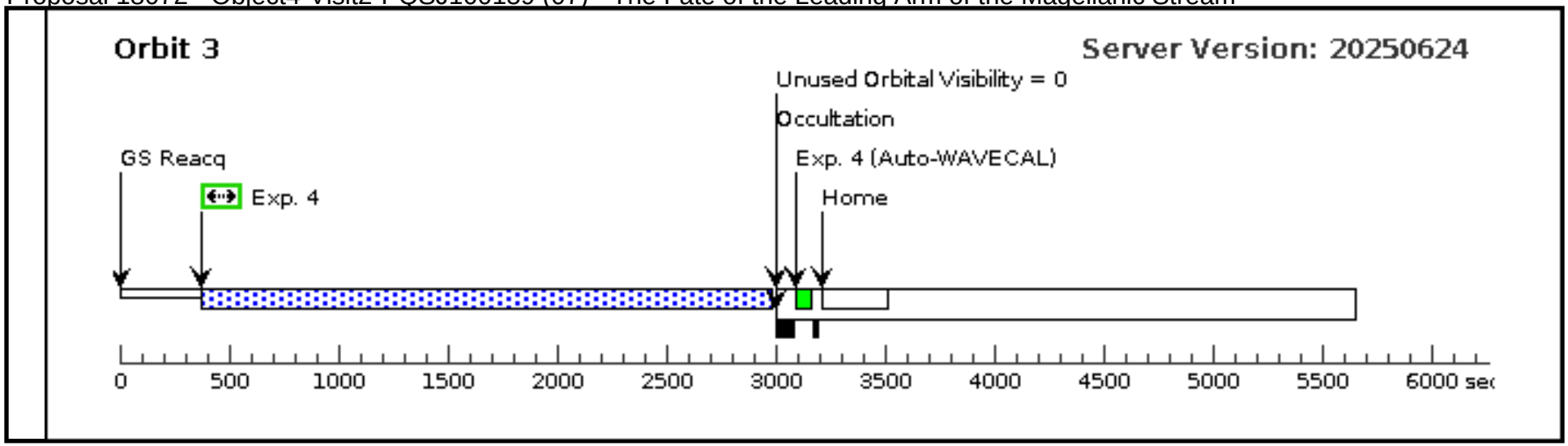
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2024175)	(4) PQSJ100159.80-443802.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				15 Secs (15 Secs) *[==>]*	***[1]***
2	G130M/1291-FPPOS3 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3767			2161 Secs (2161 Secs) *[==>]*	***[1]***
3	G130M/1291-FPPOS4 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3767			2561 Secs (2561 Secs) *[==>]*	***[2]***
4	G130M/1291-FPPOS4 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3767			2561 Secs (2561 Secs) *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20250624
Unused Orbital Visibility = 0
Occultation
GS Reacq
Exp. 4
Exp. 4 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18072, Object4-Visit3-PQSJ100159 (08) Fri Aug 15 19:01:31 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

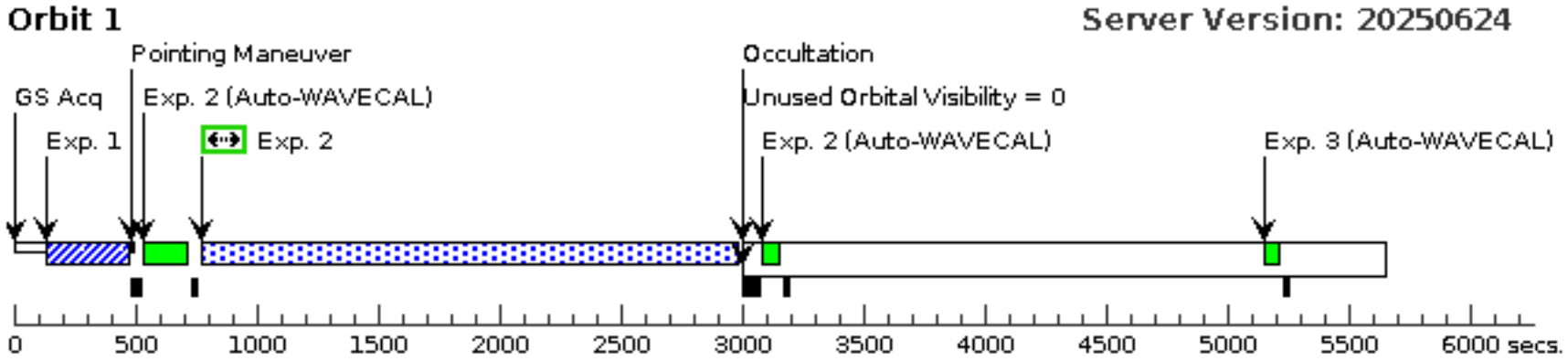
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	PQSJ100159.80-443802.0	RA: 10 01 59.9080 (150.4996167d) Dec: -44 38 0.60 (-44.63350d) Equinox: J2000	Epoch of Position: 2000	V=15.9 FUV = 18.00	Reference Frame: ICRS

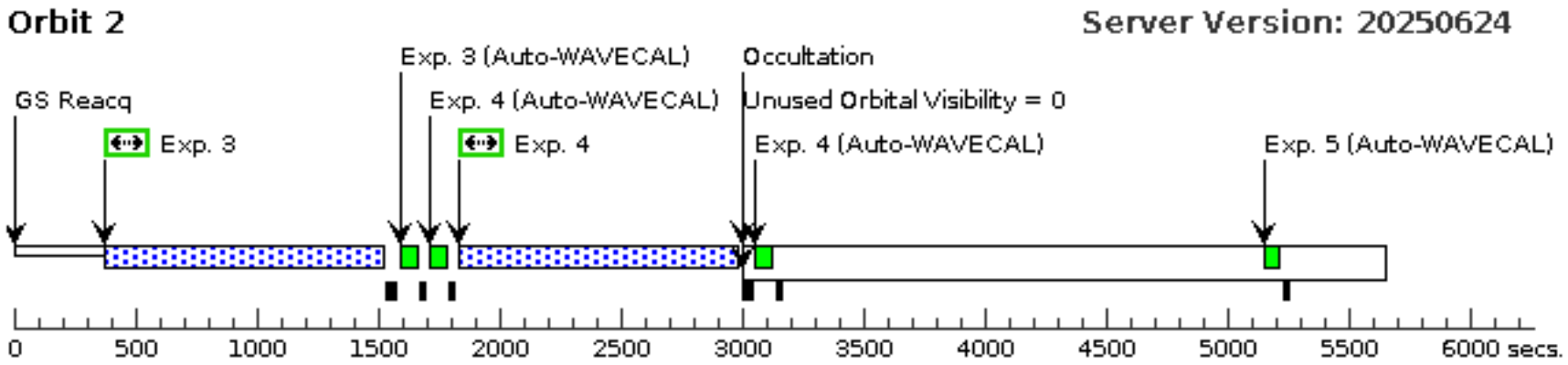
Comments:
Category=GALAXY
Description=[QSO, QUASAR]
Extended=NO

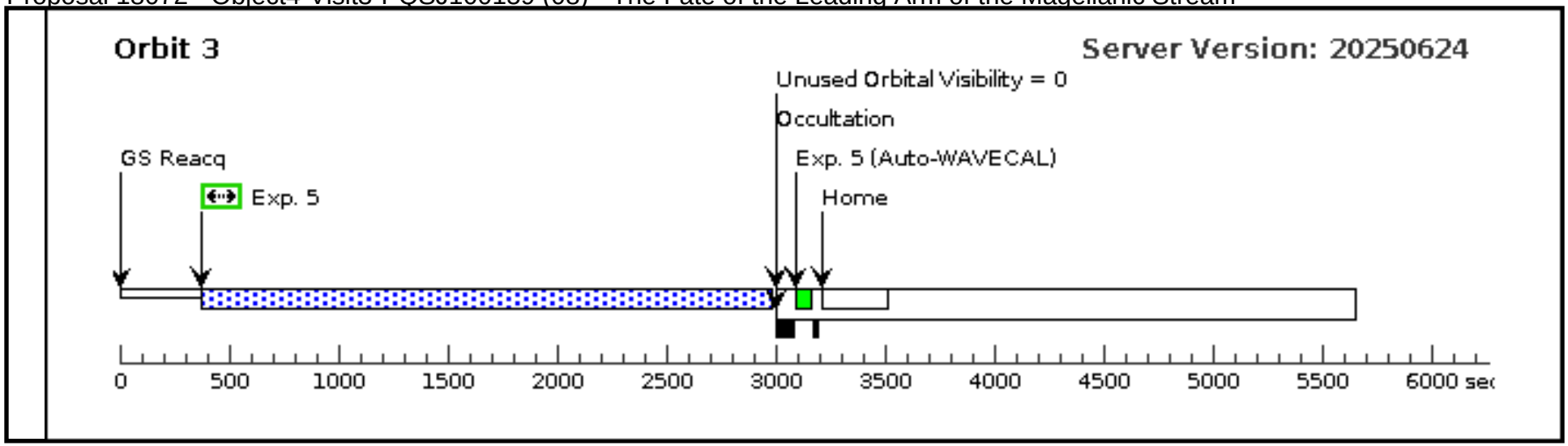
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (2024175)	(4) PQSJ100159.80-443802.0	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				15 Secs (15 Secs) *[==>]*	***[1]***
2	G130M/1291-FPPOS3 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3767			2161 Secs (2161 Secs) *[==>]*	***[1]***
3	G130M/1291-FPPOS3 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3767			1099 Secs (1099 Secs) *[==>]*	***[2]***
4	G130M/1291-FPPOS4 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3767			1099 Secs (1099 Secs) *[==>]*	***[2]***
5	G130M/1291-FPPOS4 (1963143)	(4) PQSJ100159.80-443802.0	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3767			2561 Secs (2561 Secs) *[==>]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20250624
Unused Orbital Visibility = 0
Occultation
GS Reacq
Exp. 5
Exp. 5 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec