17515 - Chasing Lyman Continuum Leakers in the Local Universe

Cycle: 31, 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) MRK-209	COS/FUV COS/NUV	2	28-Feb-2025 17:00:11.0	yes
02	(2) NGC-2366	COS/FUV COS/NUV	2	28-Feb-2025 17:00:12.0	yes
03	(3) UGC-4483	COS/FUV COS/NUV	2	28-Feb-2025 17:00:12.0	yes
04	(4) LEDA-37102	COS/FUV COS/NUV	2	28-Feb-2025 17:00:13.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
05	(5) VIIZW403	COS/FUV COS/NUV	2	28-Feb-2025 17:00:13.0	yes

10 Total Orbits Used

ABSTRACT

When and how did reionization occur? This will be one of the questions JWST will seek to address in the coming years. The main challenge, however, is the fact that direct measures of the leaking Lyman continuum (LyC) radiation from the same galaxies that reionized the Universe are not possible due to the high opacity of the intergalactic medium (IGM). To fully understand the mechanisms enabling the escape of LyC photons into the IGM, and to uncover the main contributors to the cosmic reionization, it is imperative that we: (1) Test and develop tools to indirectly infer the LyC escape fraction, and (2) compile a sample of nearby LyC leakers allowing us to exploit the ease of fully resolving these objects in the context of LyC escape. We propose a pioneering program to do exactly that. Building on archival observations of eleven local star-forming galaxies (SFGs), we request COS/FUV G130M/1291 spectroscopic data of five additional targets, all of which are expected to have f_esc(LyC)>10% based on cosmological radiation hydrodynamics simulations. Our study will test a much-needed indirect signpost of LyC leakers based primarily on the saturated CII 1334.5A line, allowing us to understand the physical process making LyC leakage possible, and probing the contribution of low-mass SFGs to the epoch of reionization.

OBSERVING DESCRIPTION

This HST/COS program observes 5 young star clusters in nearby star-forming galaxies in 5 separate visits with the G130M/1291 COS configuration. Each individual visit acquires the target using the ACQ/IMAGE mode with either MIRROR or MIRRORB. The spectroscopic observations are collected using FP-POS = 3 and 4. These new observations will be complemented by an archival sample of eleven local star-forming galaxies. This sample of 16 nearby star-forming galaxies will allow us to test the much-needed indirect signpost of LyC leakers based primarily on the saturated CII 1334.5A line, allowing us to understand the physical process making LyC leakage possible, and probing the contribution of low-mass SFGs to the epoch of reionization.

Target Selection: The new COS sub-sample of star-forming galaxies covers a broad parameter space both in star formation rates, stellar masses, and metallicity. This new COS targets are needed to span the broadest parameter space possible for candidates with the highest probability, P(fesc(LyC)>=10%)> 0.6, to leak Lyman Continuum radiation.

The exposure times were calculated assuming the spectrum of a simple stellar population of age 5 or 25 Myr (based on literature values) renormalized to either their WFC3/F275W, or WFC3/F336W magnitudes to reach S/N~10 at 1335 A. The only exception to this approach was VIIZw403. For this target we instead used archival IUE observations to estimate the appropriate exposure times.

Visit

Proposal 17515, Mrk-209 (01), completed Fri Feb 28 22:00:14 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

(Mrk-209 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Mrk-209 (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

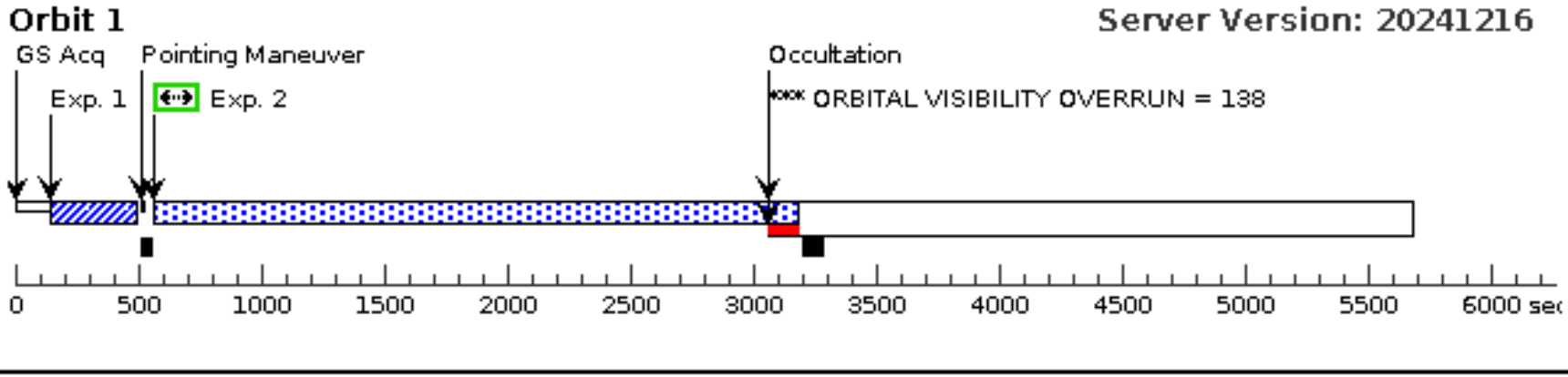
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MRK-209	RA: 12 26 15.7262 (186.5655258d)	Epoch of Position: 2015.5	V=14.15	Reference Frame: ICRS
	Alt Name1: UGCA281	Dec: +48 29 38.41 (48.49400d)			
		Equinox: J2000			

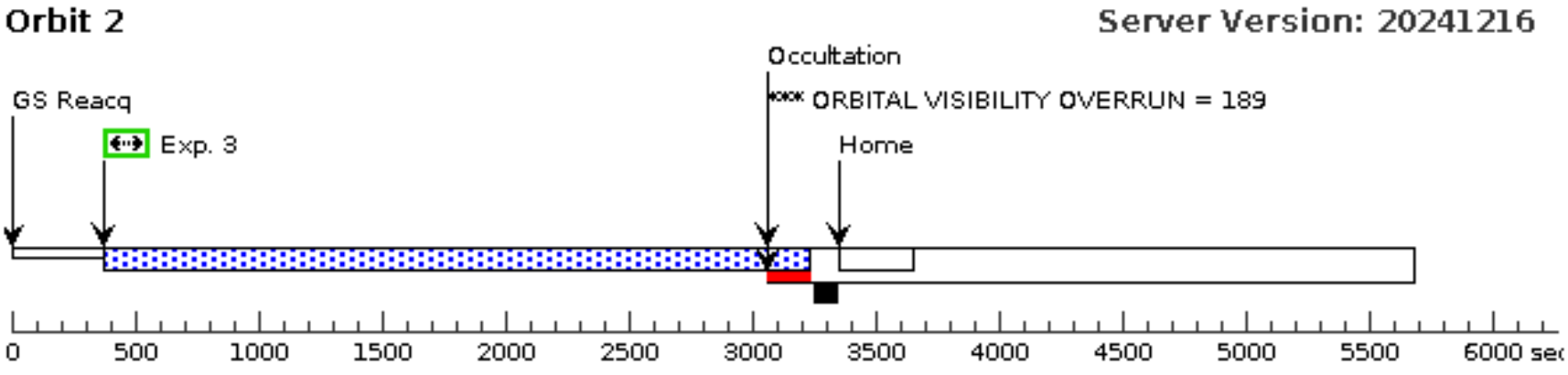
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[STAR FORMING REGION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.1889568)	(1) MRK-209	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				30 Secs (30 Secs)	
								[==>]	***[1]***
2	(COS.sp.1889557)	(1) MRK-209	COS/FUV, TIME-TAG, PSA	G130M	FP-POS=3;			2600 Secs (2447 Secs)	
				1291 A	BUFFER-TIME=3335			*[==>2447.0 Secs]*	***[1]***
3	(COS.sp.1889557)	(1) MRK-209	COS/FUV, TIME-TAG, PSA	G130M	FP-POS=4;			618 Secs (2807 Secs)	
				1291 A	BUFFER-TIME=3335			*[==>2807.0 Secs]*	***[2]***

Orbit Structure





Visit

Proposal 17515, NGC-2366-A (02), completed Fri Feb 28 22:00:14 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

(NGC-2366-A (02)) Warning (Orbit Planner): COS EXPOSURE TIME ROUNDED DOWN TO NEAREST 0.1 SECONDS

(NGC-2366-A (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(NGC-2366-A (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

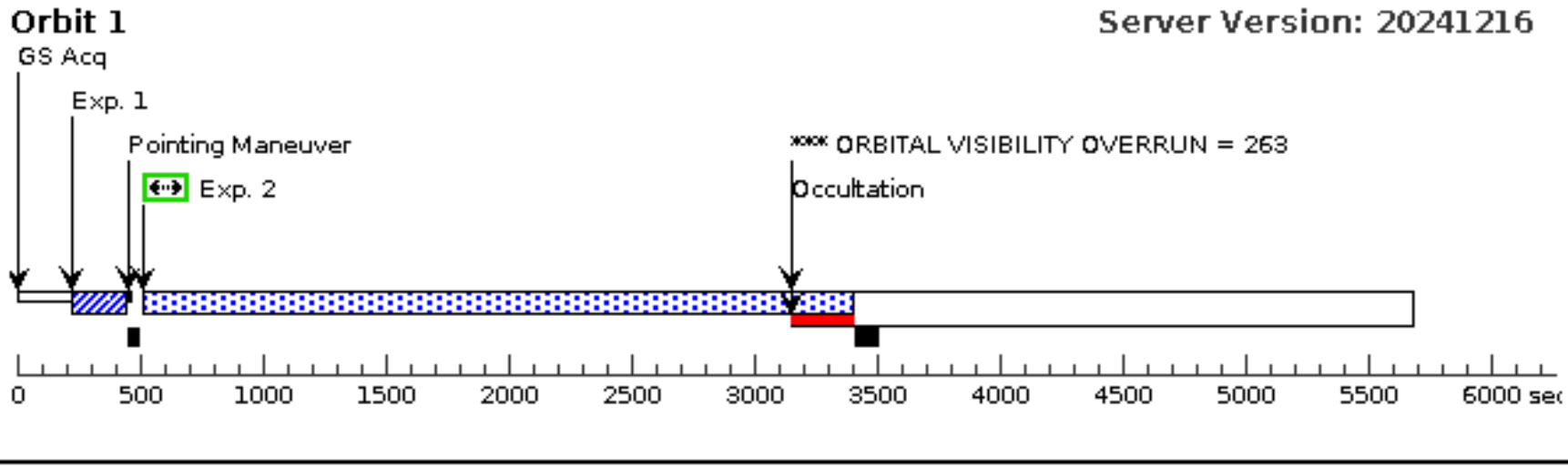
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	NGC-2366	RA: 07 28 42.6702 (112.1777925d) Dec: +69 11 21.90 (69.18942d) Equinox: J2000	Epoch of Position: 2015.5	V=11.39	Reference Frame: ICRS

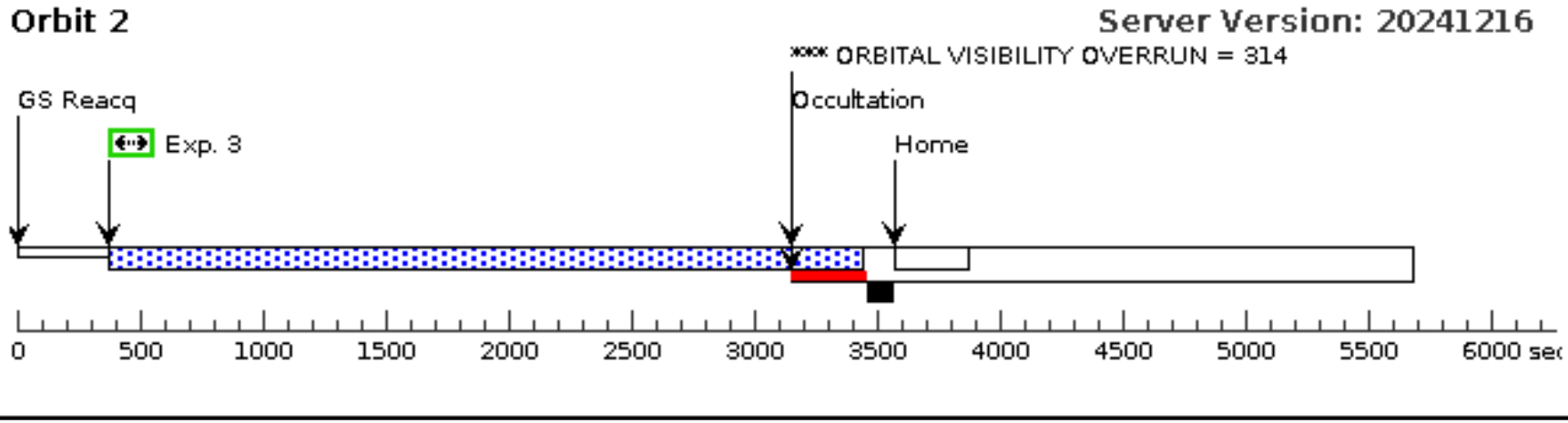
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[STAR FORMING REGION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.1889570)	(2) NGC-2366	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				1.4 Secs (1.4 Secs) *[==>]*	***[1]***
2	(COS.sp.1889569)	(2) NGC-2366	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3065			618 Secs (2717 Secs) *[==>2717.0 Secs]*	***[1]***
3	(COS.sp.1889569)	(2) NGC-2366	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3065			618 Secs (3021 Secs) *[==>3021.0 Secs]*	***[2]***

Orbit Structure





Visit

Proposal 17515, UGC-4483 (03), completed Fri Feb 28 22:00:14 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

(UGC-4483 (03)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(UGC-4483 (03)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

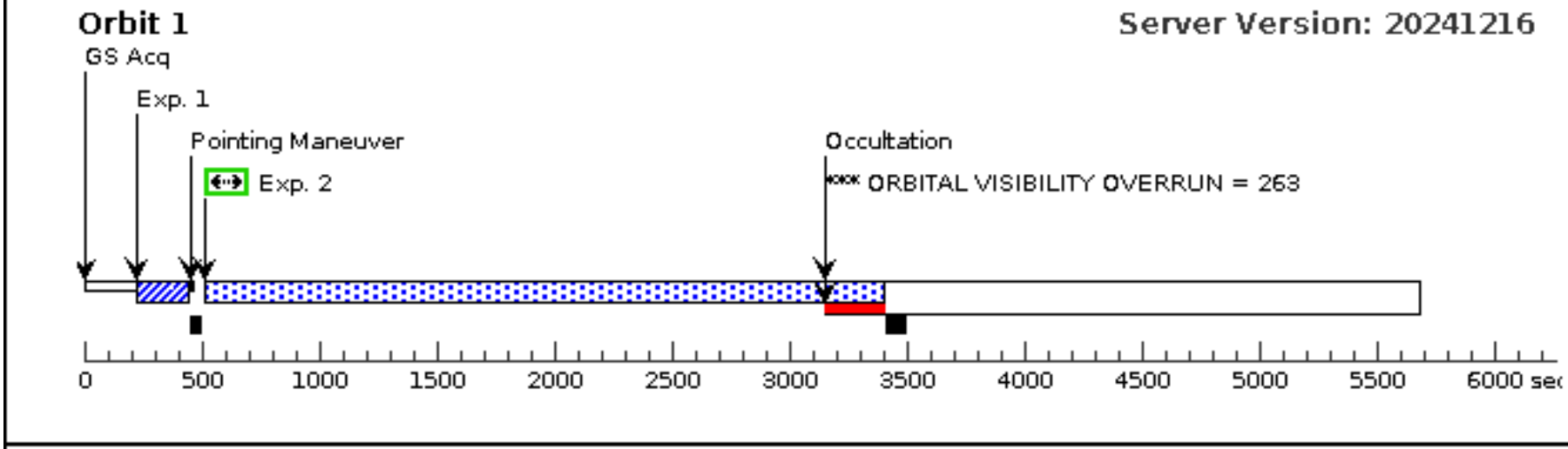
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	UGC-4483	RA: 08 37 2.9192 (129.2621633d) Dec: +69 46 51.03 (69.78084d) Equinox: J2000	Epoch of Position: 2015.5	V=14.98	Reference Frame: ICRS

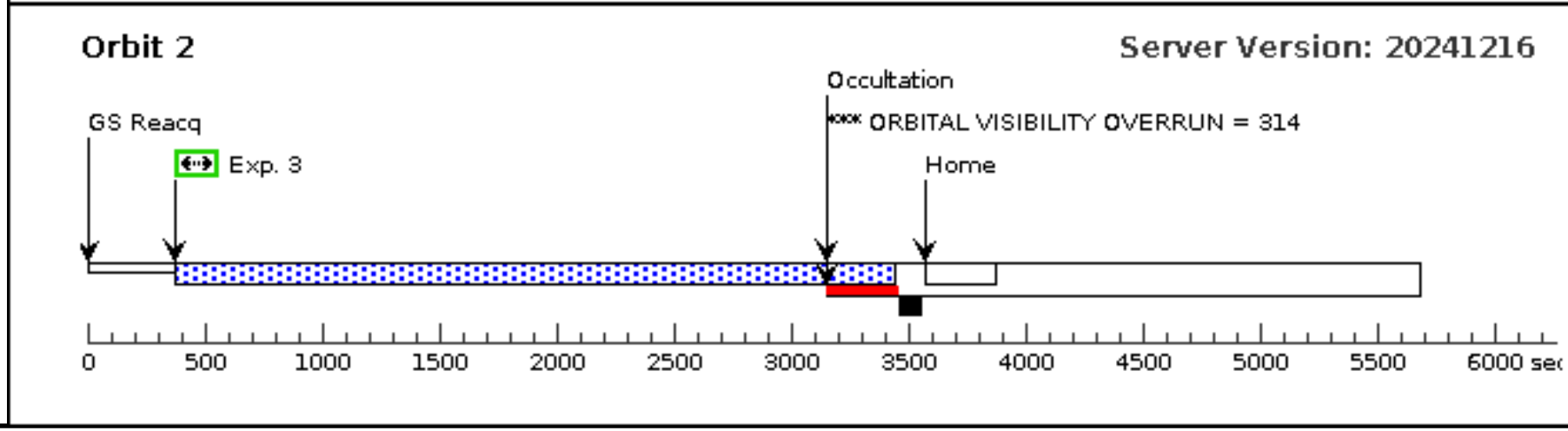
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[STAR FORMING REGION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.1889575)	(3) UGC-4483	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				2 Secs (2 Secs) *[==>]*	***[1]***
2	(COS.sp.1889574)	(3) UGC-4483	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3610			618 Secs (2717 Secs) *[==>2717.0 Secs]*	***[1]***
3	(COS.sp.1889574)	(3) UGC-4483	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=3610			618 Secs (3021 Secs) *[==>3021.0 Secs]*	***[2]***

Orbit Structure





Visit

Proposal 17515, UM461 (04), implementation Fri Feb 28 22:00:14 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Fixed Targets

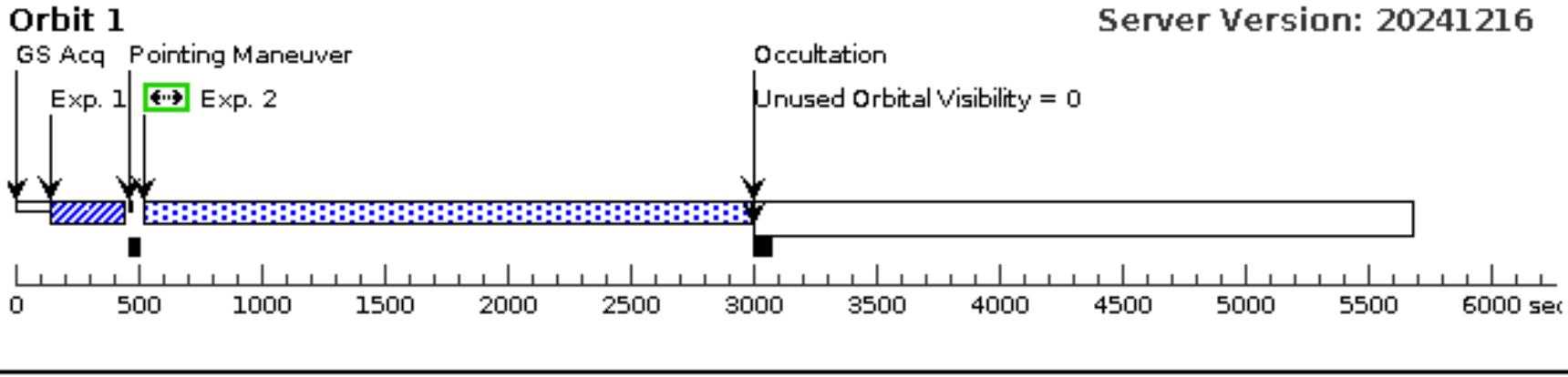
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	LEDA-37102	RA: 11 51 33.3575 (177.8889896d)	Epoch of Position: 2015.5	V=15.71	Reference Frame: ICRS
	Alt Name1: UM461	Dec: -02 22 22.08 (-2.37280d)			
		Equinox: J2000			

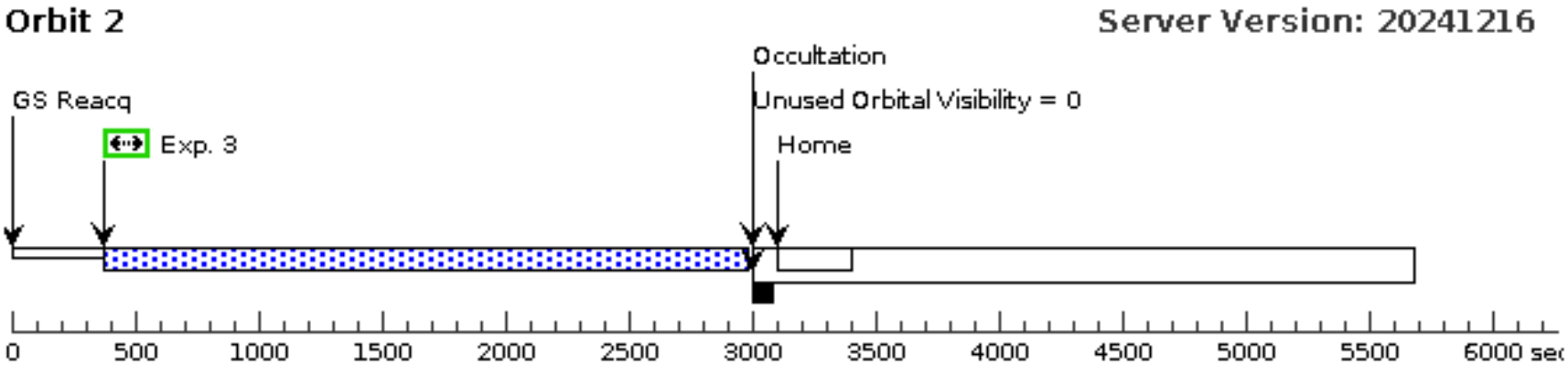
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=GALAXY
Description=[STAR FORMING REGION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.1889578)	(4) LEDA-37102	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				7 Secs (7 Secs)	
								[==>]	***[1]***
2	(COS.sp.1889576)	(4) LEDA-37102	COS/FUV, TIME-TAG, PSA	G130M	FP-POS=3;			618 Secs (2298 Secs)	
				1291 A	BUFFER-TIME=3468			*[==>2298.0 Secs]*	***[1]***
3	(COS.sp.1889576)	(4) LEDA-37102	COS/FUV, TIME-TAG, PSA	G130M	FP-POS=4;			618 Secs (2561 Secs)	
				1291 A	BUFFER-TIME=3468			*[==>2561.0 Secs]*	***[2]***

Orbit Structure





Visit

Proposal 17515, VIIZw403 (05), completed Fri Feb 28 22:00:14 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: (none)

Diagnostics

(VIIZw403 (05)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(VIIZw403 (05)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	VIIZW403	RA: 11 28 1.3187 (172.0054946d) Dec: +78 59 27.92 (78.99109d) Equinox: J2000		V=13.58	Reference Frame: ICRS

Comments:
Category=GALAXY
Description=[STAR FORMING REGION]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.1889597)	(5) VIIZW403	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				1.8 Secs (1.8 Secs) *[==>]*	***[1]***
2	(COS.sp.1889580)	(5) VIIZW403	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=1294			618 Secs (2744 Secs) *[==>2744.0 Secs]*	***[1]***
3	(COS.sp.1889580)	(5) VIIZW403	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=4; BUFFER-TIME=1294			618 Secs (3048 Secs) *[==>3048.0 Secs]*	***[2]***

Orbit Structure