18077 - Ultraviolet Spectroscopy of a Luminous Fast Blue Optical Transient

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Daniel Perley (PI) (ESA Member) (Contact)	**Liverpool John Moores University**
Anna Yen Qin Ho (CoI) (AdminUSPI)	Cornell University
Dr. Christoffer Fremling (CoI)	California Institute of Technology
Dr. Lin Yan (CoI)	California Institute of Technology
Prof. Shrinivas R. Kulkarni (CoI)	California Institute of Technology
Dr. Ragnhild Lunnan (CoI) (ESA Member)	Stockholm University

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) LFBOT	COS/FUV COS/NUV	4	13-Oct-2025 11:00:28.0	yes
02	(1) LFBOT	COS/FUV COS/NUV	4	13-Oct-2025 11:00:29.0	yes

8 Total Orbits Used

ABSTRACT

Recent surveys have identified a population of rapidly evolving, very luminous extragalactic transients which radiate primarily in the ultraviolet (even out to late times) and are accompanied by powerful X-ray and radio emission. These transients lack any discernable supernova features in optical spectra and ground-based observations have been unable to definitively pin down their origins, although a combination of extreme energetics

and low ejecta masses indicate they are probably linked to accretion events involving very massive (but not supermassive) black holes. We propose to obtain a far-ultraviolet spectrum of a newly-identified transient of this nature in Cycle 33 or 34, which would be only the second such spectrum obtained to date. The abundant strong line features in the FUV make it a uniquely powerful spectral regime for testing models for the structure, composition, and velocity of the outflow and allow for a crucial test of competing models: whether these events represent the collapses of massive stars into black holes (and if so, which types of stars), or the disruption and accretion of stars onto supermassive black holes.

OBSERVING DESCRIPTION

Our objective is to carry out low-resolution FUV and NUV spectroscopy of a fast-luminous UV transient with COS (G140L) and STIS (G230L). Fast turnaround is helpful for many reasons - both to optimize the S/N (the target will fade rapidly) and to decrease the risk of acquisition failure if the target's UV flux evolution is different than expected. A turnaround of less than 1 week is ideal, although for a sufficiently nearby event we may accept a longer delay. Using fewer guide stars may be acceptable to achieve faster turnaround. It is desirable in principle to obtain the COS and STIS observations close in time to each other but observing sooner in one band will almost always be preferred if the option is available.

Rapid two-way communication with STScI will be necessary to correctly configure the observations and perform all safety checks to ensure a successful acquisition. The PI's mobile number is +44 745 6339330 and can be contacted 24 hours a day.

Visit

Proposal 18077, COS FUV spectrum (01), implementation Mon Oct 13 15:00:29 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: ON HOLD ; TOO RESPONSE TIME 7.0D

Comments: Exposure times will need to be adjusted depending on the visibility of the actual target at time of trigger.

On Hold Comments: Target of opportunity awaiting a suitable trigger from ZTF or another survey. The anticipated rate of fading is 0.25 mag/day, so sooner observations is always better. A longer response may be acceptable depending on the initial brightness of the event.

Generic Targets

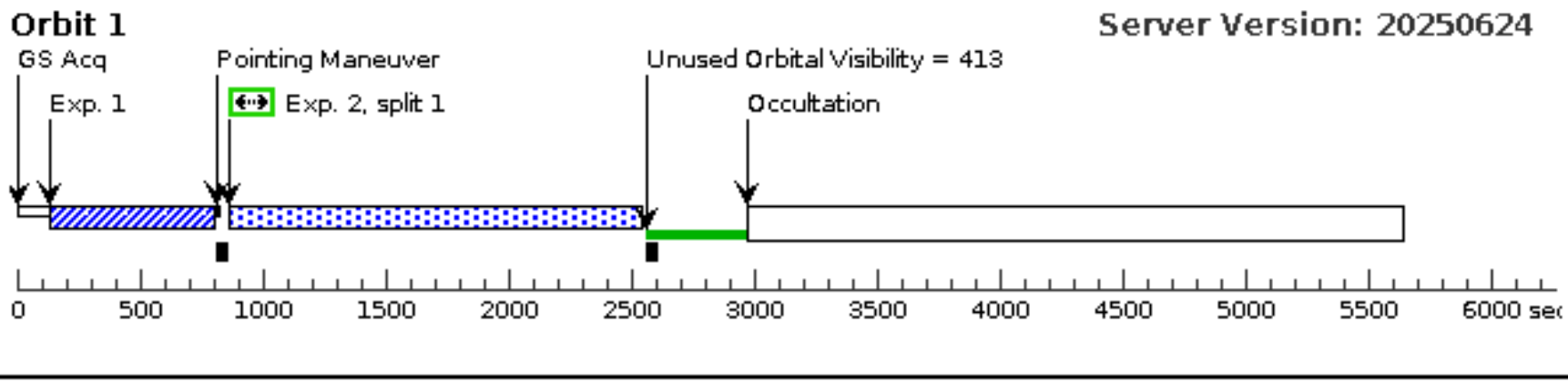
#	Name	Criteria	Description
(1)	LFBOT	Fast rise (<3 days) to high luminosity (M ~ -20) without cooling	SUPERNOVA

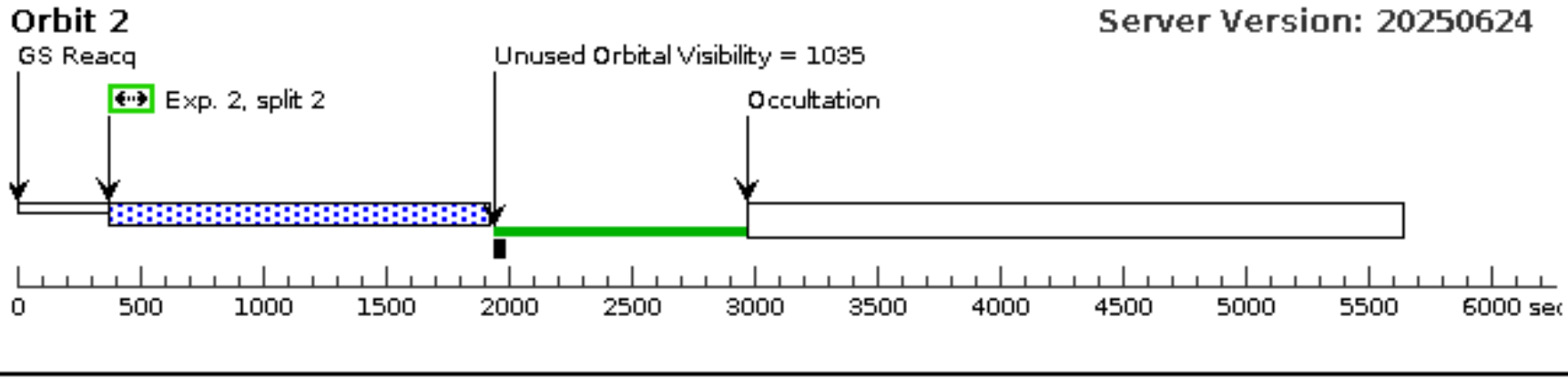
Comments: The target will be identified from ZTF or potentially another high-cadence optical survey. The trigger will be submitted at or after peak and there will be a clear upper limit on the flux of the target based on this. The source will probably be close to V=18.5, UV=17.5 mag at peak (AB). The source is expected to fade rapidly after peak, but this is difficult to project. The target is a point source and we expect it will be brighter than its host galaxy (in UV) but will confirm at the time of triggering.

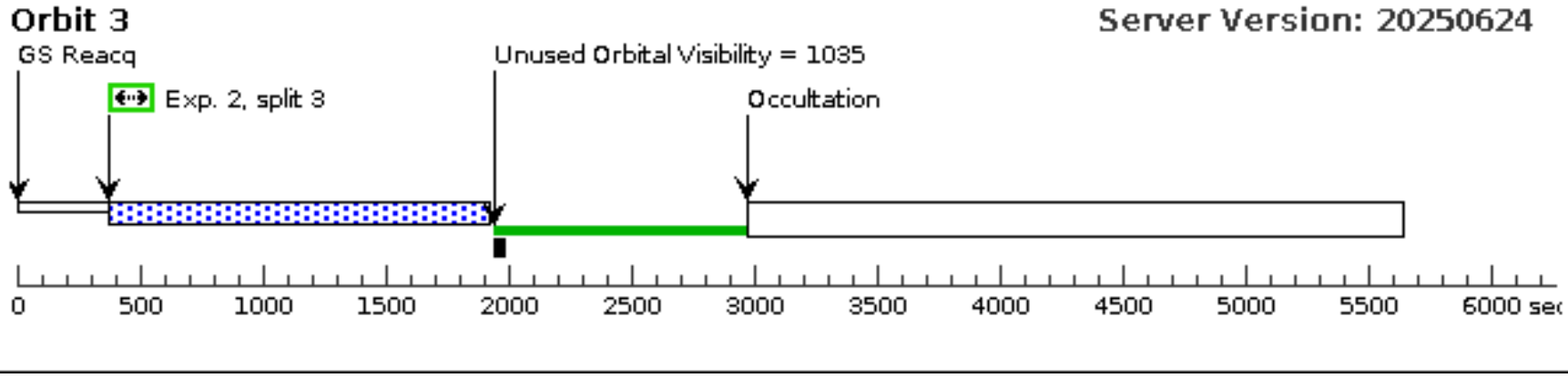
Exposures

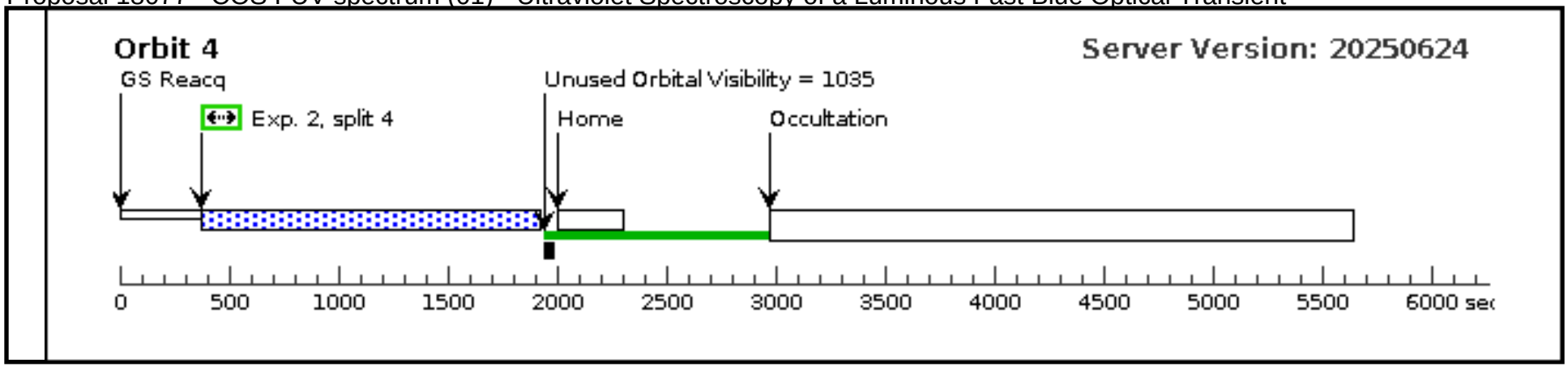
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acquisition (COS.ta.2023464)	(1) LFBOT	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				180 Secs (180 Secs)	
								[==>]	***[1]***
Comments: There will be uncertainty in the target magnitude, although most of the uncertainty will be in the downward direction (how fast will it fade) once the time of observation is determined. We may elect to use MIRRORA if the target is faint.									
2	COS spectrum (COS.sp.2023455)	(1) LFBOT	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FLASH=YES; BUFFER-TIME=6400; FP-POS=ALL			1500 Secs (6000 Secs)	
								[==>(Split 1)]	***[1]***
								[==>(Split 2)]	***[2]***
								[==>(Split 3)]	***[3]***
								[==>(Split 4)]	***[4]***

Orbit Structure





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GS Reacq
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Unused Orbital Visibility = 1035
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6000 sec

Visit

Proposal 18077, COS FUV spectrum (02), implementation Mon Oct 13 15:00:29 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: ON HOLD ; TOO RESPONSE TIME 7.0D

Comments: Exposure times will need to be adjusted depending on the visibility of the actual target at time of trigger.

This visit is currently identical to the other COS visit. The observation is broken into two separate visits to increase scheduling flexibility. Our general expectation is that the two visits will be executed back to back, but if the TOO target is sufficiently bright we may request a time constraint on the second visit to delay the observation for a few days to study time evolution.

On Hold Comments: Target of opportunity awaiting a suitable trigger from ZTF or another survey. The anticipated rate of fading is 0.25 mag/day, so sooner observations is always better. A longer response may be acceptable depending on the initial brightness of the event.

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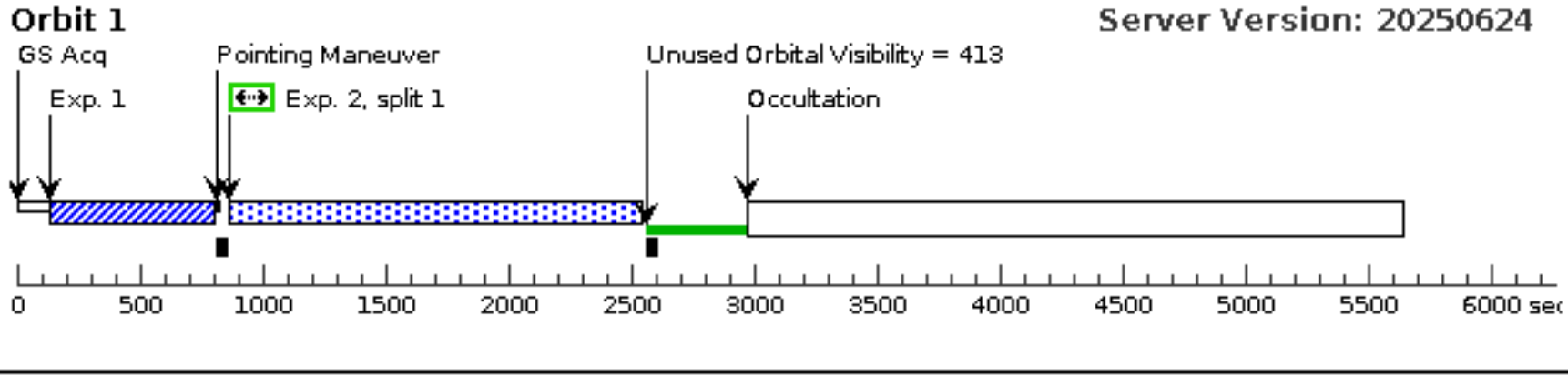

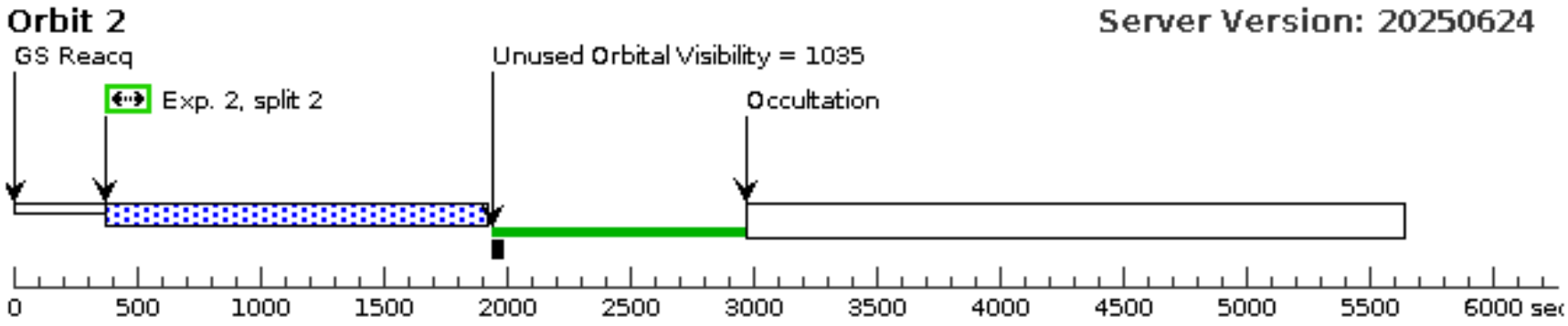

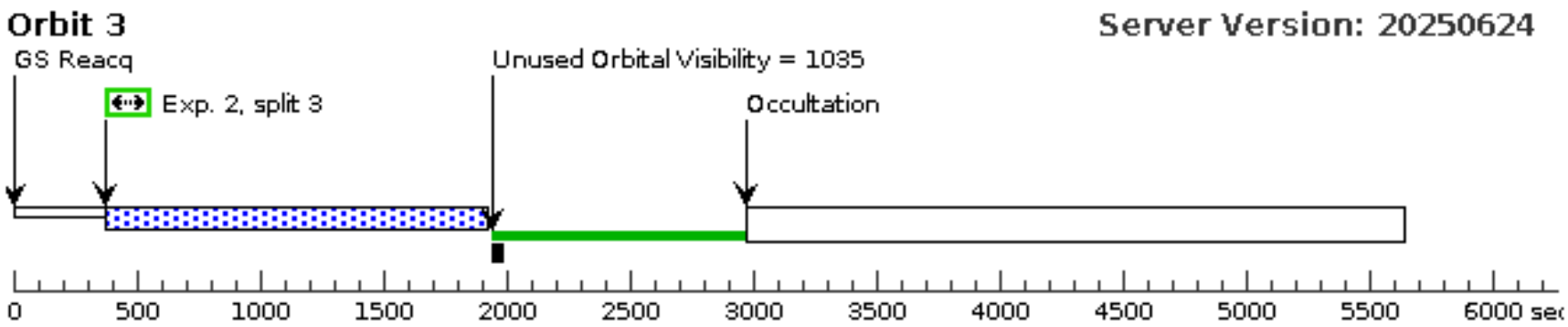

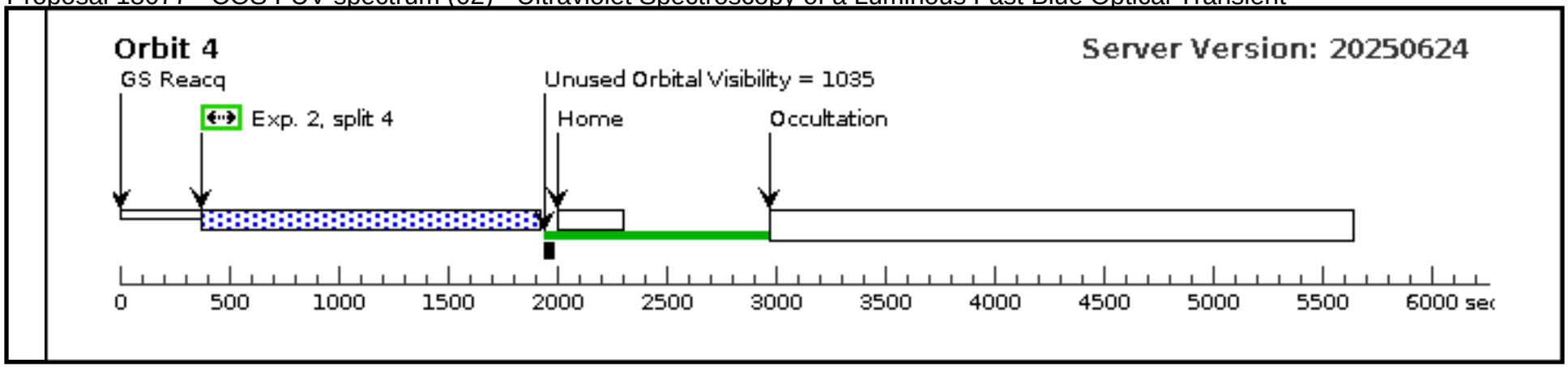
Orbit 4
Server Version: 20250624
GS Reacq
Exp. 2, split 4
Unused Orbital Visibility = 1035
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