13827 - A New Opportunity to Detect Iron in the Most Iron-Poor Star Known

Cycle: 22, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Ian U. Roederer (PI) (Contact)	**University of Michigan**	**iur@umich.edu**

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SMSS-J031300-670839	COS/NUV	5	29-Sep-2015 21:30:48.0	yes
02	(1) SMSS-J031300-670839	COS/NUV	5	29-Sep-2015 21:30:51.0	yes

10 Total Orbits Used

ABSTRACT

At present, there are three stars known in the Milky Way with Fe/H ratios less than 1/100,000 times the Solar Fe/H ratio. These stars were almost certainly formed during the earliest epochs of star formation in the Milky Way, and their metals were formed from the yields of just one zero-metallicity Population III supernova. High-quality optical spectroscopy reveals the presence of C, Mg, Ca, Fe, and other metals in two of these stars. In the most iron-poor star, SMSS J031300-670839, only Li, C, Mg, and Ca are detected. Not a single iron line can be detected in the optical spectral range. The Fe/H ratio of this star is currently estimated to be less than 1/13,000,000 times the Solar Fe/H ratio.

I propose to obtain a high-resolution COS spectrum of this star to attempt to detect Fe II lines in the NUV near 2400 Angstroms. These Fe II lines are the strongest of any iron-group element, and they present the best opportunity to detect iron in this star. My proposed observations would tighten the constraint on the Fe/H ratio by a factor of 50, and a detection would be possible if the Fe/H ratio in this star is 1/1,000,000,000 times the Solar

Fe/H ratio or greater. NUV observations with COS provide the only opportunity to perform this study.

OBSERVING DESCRIPTION

This program will obtain R~22,000 COS spectra around several Fe II absorption lines near 2400 Angstroms in a very metal-poor late-G-type star. The goal is to obtain the highest S/N possible (target: S/N ~ 20/1) in this one setup within the 10 orbits allocated.

Visit

Proposal 13827, SMSS J0313 visit 1 (01), implementation Wed Sep 30 01:30:53 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV

Special Requirements: (none)

Fixed Targets

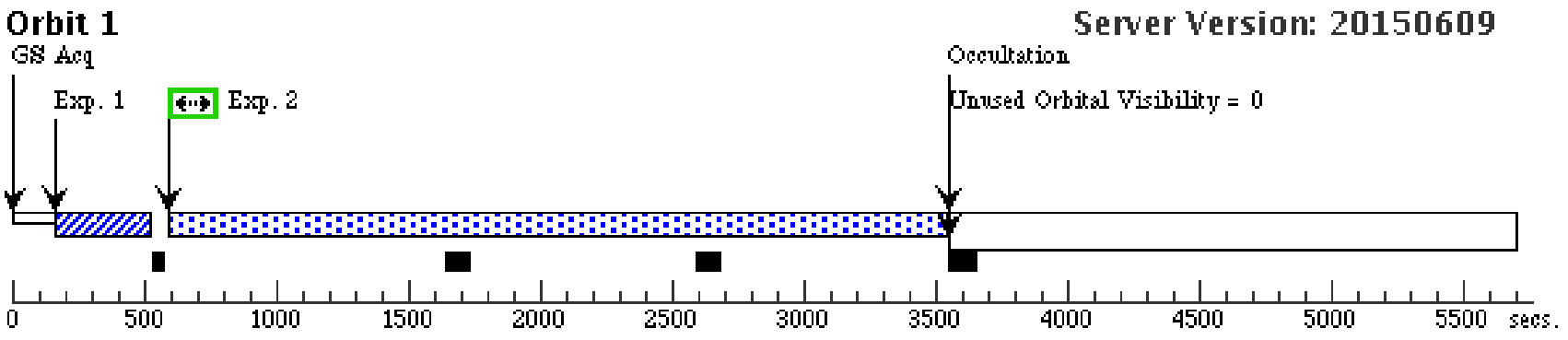
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SMSS-J031300-670839	RA: 03 13 0.3600 (48.2515000d) Dec: -67 08 39.33 (-67.14426d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0 Epoch of Position: 1994.35 Radial Velocity: -334 km/sec	V=14.7+/-0.1 E(B-V) = 0.04; B = 15.36 (USNO-B); R = 14.10 (USNO-B); J = 13.181 (2MASS); H = 12.692 (2MASS); K = 12.661 (2MASS)	Reference Frame: ICRS

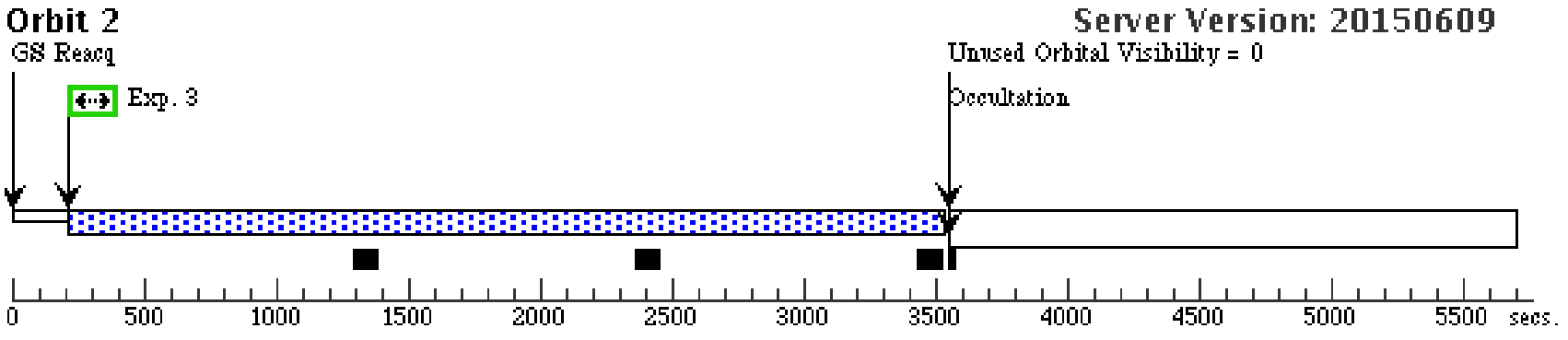
*Comments: The coordinates are taken from the USNO-B catalog accessed through IRSA on 07 July 2014. The proper motions derived by the PPMXL catalog (USNO-B plus 2MASS) are PMRA = -0.000002 +/- 0.000003 deg/yr and PMDEC = 0.000002 +/- 0.000003 deg/yr. Neither one is significant, so I have entered 0.0 for both values in the APT table. The coordinate uncertainties are given as 0.000018 deg (*cos(DEC)), which I convert to 0.17 arcsec.*
Extended=NO

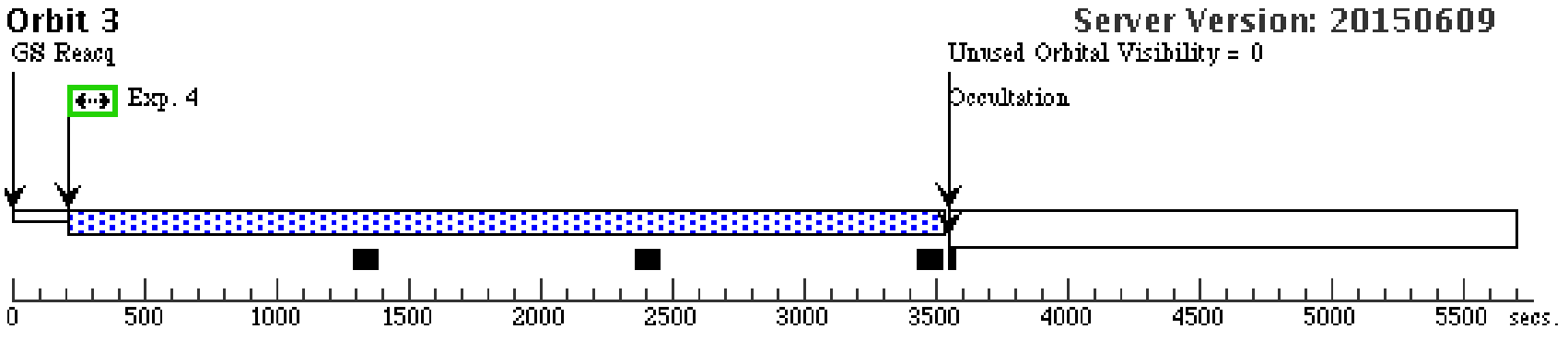
Exposures

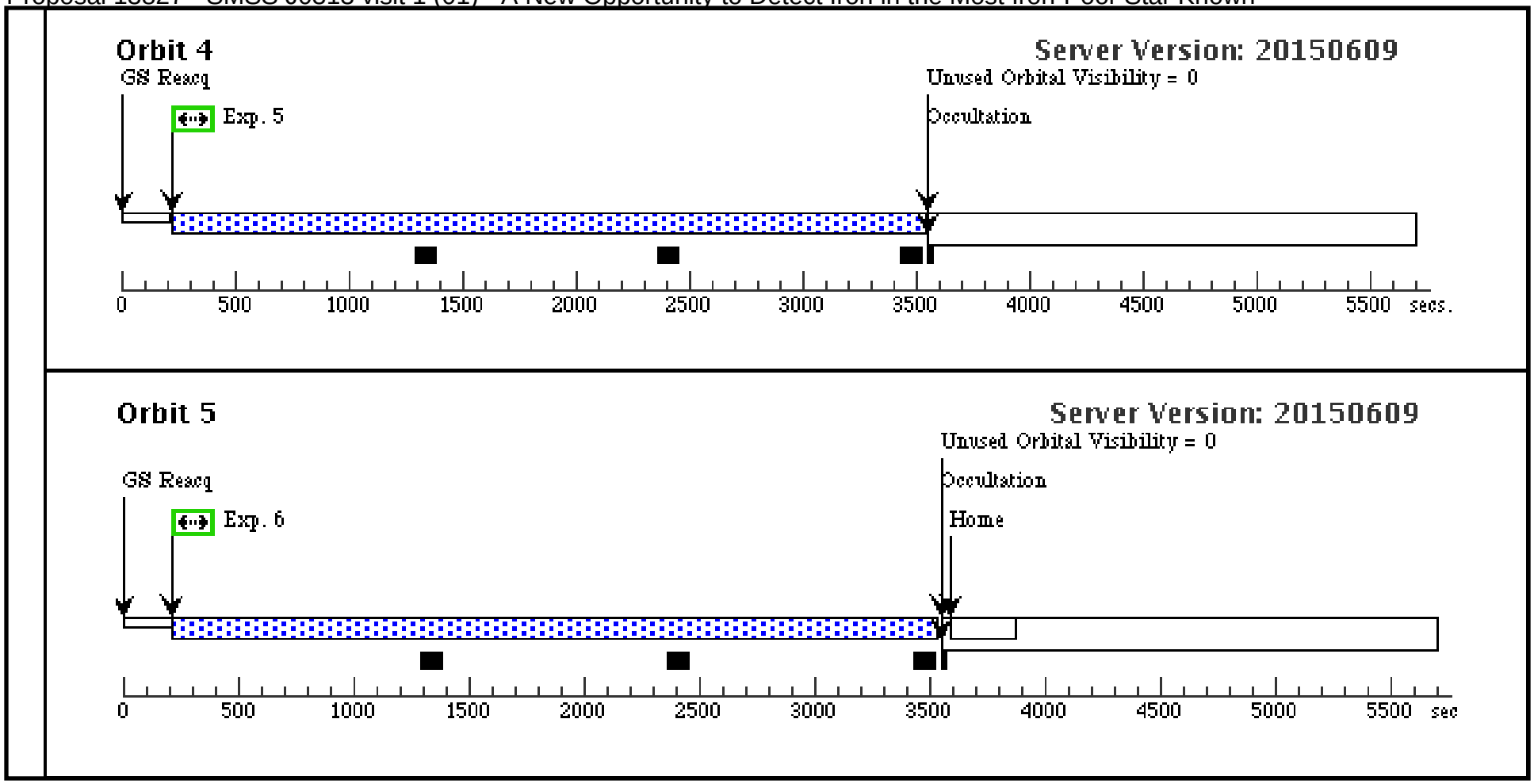
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	acq/image (cos.ta.618623)	(1) SMSS-J031300-670839	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				66 Secs (66 Secs) *[==>]*	*[1]*
2	smss j0313 exposure 1, visit 1 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=948; FLASH=YES; FP-POS=1			2953 Secs (2828 Secs) *[==>2828.0 Secs]*	*[1]*
3	smss j0313 exposure 2, visit 1 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=2			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[2]*
4	smss j0313 exposure 3, visit 1 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=3			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[3]*
5	smss j0313 exposure 4, visit 1 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=3			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[4]*
6	smss j0313 exposure 5, visit 1 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=4			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[5]*

Orbit Structure





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Visit

Proposal 13827, SMSS J0313 visit 2 (02), implementation Wed Sep 30 01:30:54 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV

Special Requirements: (none)

Fixed Targets

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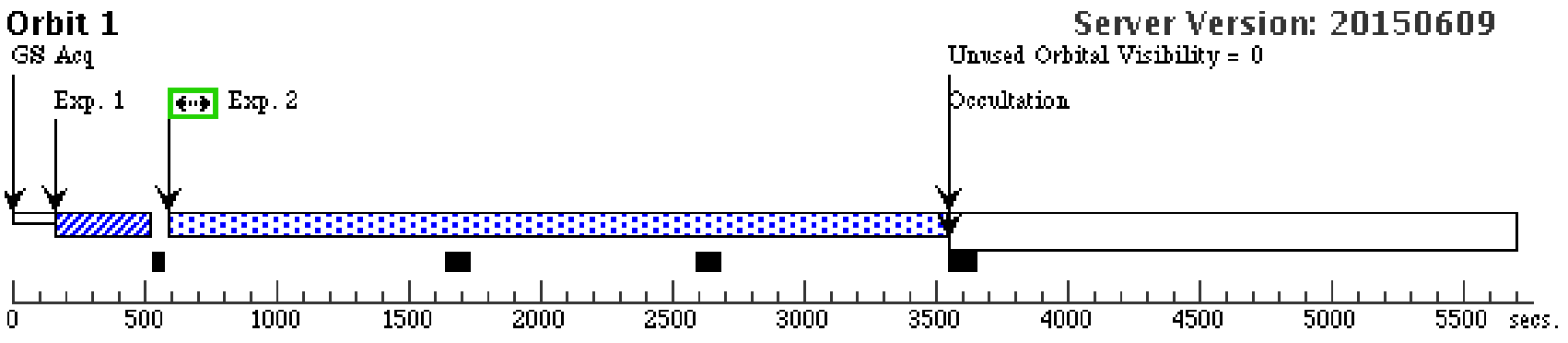
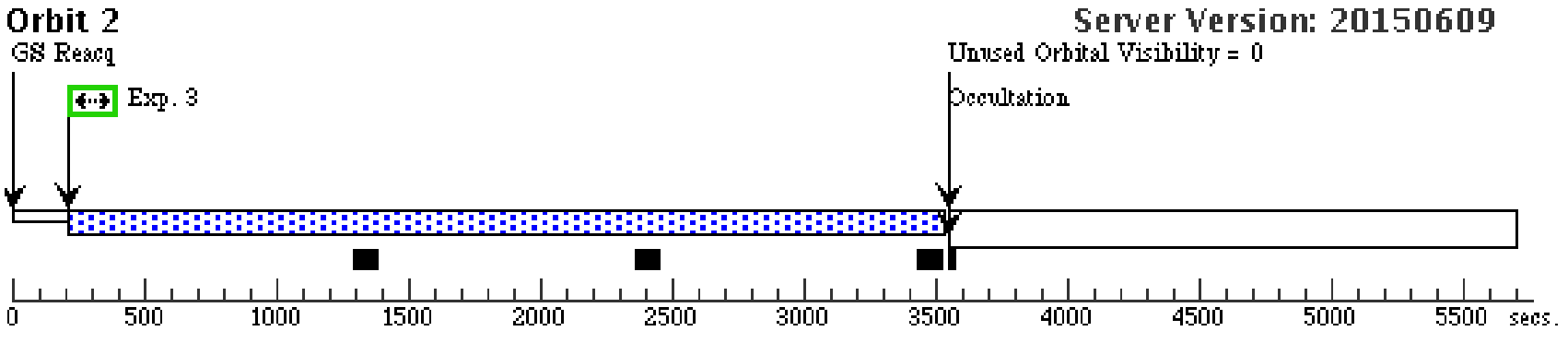
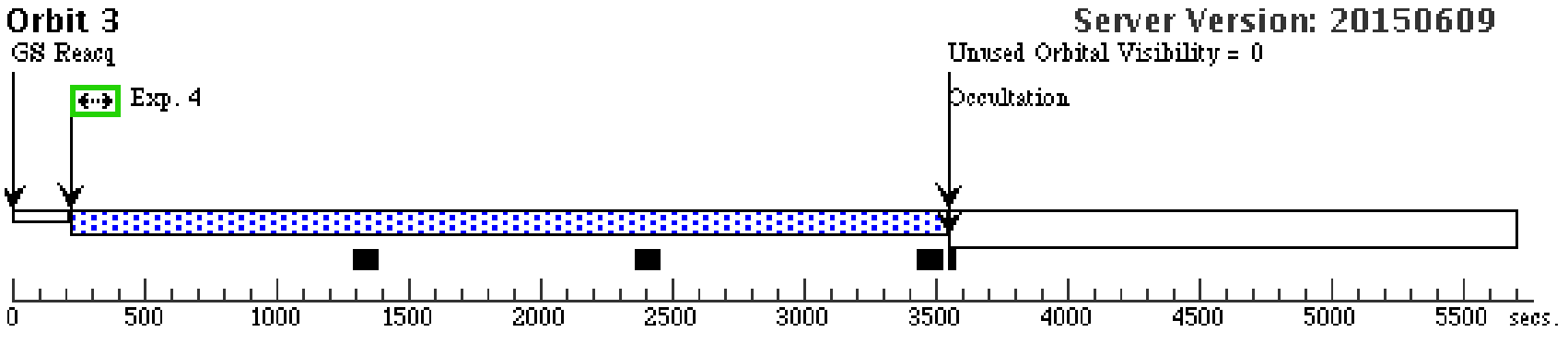
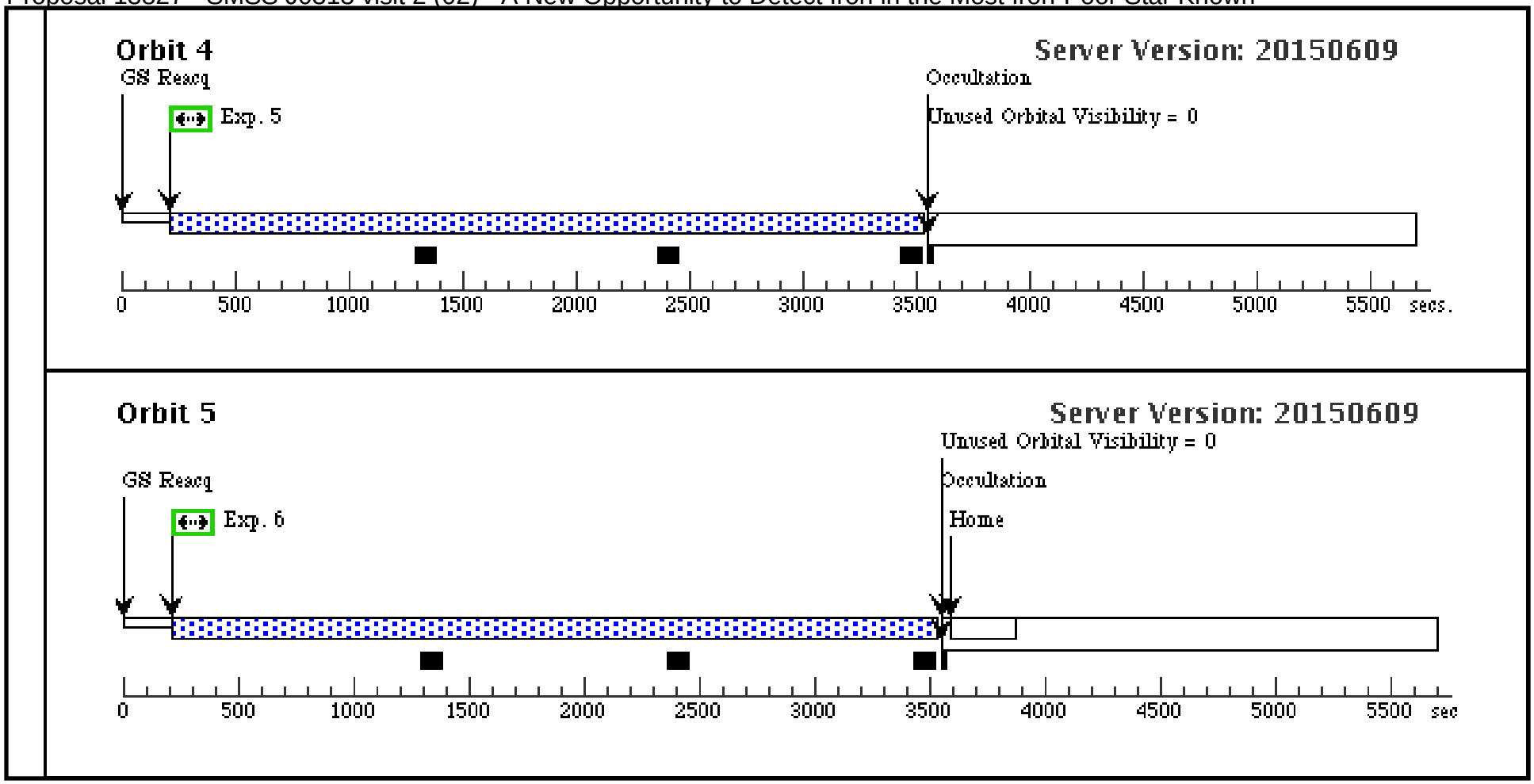
2	smss j0313 exposure 1, visit 2 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=948; FLASH=YES; FP-POS=1			2953 Secs (2828 Secs) *[==>2828.0 Secs]*	*[1]*
3	smss j0313 exposure 2, visit 2 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=2			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[2]*
4	smss j0313 exposure 3, visit 2 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=2			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[3]*
5	smss j0313 exposure 4, visit 2 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=3			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[4]*
6	smss j0313 exposure 5, visit 2 (cos.sp.573199)	(1) SMSS-J031300-670839	COS/NUV, TIME-TAG, PSA	G225M 2390 A	BUFFER-TIME=1071; FLASH=YES; FP-POS=4			3323 Secs (3307 Secs) *[==>3307.0 Secs]*	*[5]*

Orbit Structure





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Exp. 5
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Unused Orbital Visibility = 0
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