14744 - A Definitive UV-Optical Template for Iron Emission in Active Galactic Nuclei

Cycle: 24, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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-493 CCDFLAT	STIS/CCD	3	09-Nov-2016 11:53:22.0	yes
02	(1) MRK-493	STIS/CCD STIS/NUV-MAMA	5	09-Nov-2016 11:53:24.0	yes
03	(1) MRK-493	STIS/CCD STIS/FUV-MAMA	5	09-Nov-2016 11:53:26.0	yes

13 Total Orbits Used

ABSTRACT

The spectra of broad-line AGNs typically show strong blends of Fe II emission that form a pseudo-continuum covering much of the UV/optical range. However, the complex Fe II emission is difficult to model theoretically, and current models still struggle to match the details and diversity of observed Fe II emission in quasars. Accurate measurements of the emission lines and continuum in quasar spectra require the use of empirically derived iron templates based on observations of narrow-line Seyfert 1 galaxies. Fitting Fe II emission and separating it from the Balmer lines and Mg II is required for deriving accurate virial black hole masses in quasars, for investigating broad-line region structure and dynamics via reverberation mapping, and for probing quasar metal enrichment over cosmic time. The existing templates, however, suffer from low S/N and non-contemporaneous data with limited wavelength coverage, which consequently limits the accuracy of almost all spectroscopic measurements of continuum and emission lines in AGNs. Thus, it is critically important to derive a new empirical iron template having high S/N and complete UV/optical coverage simultaneously observed with a consistent aperture. To achieve this goal, we propose to obtain new STIS spectra covering 1150-10270 A for a new and better identified Fe II template galaxy, Mrk 493, which will yield the first consistent and complete UV/optical iron template. Our new Fe II template will provide the best practical tool to enable accurate modeling and fitting of the iron emission blends in AGN spectra, thus improving the understanding of black hole masses, broad-line region physics, and the cosmic evolution of AGNs.

OBSERVING DESCRIPTION

The goal of our proposed observations is to obtain high-S/N, quasi-simultaneous UV and optical spectra with a consistent slit width and aperture size for the new template galaxy Mrk 493, in order to construct new iron emission template of broader wavelength coverage and higher quality than was previously possible with any HST or ground-based dataset.

We will use the G140L (1150-1730 A), G230L (1570-3180 A), G430L (2900-5700 A), and G750L (5240-10270 A) gratings to cover the full available wavelength range, and use the 52x0.2 slit, whose narrow width will minimize the host-galaxy and narrow-line region contributions to the data. The spectral resolution for G140L is R ~ 2400, which is higher than the previous HST FOS resolution (i.e., R ~ 1300), and the resolution for G230L/G430L/G750L is R ~ 1500. For the CCD G430L observations, we will use the E1 aperture position to minimize the CTE losses. For optimal fringe subtraction, the E2 aperture location for the CCD G750L grating will be used, along with CCDFLAT exposures observed immediately afterward. We will place the G750L science exposures at the end of an orbit so that the CCDFLAT exposures can be taken during the occultation period to optimize the efficiency. The D1 aperture position for the FUV-MAMA G140L grating will be used for low FUV dark current.

Our goal is to achieve a minimum S/N per pixel of 40 at the rest wavelength of 1350 A in the G140L setting, 70 at the rest wavelength of 2650 A in

G230L, and 100 at the rest wavelengths of 5100 A and 6200 A in G430L and G750L, in order to be able to construct iron templates of significantly higher quality and S/N than have ever been previously possible. Using the STIS exposure time calculator, a total of ~8.0 hours on-source are required (10609 sec with G140L, 12578 sec with G230L, 3498 sec with G430L, and 2566 sec with G750L). Multiple dithered exposures (between 5 and 7) will be taken in each of the optical CCD and UV MAMA grating settings for cleaning of cosmic-ray hits and bad pixels and reduction of small-scale detector nonuniformity.

To ensure SAA-free orbits, a MAMA visit should be restricted up to five orbits as recommended in the STIS Instrument Handbook. Thus we split observations into three visits. We set the SAME ORIENT requirement so that every visit will be done with same orientation to minimize the possible biases from the variable host galaxy and narrow-line contribution. Since our observations require three separate visits for the target, we request the separate visits to be done as close in time as possible to minimize possible systematic biases due to AGN variability.

Visit

Proposal 14744, Optical (01), implementation Wed Nov 09 16:53:27 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SEQ 01,02,03 WITHIN 3 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2), (3)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=7	Angle Between Sides=		
	Point Spacing=0.15	Center Pattern=false		
	Line Spacing=			

Fixed Targets

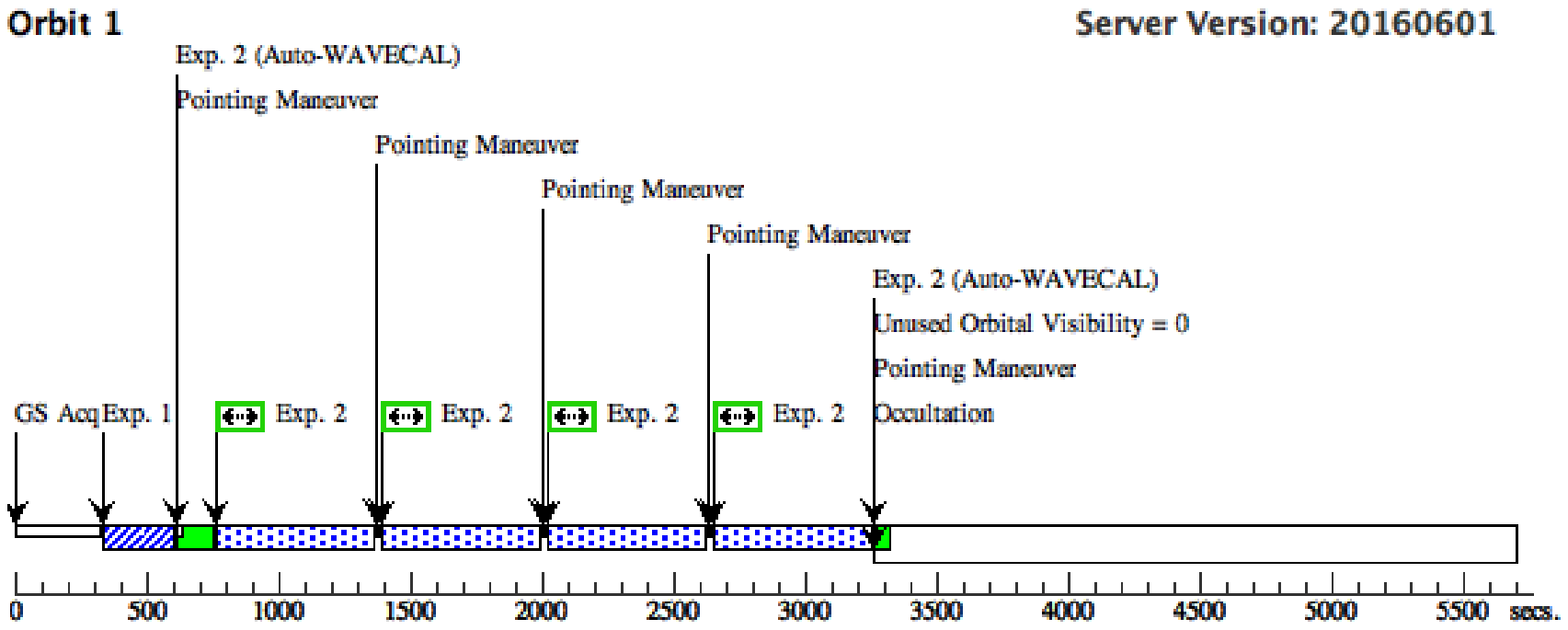
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MRK-493	RA: 15 59 9.6750 (239.7903125d) Dec: +35 01 47.34 (35.02982d) Equinox: J2000	Redshift: 0.03102	V=15.06 FUV (GALEX) AB = 16.270, NUV (GALEX) AB = 15.745, F330W (HST/ACS) = 14.43, r (SDSS PSF) AB = 15.52	Reference Frame: ICRS

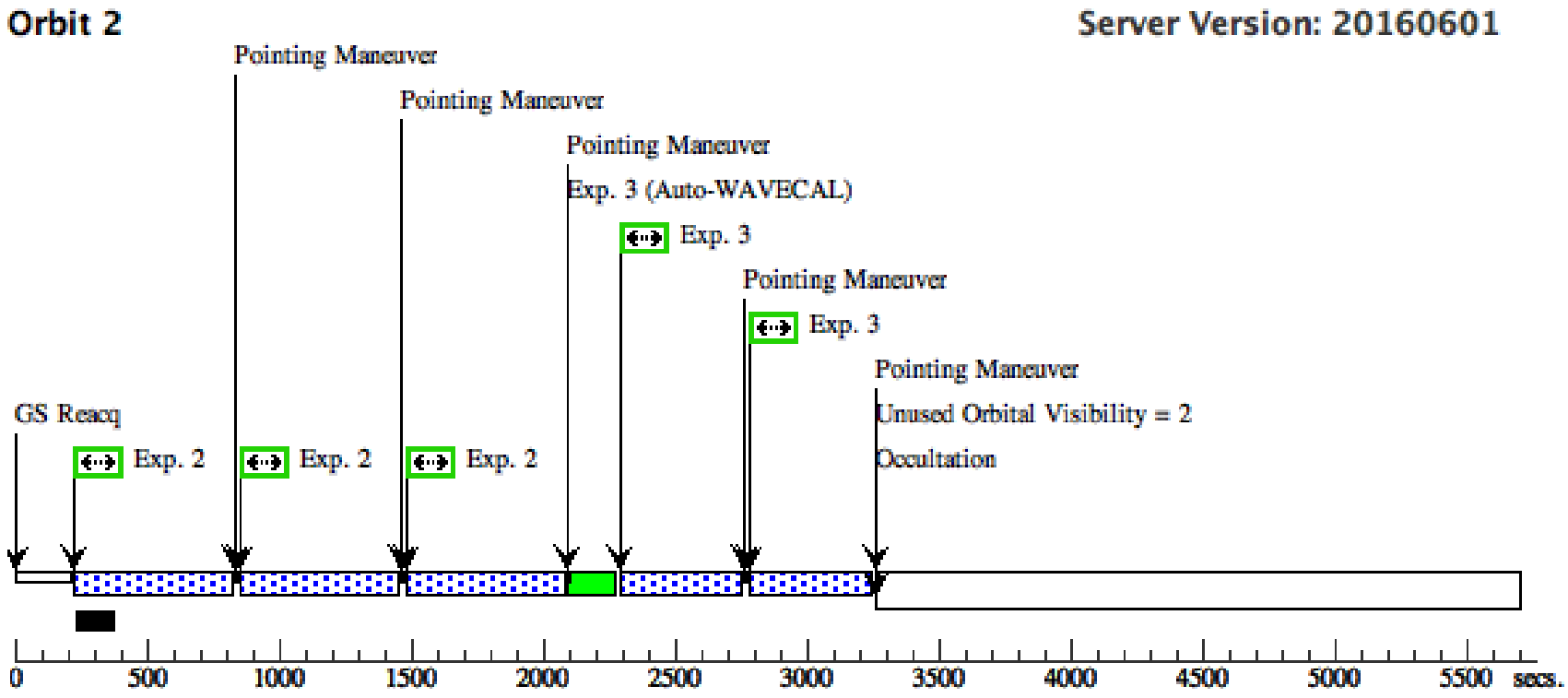
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	targetACQ (STIS.ta.823133)	(1) MRK-493	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs (10 Secs)	
								[==>]	***[1]***
2	G430L (STIS.sp.821477)	(1) MRK-493	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO		Pattern 1, Exps 2-2 in Optical (01) (1)	500 Secs (3920 Secs)	
								[==>560.0 Secs (Pattern 1)]	***[1]***
								[==>560.0 Secs (Pattern 2)]	
								[==>560.0 Secs (Pattern 3)]	
								[==>560.0 Secs (Pattern 4)]	
								[==>560.0 Secs (Pattern 5)]	***[2]***
								[==>560.0 Secs (Pattern 6)]	
								[==>560.0 Secs (Pattern 7)]	
3	G750L (STIS.sp.821480)	(1) MRK-493	STIS/CCD, ACCUM, 52X0.2E2	G750L 7751 A	CR-SPLIT=NO		Pattern 1, Exps 3-3 in Optical (01) (1)	367 Secs (3514 Secs)	
								[==>427.0 Secs (Pattern 1)]	***[2]***
								[==>427.0 Secs (Pattern 2)]	
								[==>532.0 Secs (Pattern 3)]	***[3]***
								[==>532.0 Secs (Pattern 4)]	
								[==>532.0 Secs (Pattern 5)]	
								[==>532.0 Secs (Pattern 6)]	
								[==>532.0 Secs (Pattern 7)]	
4	CCDFLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A				*[==>(Copy 1)]*	***[3]***
								[==>(Copy 2)]	

Orbit Structure

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Pointing Maneuver
Pointing Maneuver
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Exp. 3
Pointing Maneuver
Exp. 3
Pointing Maneuver
Unused Orbital Visibility = 2
Occultation
GS Reacq
Exp. 2
Exp. 2
Exp. 2
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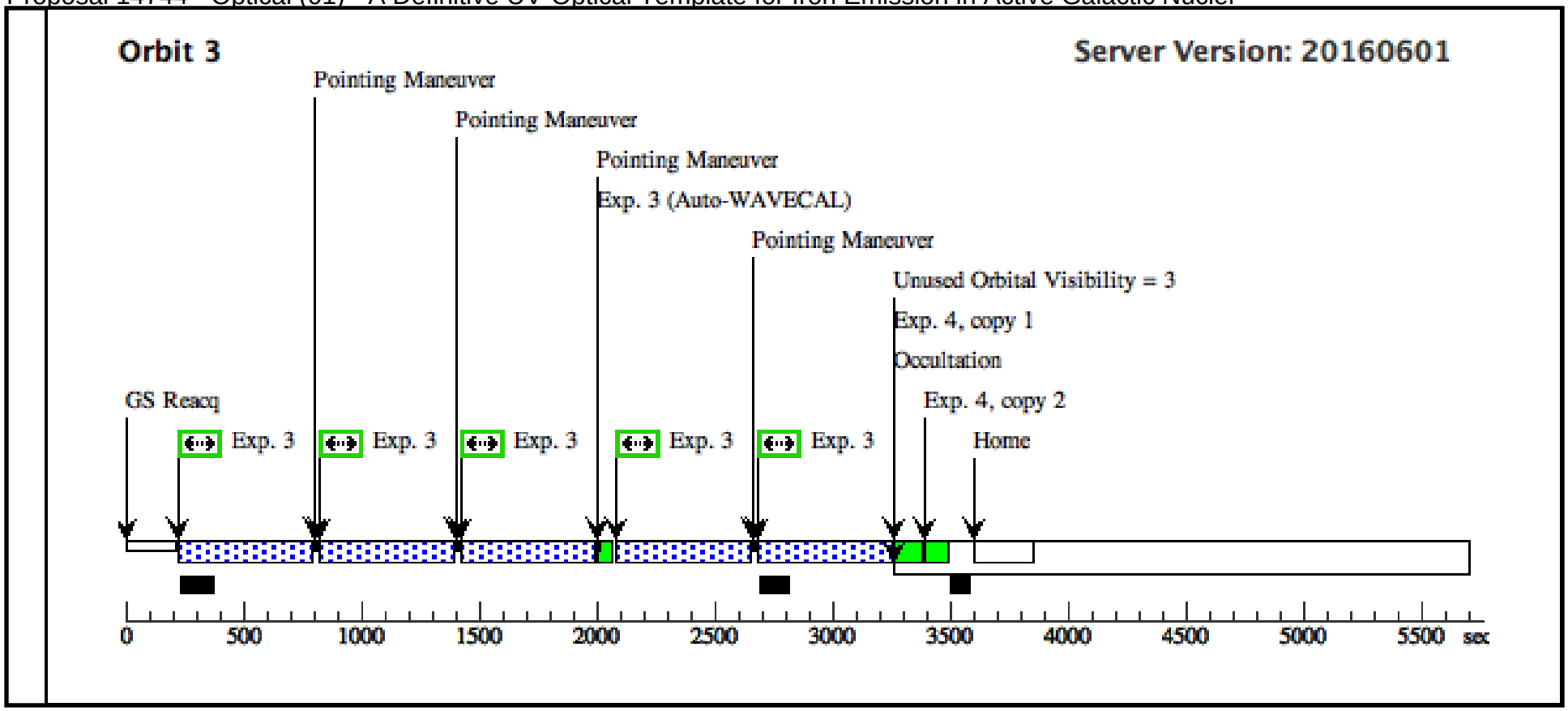
secs.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Occultation
Exp. 4, copy 2
Home
GS Reacq
Exp. 3
Exp. 3
Exp. 3
Exp. 3
Exp. 3
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sec

Visit

Proposal 14744, NUV (02), implementation Wed Nov 09 16:53:27 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: SAME ORIENT AS 01

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=5	Angle Between Sides=		
	Point Spacing=0.15	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MRK-493	RA: 15 59 9.6750 (239.7903125d) Dec: +35 01 47.34 (35.02982d) Equinox: J2000	Redshift: 0.03102	V=15.06 FUV (GALEX) AB = 16.270, NUV (GALEX) AB = 15.745, F330W (HST/ACS) = 14.43, r (SDSS PSF) AB = 15.52	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	targetACQ (STIS.ta.823133)	(1) MRK-493	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs (10 Secs)	
								[==>]	***[1]***
2	G230L (STIS.sp.821475)	(1) MRK-493	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 2, Exps 2-2 in NUV (02) (2)	2516 Secs (14493 Secs)	
								[==>2425.0 Secs (Pattern 1)]	***[1]***
								[==>3017.0 Secs (Pattern 2)]	***[2]***
								[==>3017.0 Secs (Pattern 3)]	***[3]***
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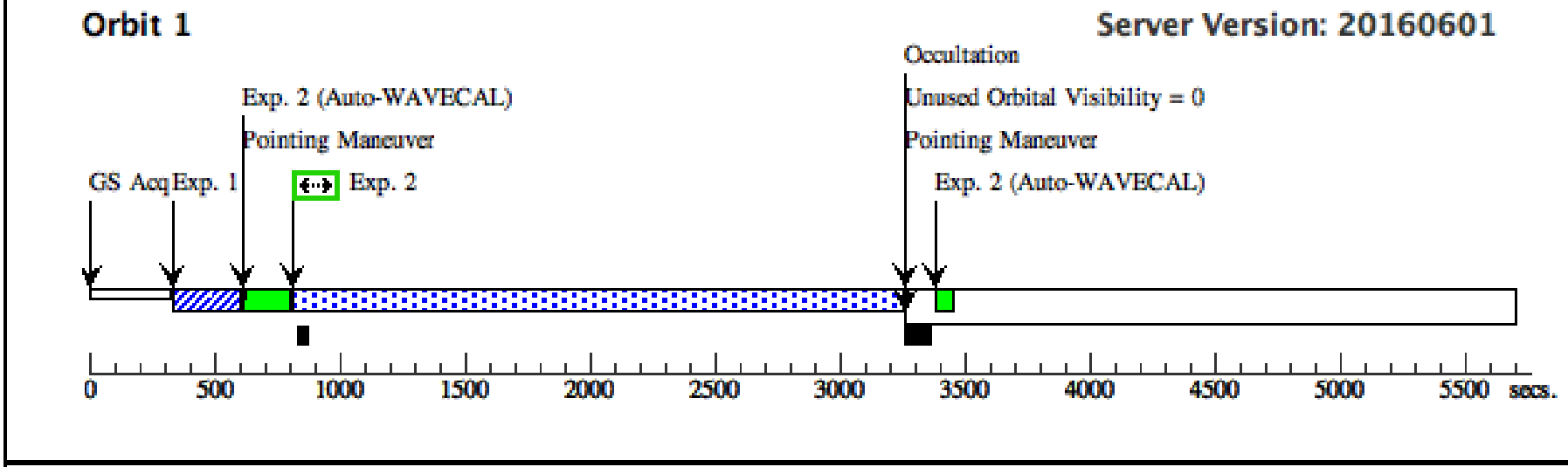
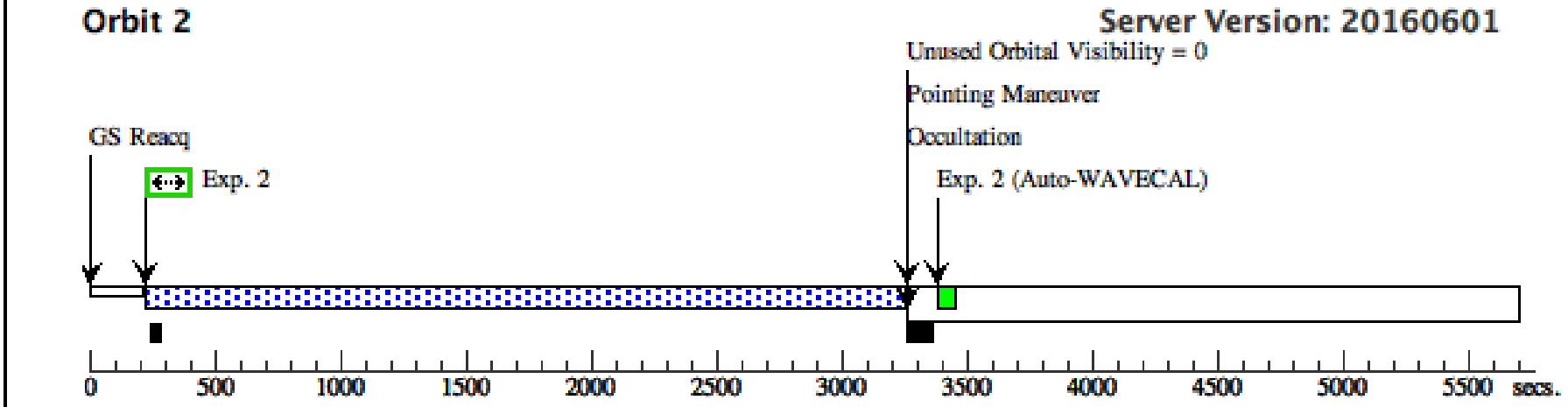
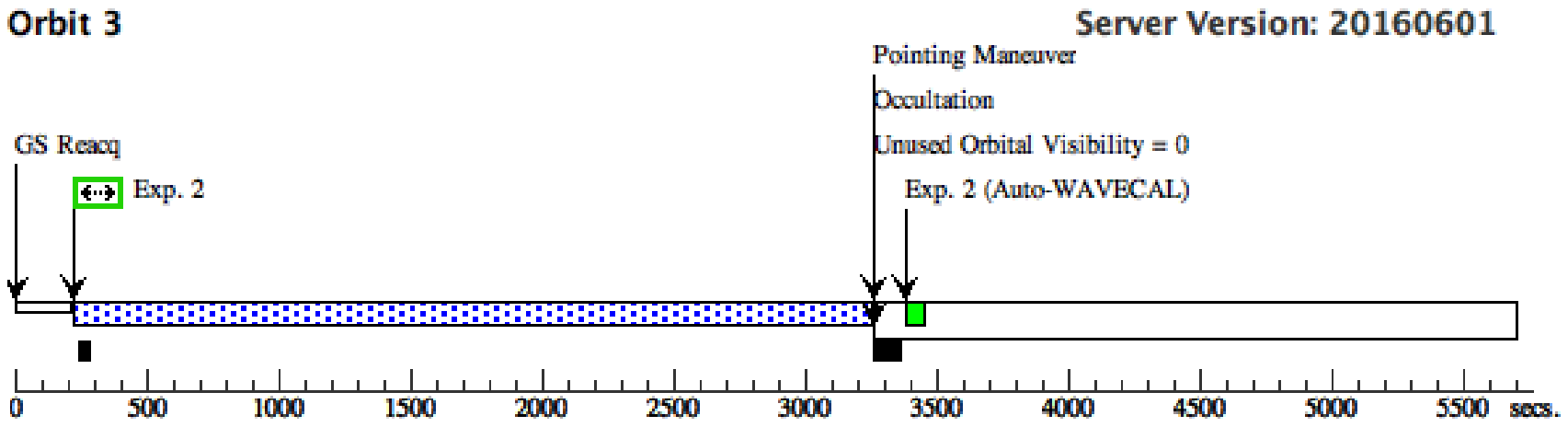
								[==>3017.0 Secs (Pattern 5)]	***[5]***

Orbit Structure



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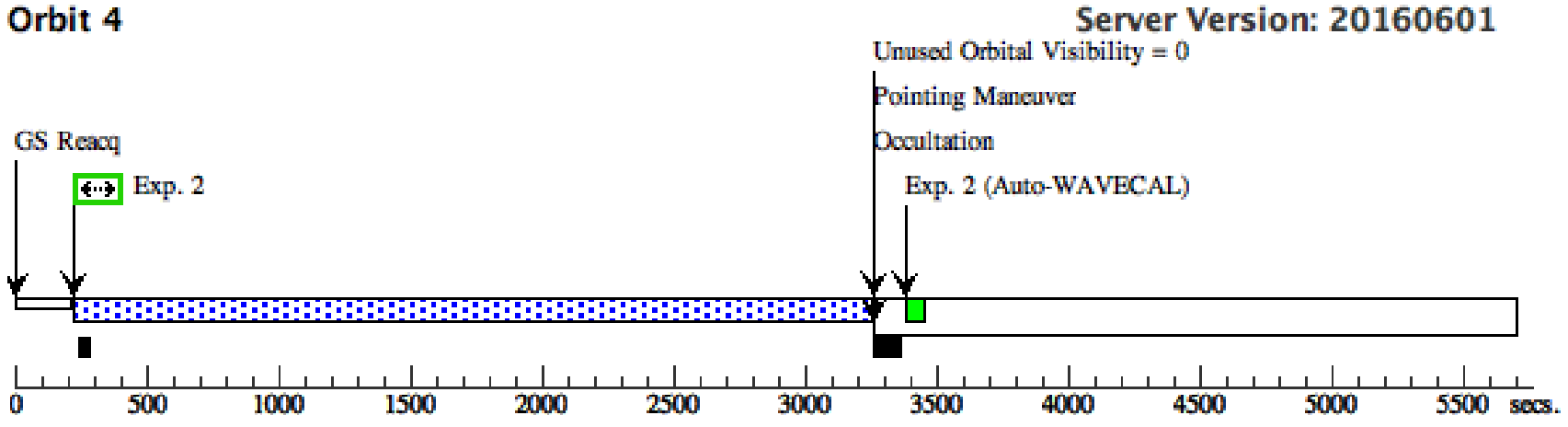
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Pointing Maneuver
Occultation
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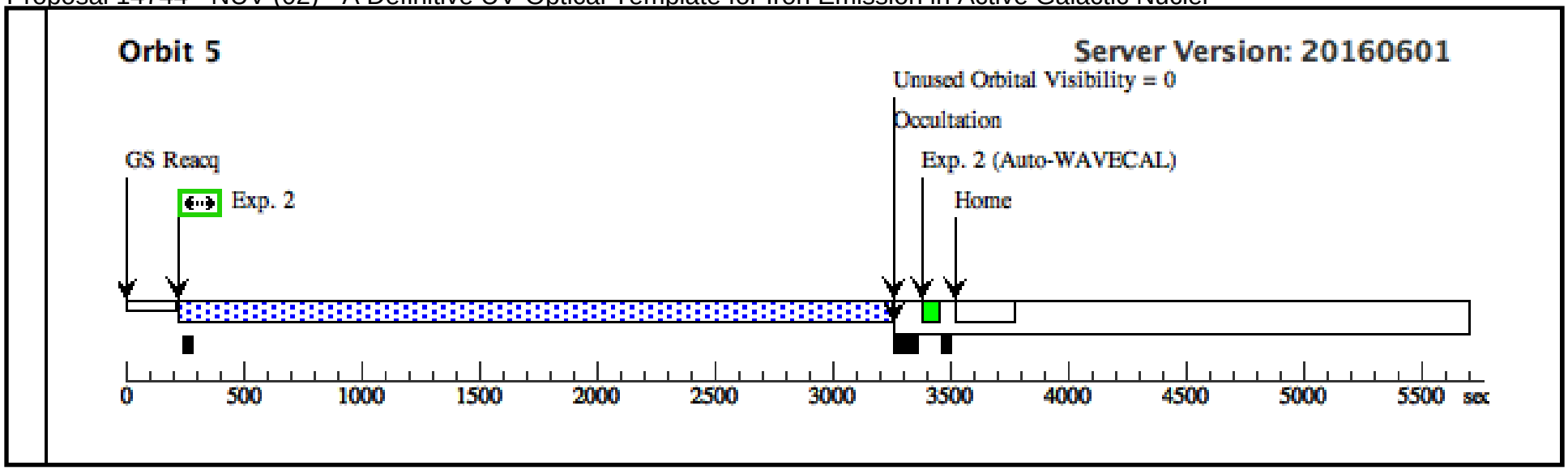
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Occultation
GS Reacq
Exp. 2
Exp. 2 (Auto-WAVECAL)
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sec

Visit

Proposal 14744, FUV (03), implementation Wed Nov 09 16:53:27 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA

Special Requirements: SAME ORIENT AS 01

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=5	Angle Between Sides=		
	Point Spacing=0.15	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	MRK-493	RA: 15 59 9.6750 (239.7903125d) Dec: +35 01 47.34 (35.02982d) Equinox: J2000	Redshift: 0.03102	V=15.06 FUV (GALEX) AB = 16.270, NUV (GALEX) AB = 15.745, F330W (HST/ACS) = 14.43, r (SDSS PSF) AB = 15.52	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	targetACQ (STIS.ta.823133)	(1) MRK-493	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs (10 Secs)	
								[==>]	***[1]***
2	G140L (STIS.sp.821465)	(1) MRK-493	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A			Pattern 2, Exps 2-2 in FUV (03) (2)	2122 Secs (14493 Secs)	
								[==>2425.0 Secs (Pattern 1)]	***[1]***
								[==>3017.0 Secs (Pattern 2)]	***[2]***
								[==>3017.0 Secs (Pattern 3)]	***[3]***
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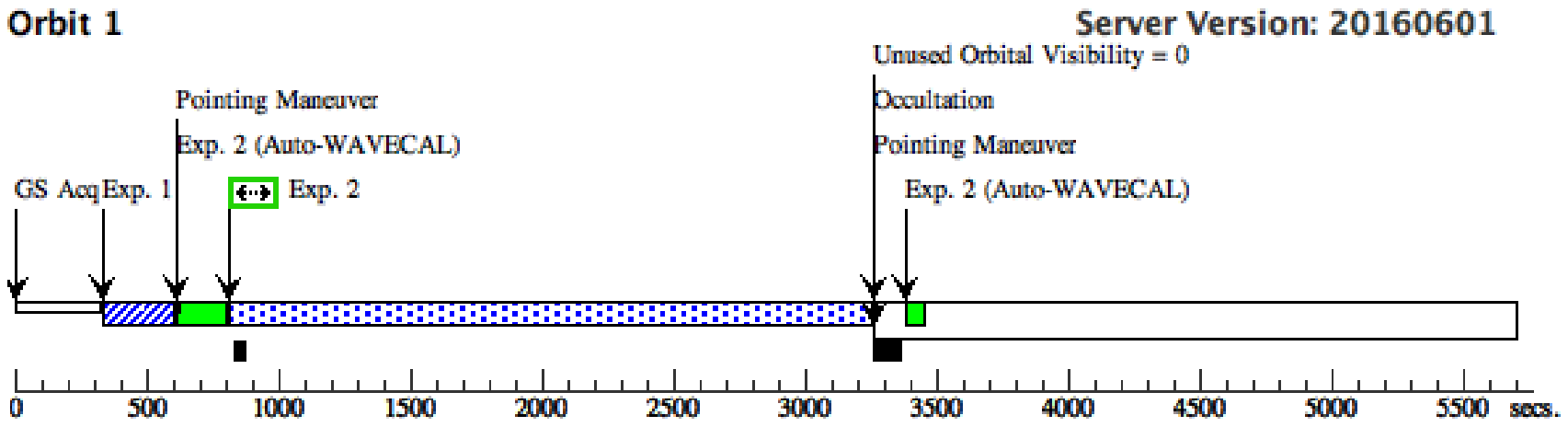
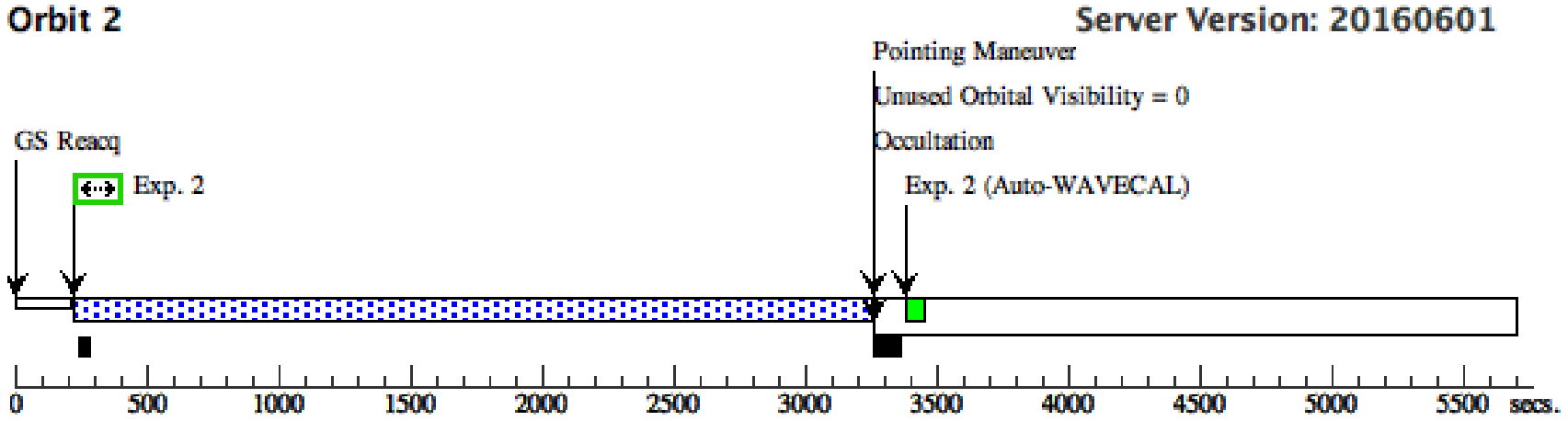
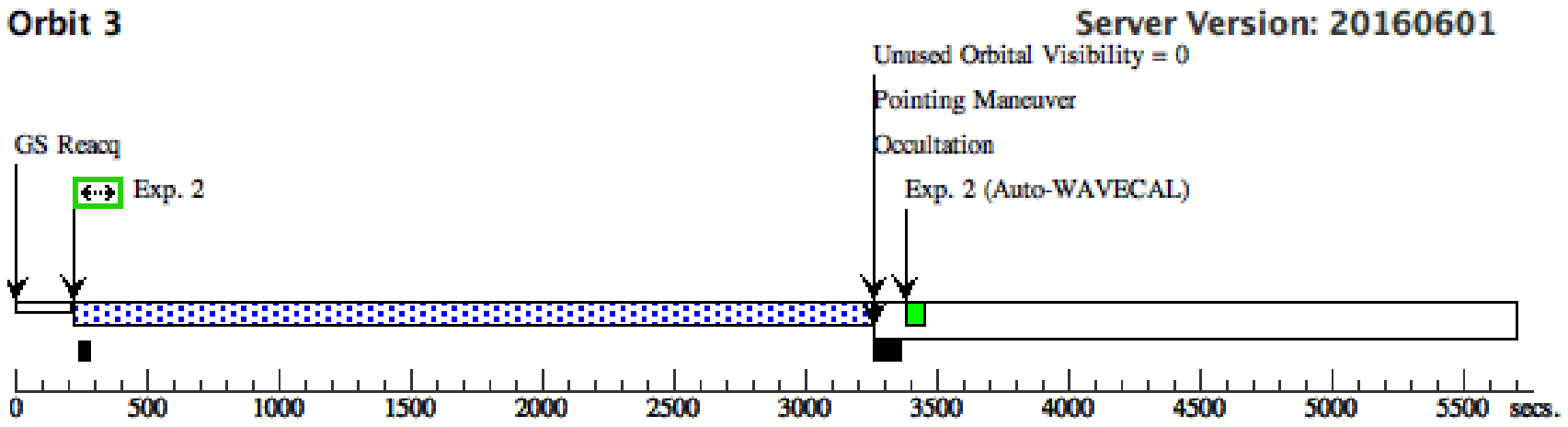
Orbit Structure



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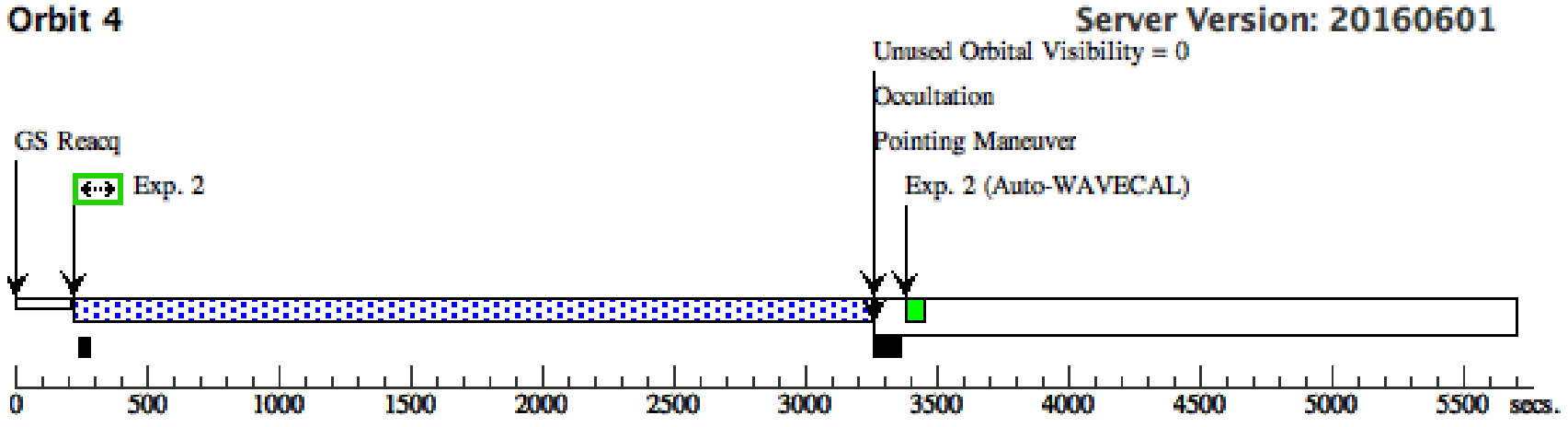
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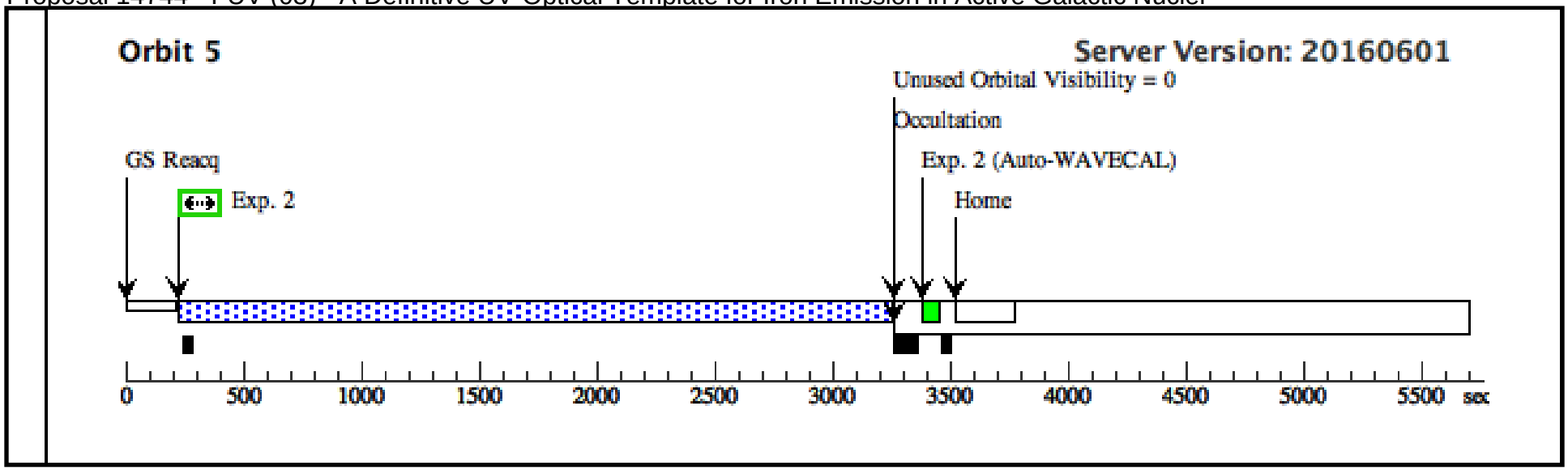
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