11722 - Imaging the Distribution of Iron in a Type Ia Supernova

Cycle: 17, Proposal Category: GO

(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) NGC224-SN1885	ACS/WFC	5	26-Jun-2008 21:15:58.0	yes

5 Total Orbits Used

ABSTRACT

We know Type Ia supernovae are thermonuclear explosions of CO white dwarfs, but we don't know the specifics of how the nuclear burning proceeds from the core outward to the surface once it starts. Thermonuclear instability in a WD core is thought to start off as a subsonic, turbulent deflagration wave or "burning" wave but then may, at some point, transition into a supernova blast or detonation wave. In such a "delayed detonation" model, differences between normal and subluminous Type Ia SNe reflect differences in the amount of burning that has occurred in the pre-detonation phase. More burning helps to pre-expand the WD before passage of the detontation wave which then lowers the density of the outer layers and, in turn, results in a different element production and internal structure.

Directly imaging the 2D chemical distribution of ejecta from a Type Ia SN is actually possible in the case of the subluminous Type Ia SN 1885 which occurred on the near-side of M31's central bulge. The entire 123 year old remnant -- core to outer edge -- is visible via strong near-UV, Ca and Fe line absorptions, and remarkably, is still in near free expansion. This means that elemental stratification seen today is likely to accurately reflect the explosive nucleosynthesis physics.

We propose ACS WFC images of SN 1885 to take advantage of this extraordinary situation: Having a young, nearby Type Ia SN remnant visible in silhouette against a galaxy-size light table. The proposed observations will reveal the Fe ejecta distribution, density structure, sphericity, and ionization state as a function of expansion velocity, thereby testing SN Ia explosion models with direct Fe-rich ejecta mapping data.

OBSERVING DESCRIPTION

This project is to image the remnant of SN 1885A in the bulge of M31 using the ramp filter FR388N centered on the remnant at the wavelength of 3710 Angstroms.

All five orbits will be used to image the target in this filter. The target (SNR 1885A) is only 0.8 arcsec across (diameter).

REAL TIME JUSTIFICATION

none.

CALIBRATION JUSTIFICATION

none.

Visit

Proposal 11722, Visit 01 Fri Jun 27 01:16:06 GMT 2008

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 1-1)) Warning (Form): POS TARG & PATTERN should be used carefully with ACS/WFPC2 ramp or WFC3 quad filters as central wavelengths & transmission efficiencies vary within the apertures.

Patterns

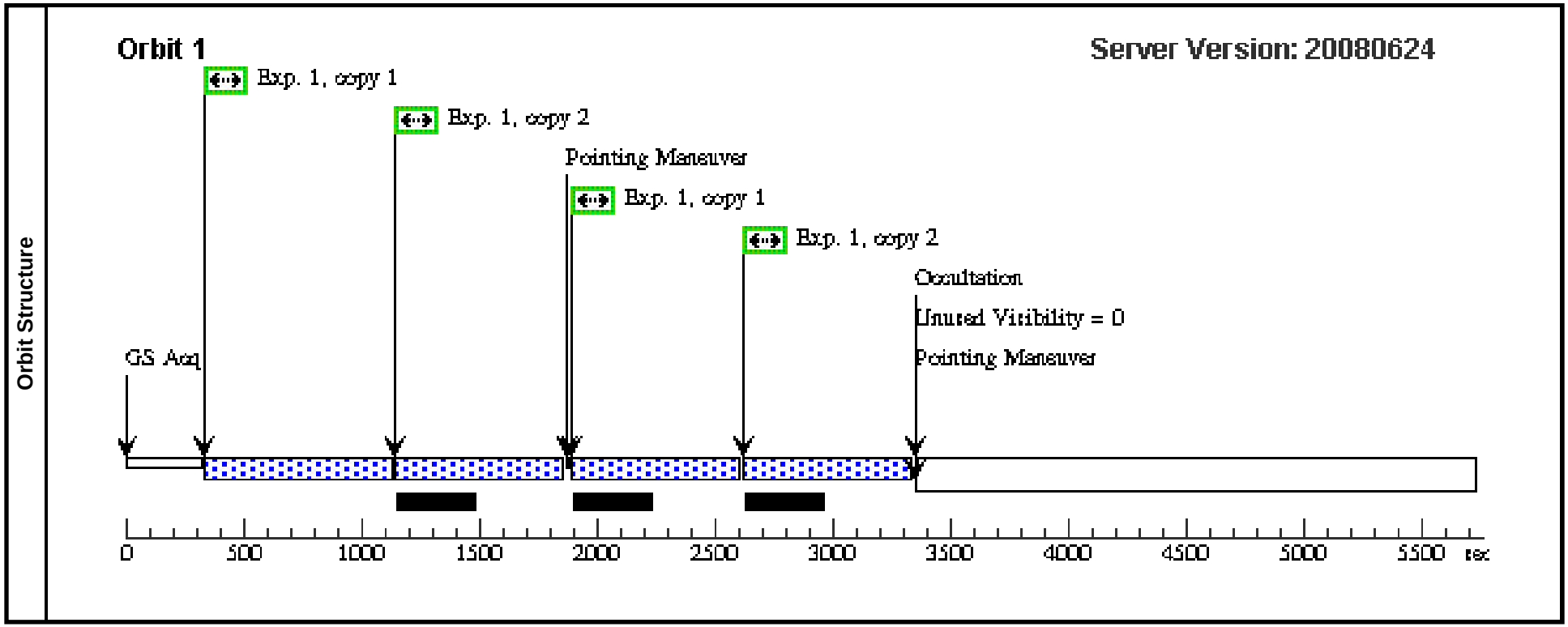
#	Primary Pattern		Secondary Pattern		Exposures
(2)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=5 Point Spacing=0.149 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=34.25 Angle Between Sides= Center Pattern=false	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.29 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=47.23 Angle Between Sides= Center Pattern=false	(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 42.9000 (10.6787500d) Dec: +41 16 5.00 (41.26806d) Equinox: J2000		V=10.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) NGC224-SN1885	ACS/WFC, ACCUM, WFC2-MRAMP	FR388N 3720.0 A			Pattern 1-1 (2)	550.0 Secs X 2	
								[==>591.0 Secs (Pattern 1,1, Copy 1)] *[==>591.0 Secs (Pattern 1,1, Copy 2)]* *[==>591.0 Secs (Pattern 1,2, Copy 1)]* *[==>591.0 Secs (Pattern 1,2, Copy 2)]*	***[1]***
								[==>646.0 Secs (Pattern 2,1, Copy 1)] *[==>646.0 Secs (Pattern 2,1, Copy 2)]* *[==>646.0 Secs (Pattern 2,2, Copy 1)]* *[==>646.0 Secs (Pattern 2,2, Copy 2)]*	***[2]***
								[==>646.0 Secs (Pattern 3,1, Copy 1)] *[==>646.0 Secs (Pattern 3,1, Copy 2)]* *[==>646.0 Secs (Pattern 3,2, Copy 1)]* *[==>646.0 Secs (Pattern 3,2, Copy 2)]*	***[3]***
								[==>646.0 Secs (Pattern 4,1, Copy 1)] *[==>646.0 Secs (Pattern 4,1, Copy 2)]* *[==>646.0 Secs (Pattern 4,2, Copy 1)]* *[==>646.0 Secs (Pattern 4,2, Copy 2)]*	***[4]***
								[==>646.0 Secs (Pattern 5,1, Copy 1)] *[==>646.0 Secs (Pattern 5,1, Copy 2)]* *[==>646.0 Secs (Pattern 5,2, Copy 1)]* *[==>646.0 Secs (Pattern 5,2, Copy 2)]*	***[5]***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Exp. 1, copy 2
Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Occultation
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Pointing Maneuver
GS Acq
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1000
1500
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3000
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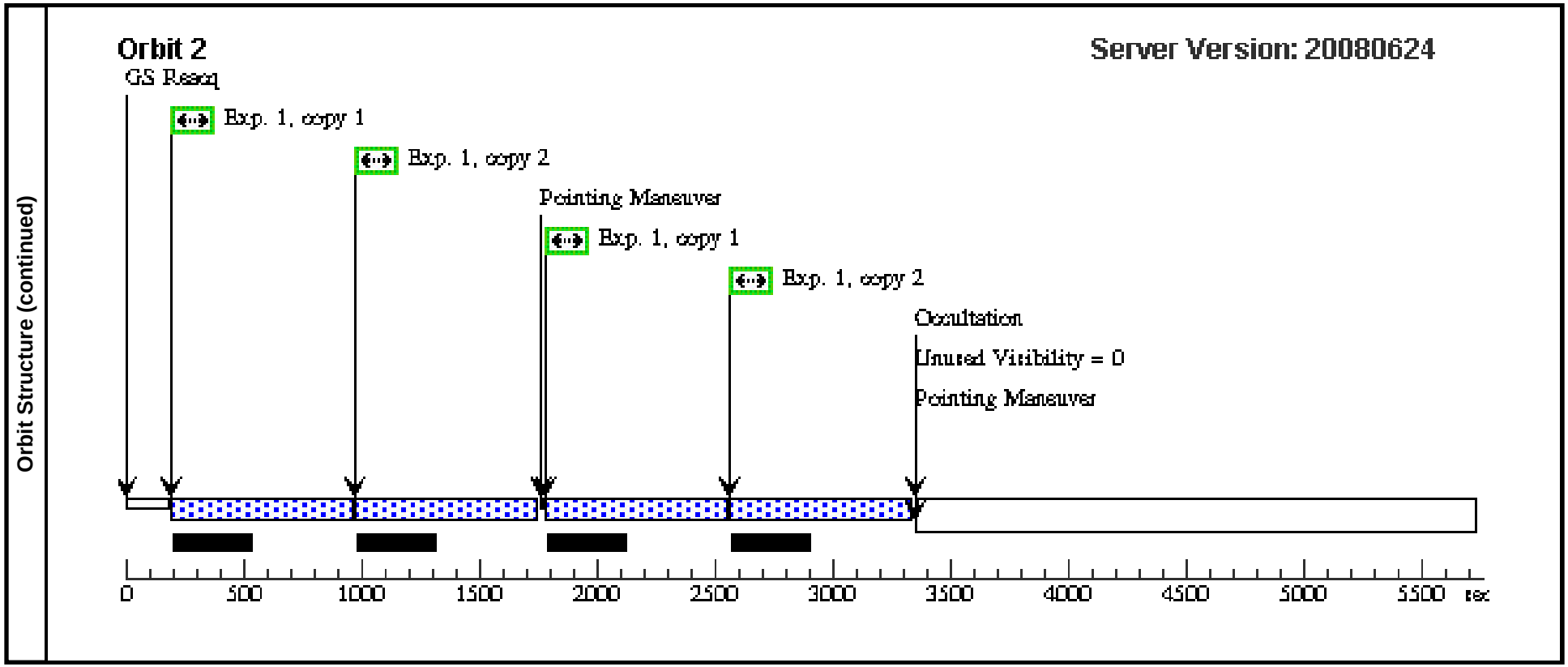
5500
sec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Exp. 1, copy 2
Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Occultation
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Pointing Maneuver
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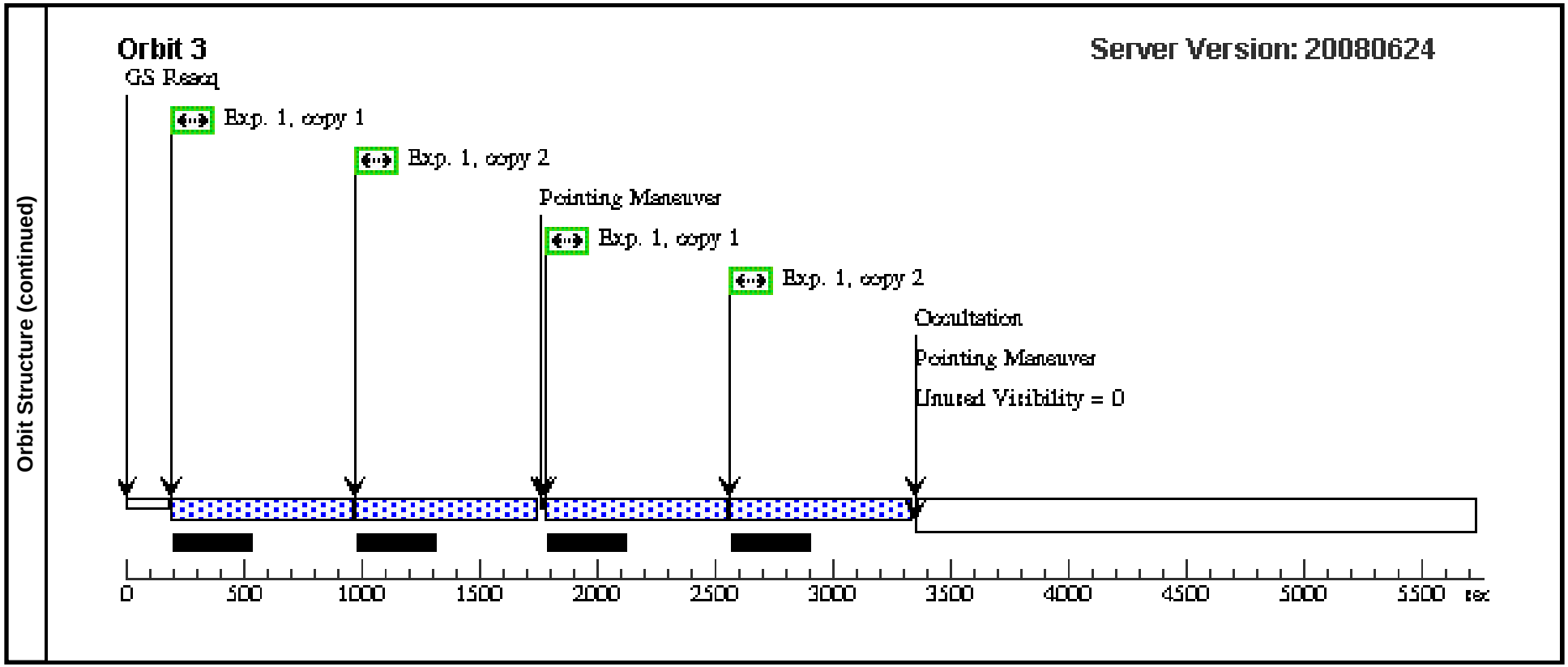
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec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Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Occultation
Pointing Maneuver
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1000
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2500
3000
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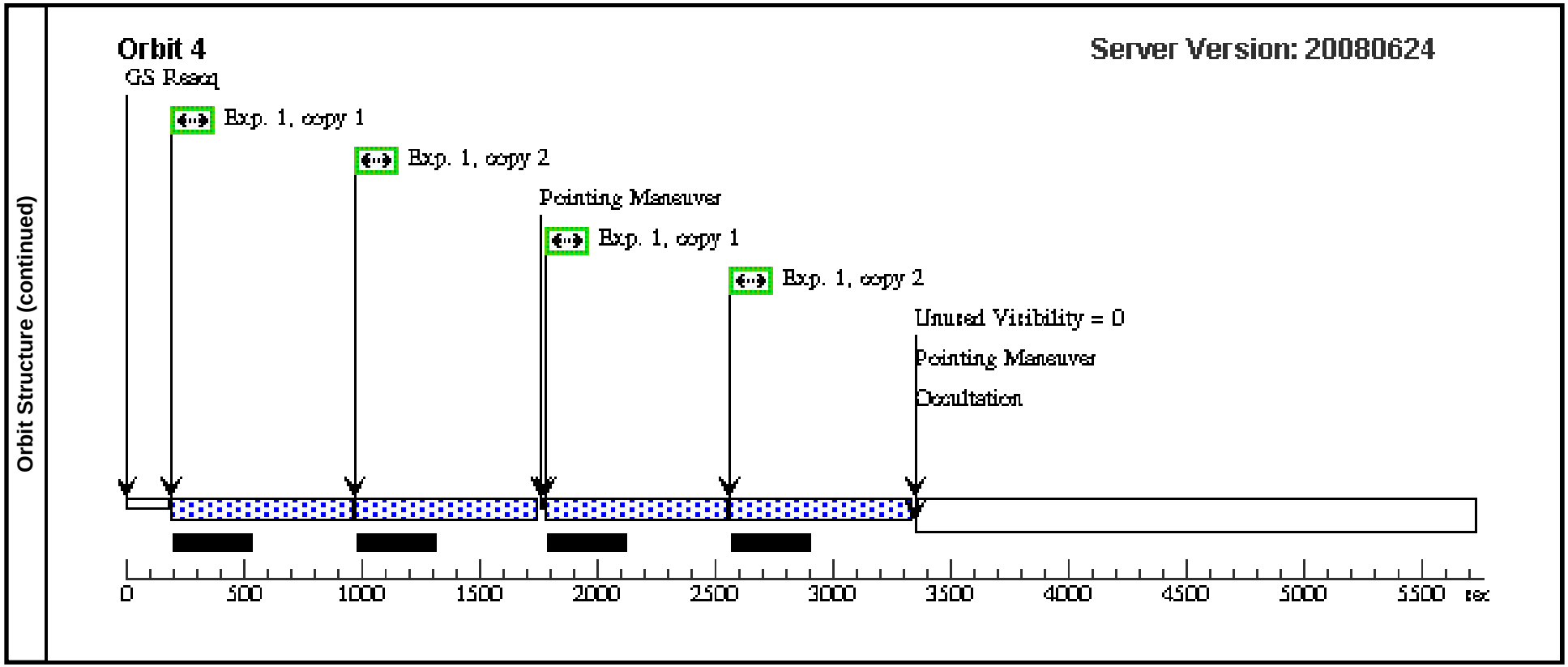
4000
4500
5000
5500
sec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Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
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Pointing Maneuver
Occultation
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3000
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4500
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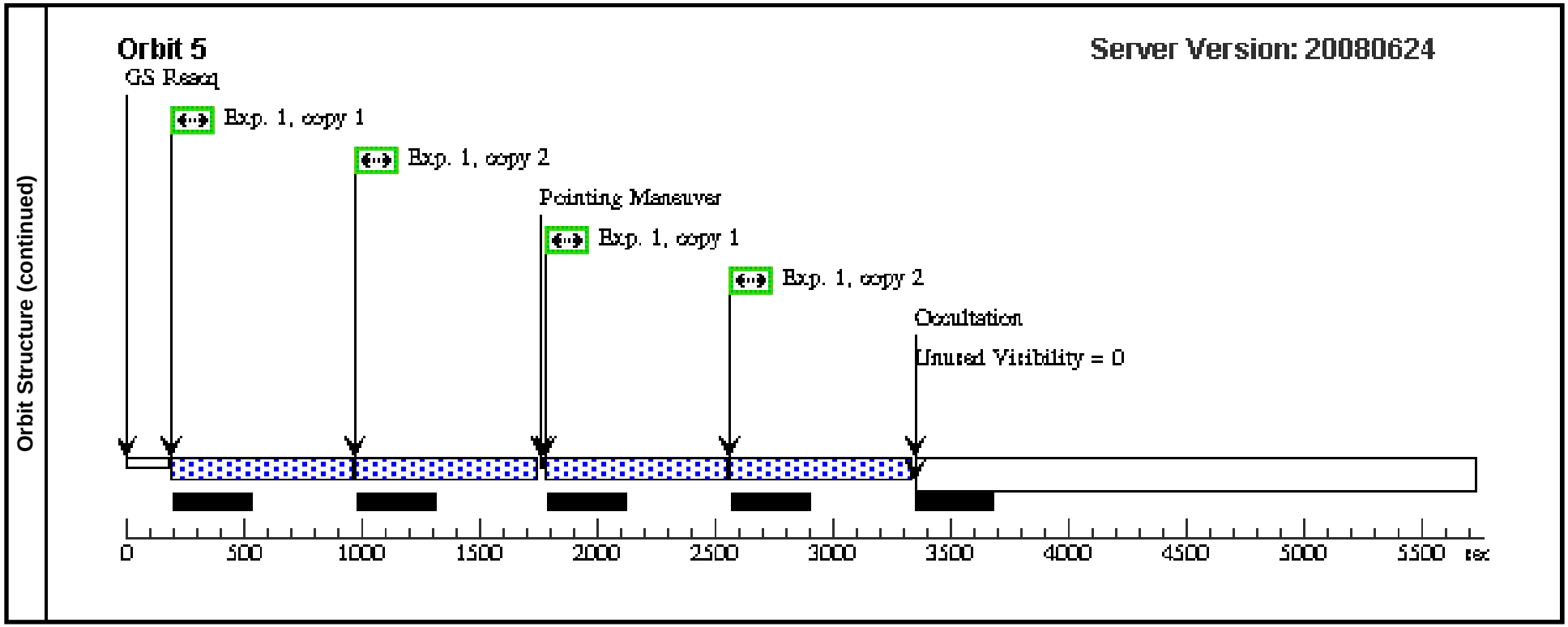
5500
sec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Exp. 1, copy 2
Pointing Maneuver
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Exp. 1, copy 2
Occultation
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