13471 - STIS Spectra of the Young SN Ia Remnant SN 1885 in M31

Cycle: 21, 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) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD	4	28-Oct-2013 21:01:25.0	yes
07	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD	4	28-Oct-2013 21:01:46.0	yes
08	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD	4	28-Oct-2013 21:02:06.0	yes
09	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD	4	28-Oct-2013 21:02:25.0	yes
10	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD	4	28-Oct-2013 21:02:46.0	yes
11	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD	4	28-Oct-2013 21:03:04.0	yes
12	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD STIS/NUV-MAMA	4	28-Oct-2013 21:03:19.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
13	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD STIS/NUV-MAMA	4	28-Oct-2013 21:03:33.0	yes
14	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD STIS/NUV-MAMA	4	28-Oct-2013 21:03:46.0	yes
15	(1) NGC224-SN1885 (2) SN1885-OFFSET	STIS/CCD STIS/NUV-MAMA	3	28-Oct-2013 21:03:58.0	yes

39 Total Orbits Used

ABSTRACT

The bright nova S Andromedae observed in August of 1885 in the central bulge of M31 had an optical spectrum lacking hydrogen lines defining it as Type I SN. Despite numerous optical, radio, and X-ray searches, the remnant of SN 1885 remained undetected across all wavelengths for over a century. It was only finally detected, by us, through ground-based near-UV images which revealed a 0.8" diameter dark spot of Ca and Fe resonance line absorptions visible through its silhouette against M31's bulge light.

The entire 128 year old remnant -- from its core to its outer edge -- can be studied through its strong resonance line absorptions due to its location on the near-side of M31's central bulge. In Cycles 17 and 19, we successfully imaged the remnant's absorptions in Ca I 4227, Ca II 3934,3968, Fe I 3720, and Fe II 2382,2599 lines. These images show a multi-armed distribution of Fe II absorption peaked in strength at the center of the remnant. They provide our first 2D views of the inner structure of any SN Ia event, reveal large-scale clumps and asymmetries in the remnant's Fe-rich ejecta, and may constitute the first direct observation of Rayleigh-Taylor plumes predicted by hydrodynamical simulations.

We propose obtaining STIS NUV and optical spectra of SN 1885's resonance line absorptions to give us deeper insights into the distribution of its metal-rich ejecta, especially the Fe-rich ejecta. SNR 1885's UV spectrum is predicted to be enormously rich. It offers an unique and powerful means to study the spatial and velocity structure of metal-rich ejecta in a Type Ia SN remnant through HST's UV and high-resolution capabilities.

OBSERVING DESCRIPTION

We will use STIS MAMA and CCD detectors to obtain spatially resolved spectra of the ejecta in SNR 1885 in M31 covering from 1600 A to 5700 A with a spectral resolution of 5 Angstroms.

Since SNR 1885 is a dark spot we will do, as was done to obtain the FOS spectrum, a ***BLIND OFFSET** from a nearby 15 mag star/Globular star cluster after acquisition and peakup (ACQ/PEAK). Archival IUE spectra, our own previous HST/FOS spectra, and WFC3 images show that the M31 bulge at the location of SNR 1885 is faint with the following surface brightnesses for the region immediately around SNR 1885: 50, 30, 20, and 5 x E16 erg/s cm per Ang per sq arcsec at 4225 A, 3950 A, 3720 A, and 2600 A, respectively.

The STIS CCD with a 52 arcsec x 0.2" slit and the G430L grating will be used to obtain a spectra of SNR 1885 binned 2x2 (5 A per pixel; 0.1") covering the wavelength region 2900 - 5700 A. The orbital visibility of M31 is 56 minutes. STIS ETC estimates for a total exposure time of 32,000 s requiring 12 orbits (initial offset star acquisition, blind-off set move, and readout overhead) taken in 3 visits S/N values of 21, 10, and 7 per resolution element for the Ca I 4227 line, Ca II H & K lines, and Fe I 3720 A line, respectively. We would obtain two sets of such STIS CCD spectra, with the two slits oriented roughly orthogonal with precise orientations determined by Phase II orbit scheduling. The native 2x2 binned data will provide 16 individual 0.1" spectra (i.e., two 0.1" x 8 0.1" radial samples along the 0.8" diameter remnant) on the Ca I and Ca II lines. The long slits (52") will also permit excellent background light correction of M31 bulge light. Total orbits: 24

Using the 52" x 0.5" slit with the NUV MAMA detector and the G230L grating we hope to obtain a spectrum of SNR 1885 covering 1600 - 3180 A. A total exposure time of 36,000 s (15 orbits, 4 visits), the 2600 A surface brightness listed above, and summing the signal for a 0.1" x 0.5" region at 5 A resolution will achieve a S/N of 5.8 for each of the eight radial slices of the remnant. Our WFC3/F225W imaging shows the Fe-rich ejecta possess expansion velocities of up to 10,000 km/s meaning the Fe II lines should be well detected due to line widths of up to 80 A.

Visit

Proposal 13471, CCD Spectra Visit 1 (01), scheduling Tue Oct 29 01:04:07 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.7	Center Pattern=false		
	Line Spacing=			

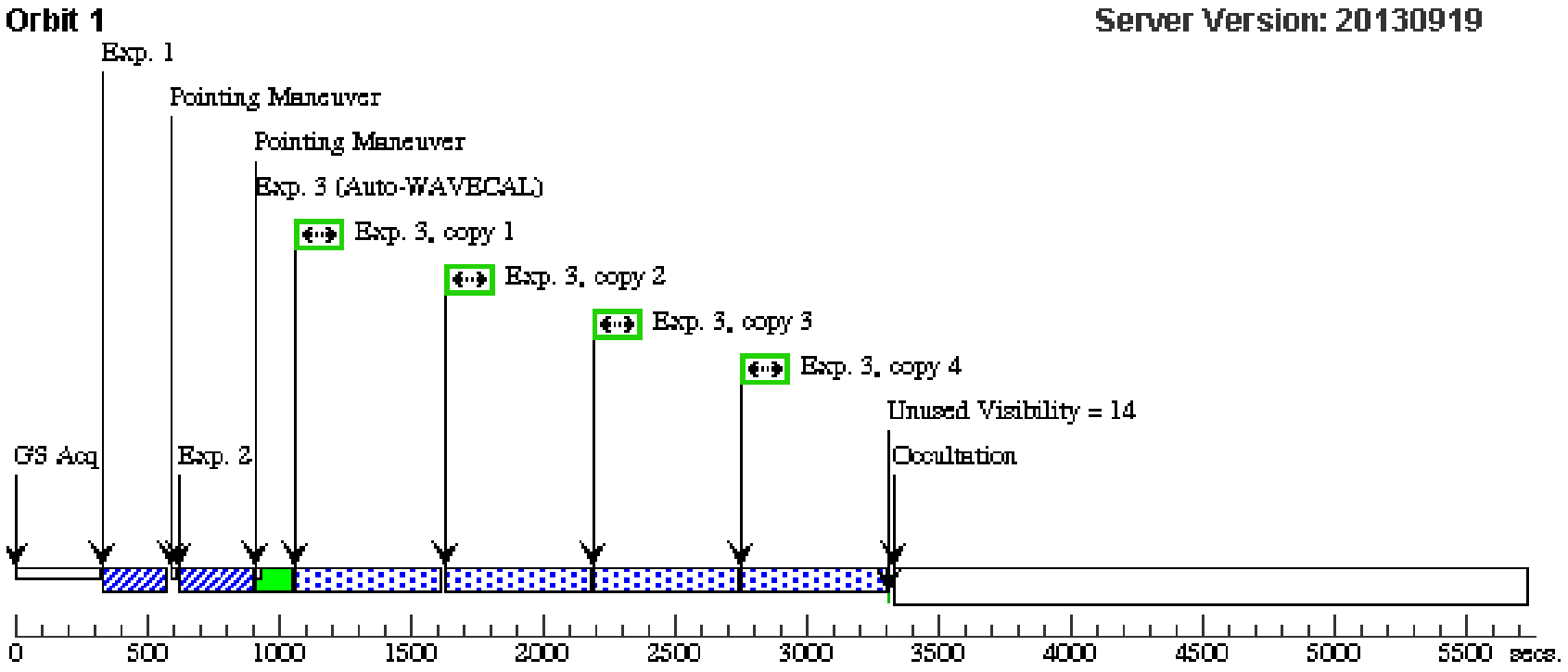
Fixed Targets

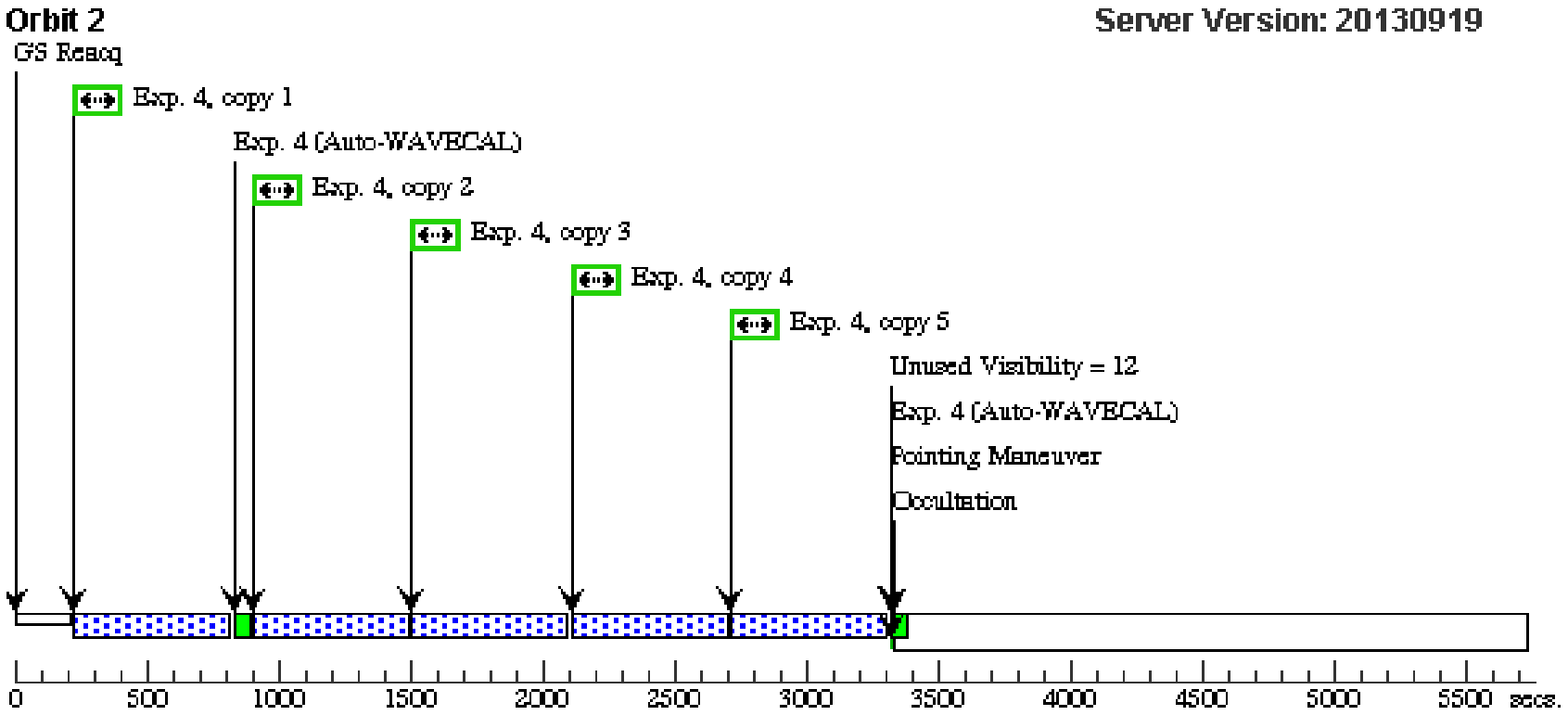
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2			535 Secs X 4 (2140 Secs)	
								[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]*	***[1]***
4	sets 2-4	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2		Pattern 2, Exps 4-4 in CCD Spectra Visit 1 (01) (2)	577 Secs X 5 (8655 Secs)	
								[==>(Pattern 1, Copy 1)] *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 1, Copy 3)]* *[==>(Pattern 1, Copy 4)]* *[==>(Pattern 1, Copy 5)]*	***[2]***
								[==>(Pattern 2, Copy 1)] *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 2, Copy 3)]* *[==>(Pattern 2, Copy 4)]* *[==>(Pattern 2, Copy 5)]*	***[3]***
								[==>(Pattern 3, Copy 1)] *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 3, Copy 3)]* *[==>(Pattern 3, Copy 4)]* *[==>(Pattern 3, Copy 5)]*	***[4]***

Orbit Structure

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Exp. 4, copy 5
Unused Visibility = 12
Exp. 4 (Auto-WAVECAL)
Pointing Maneuver
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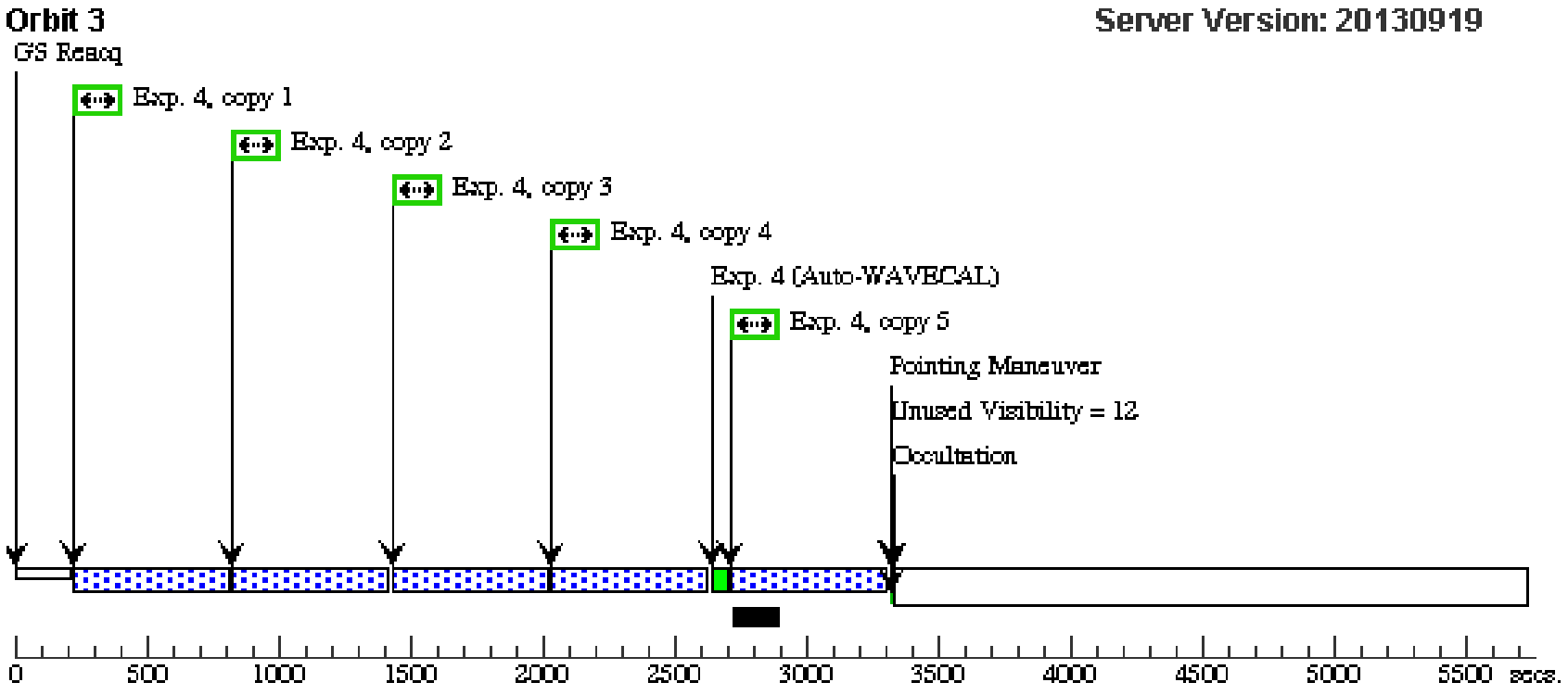
secs.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Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 5
Pointing Maneuver
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Occultation
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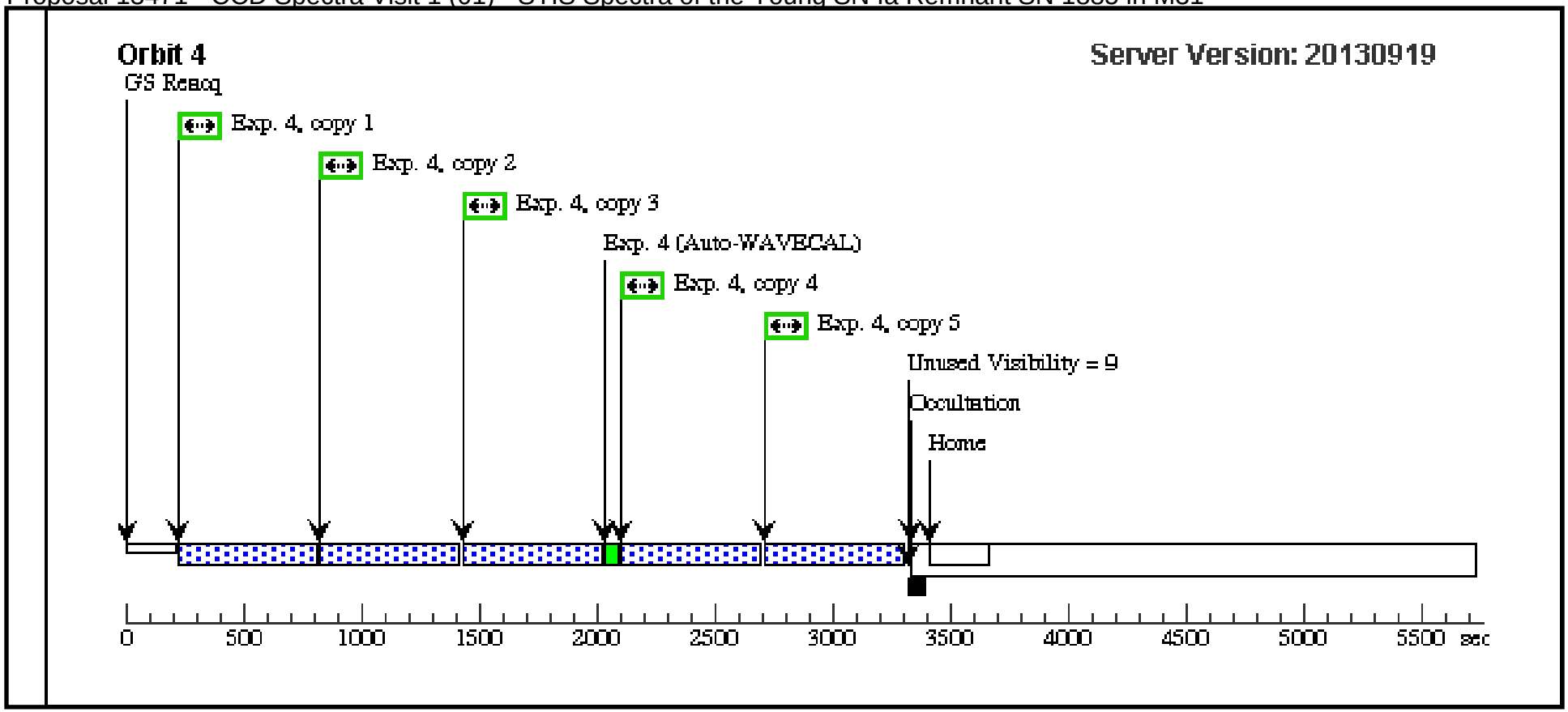
secs.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Unused Visibility = 9
Occultation
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sec

Visit

Proposal 13471, CCD Spectra Visit 2 (07), scheduling Tue Oct 29 01:04:11 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: SAME ORIENT AS 01

Diagnostics

(CCD Spectra Visit 2 (07)) Warning (Orbit Planner): PATTERN POSITION OUTSIDE APERTURE

(CCD Spectra Visit 2 (07)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 2 (07)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 2 (07)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 2 (07)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.7	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG +0.2,+0.2		535 Secs X 4 (2140 Secs)	
								[==>(Copy 1)]	***[1]***
								[==>(Copy 2)]	
								[==>(Copy 3)]	
								[==>(Copy 4)]	
4	sets 2-4	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG 0.2,0.2	Pattern 2, Exps 4-4 in CCD Spectra Visit 2 (07) (2)	577 Secs X 5 (8655 Secs)	
								[==>(Pattern 1, Copy 1)]	***[2]***
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								[==>(Pattern 2, Copy 3)]	
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								[==>(Pattern 2, Copy 5)]	
								[==>(Pattern 3, Copy 1)]	***[4]***
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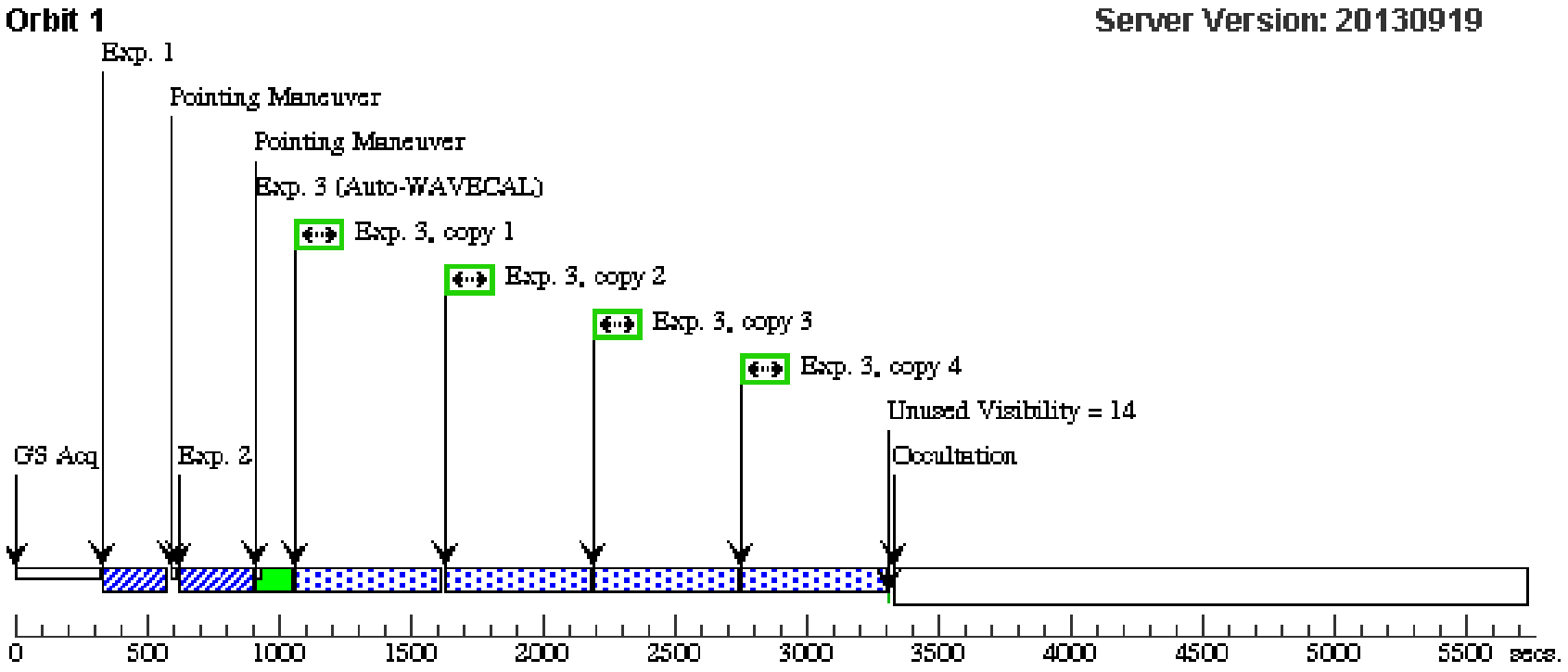
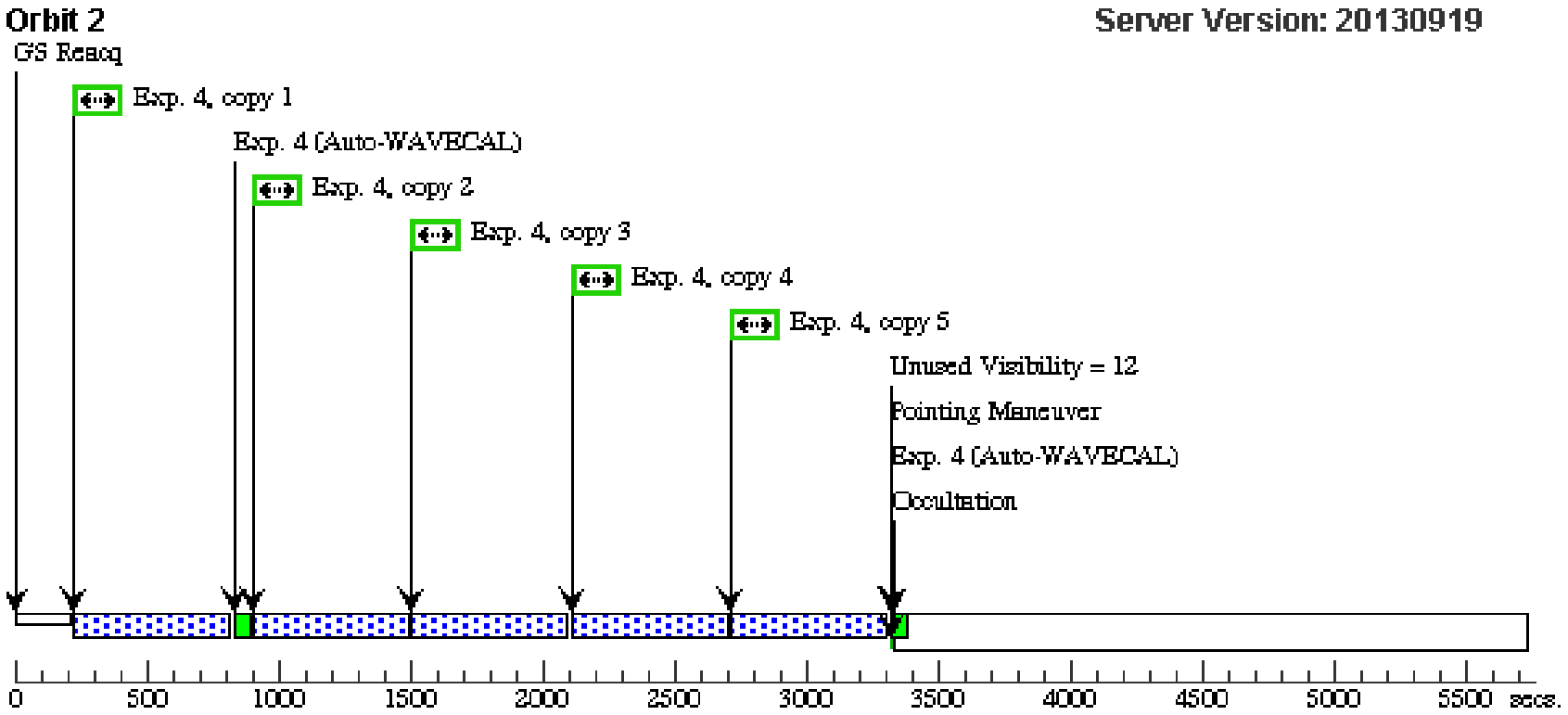
Orbit Structure

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Unused Visibility = 12
Pointing Maneuver
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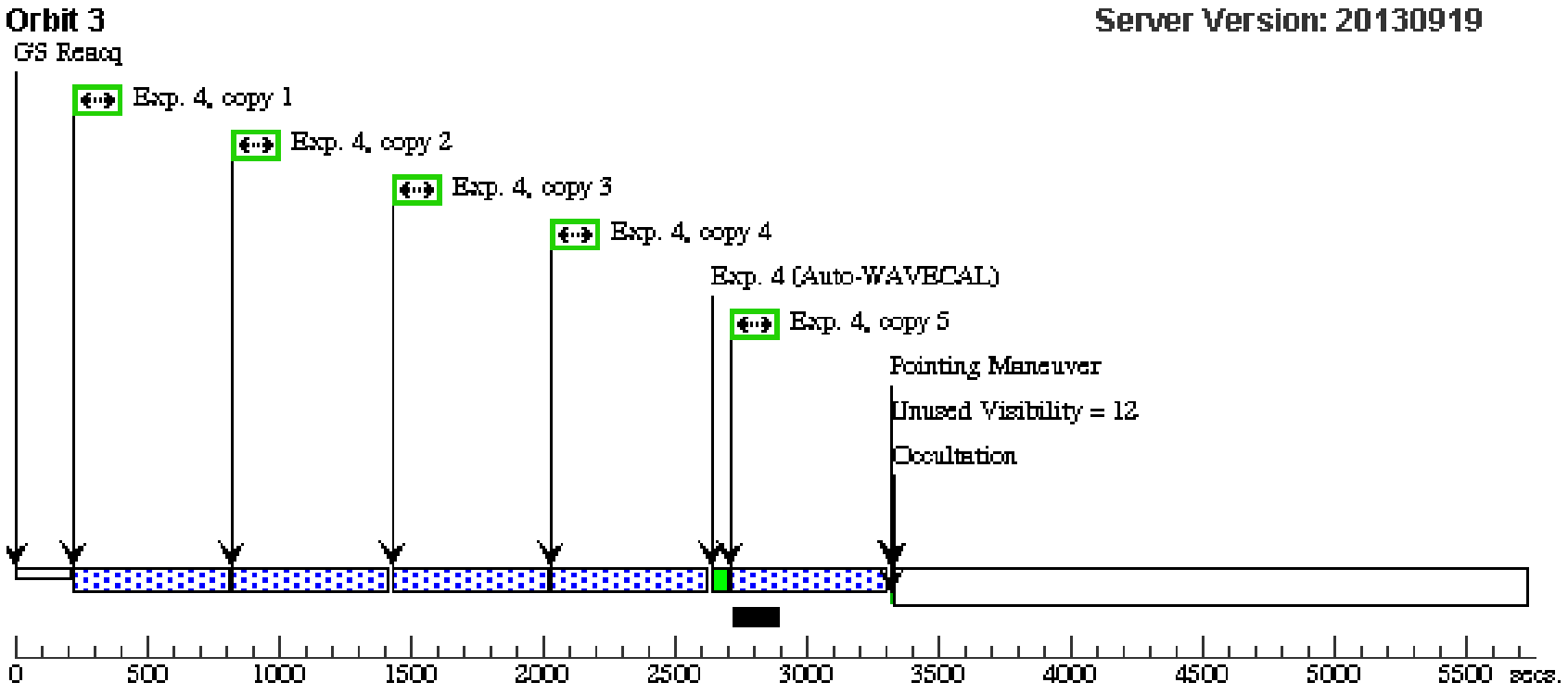
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Exp. 4, copy 5
Pointing Maneuver
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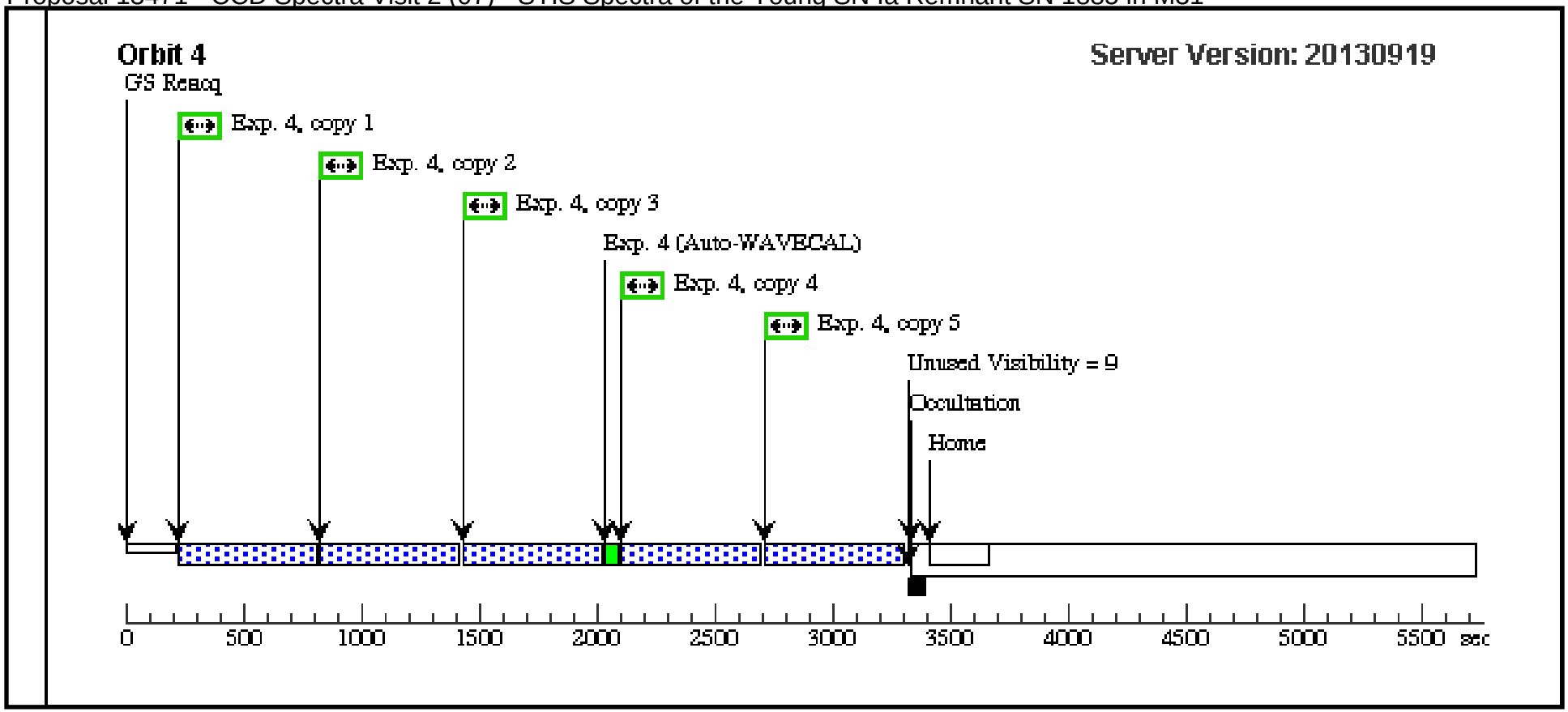
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Exp. 4, copy 5
Unused Visibility = 9
Occultation
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sec

Visit

Proposal 13471, CCD Spectra Visit 3 (08), scheduling Tue Oct 29 01:04:13 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: SAME ORIENT AS 01

Diagnostics

(CCD Spectra Visit 3 (08)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 3 (08)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 3 (08)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 3 (08)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 3 (08)) Warning (Orbit Planner): PATTERN POSITION OUTSIDE APERTURE

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.7	Center Pattern=false		
	Line Spacing=			

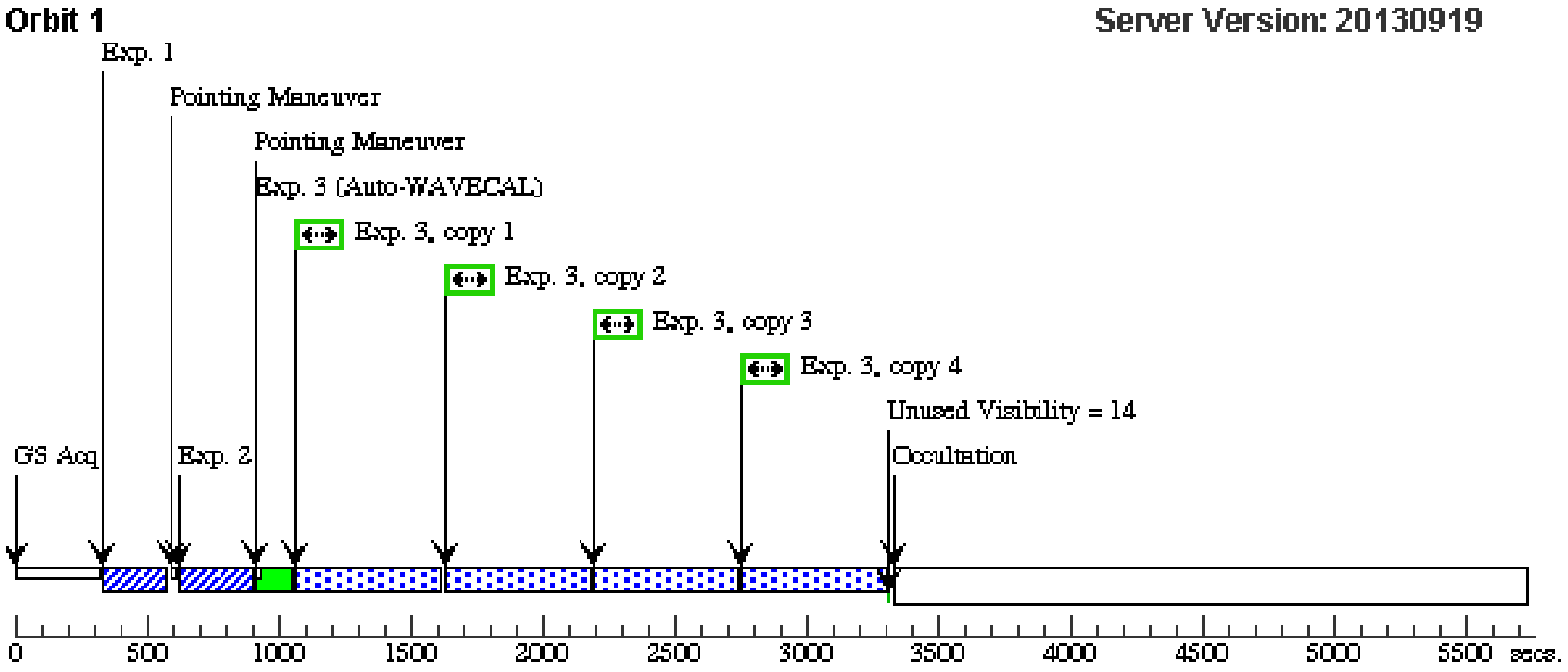
Fixed Targets

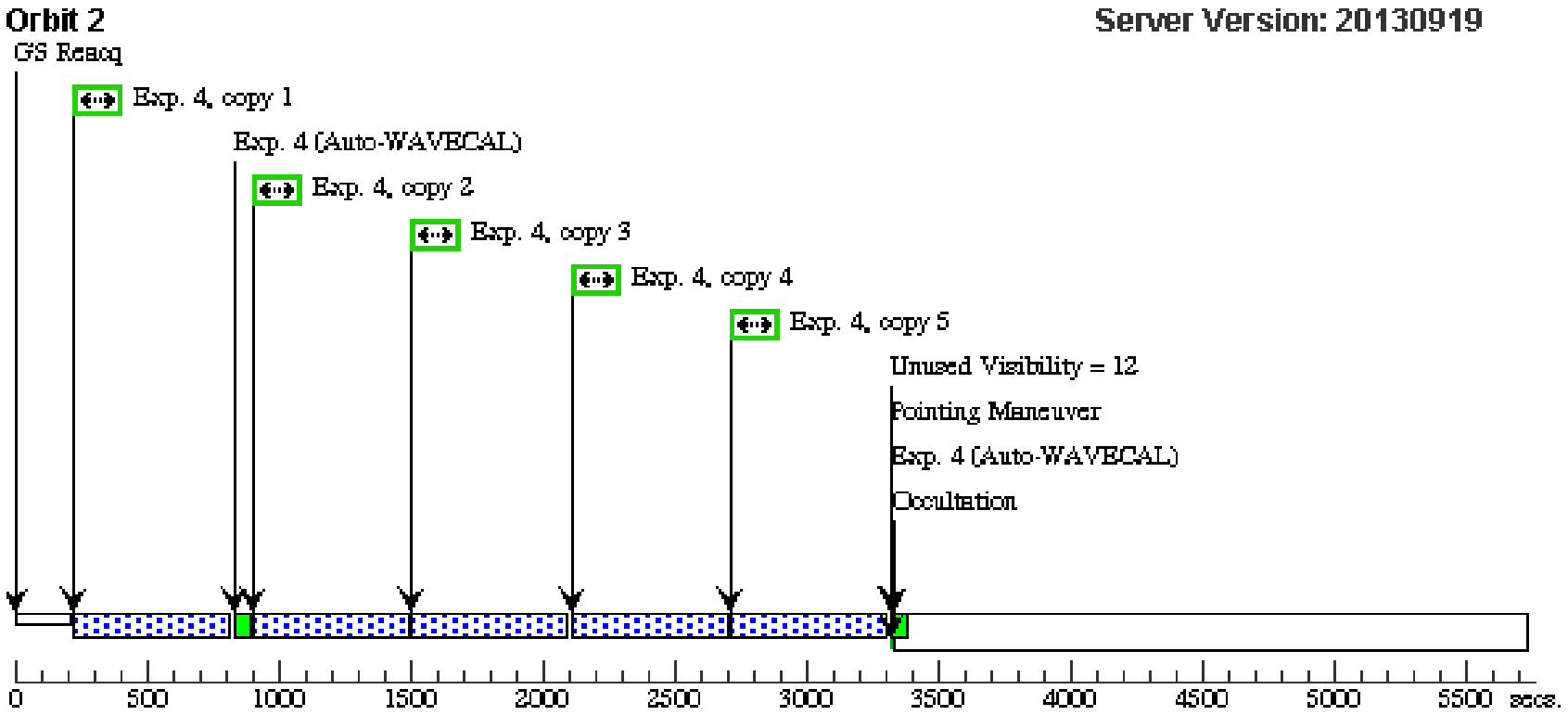
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG -0.2,-0.2		535 Secs X 4 (2140 Secs)	
								[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]*	***[1]***
4	sets 2-4	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG -0.2,-0.2	Pattern 2, Exps 4-4 in CCD Spectra Visit 3 (08) (2)	577 Secs X 5 (8655 Secs)	
								[==>(Pattern 1, Copy 1)] *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 1, Copy 3)]* *[==>(Pattern 1, Copy 4)]* *[==>(Pattern 1, Copy 5)]*	***[2]***
								[==>(Pattern 2, Copy 1)] *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 2, Copy 3)]* *[==>(Pattern 2, Copy 4)]* *[==>(Pattern 2, Copy 5)]*	***[3]***
								[==>(Pattern 3, Copy 1)] *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 3, Copy 3)]* *[==>(Pattern 3, Copy 4)]* *[==>(Pattern 3, Copy 5)]*	***[4]***

Orbit Structure

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Pointing Maneuver
Exp. 4 (Auto-WAVECAL)
Occultation
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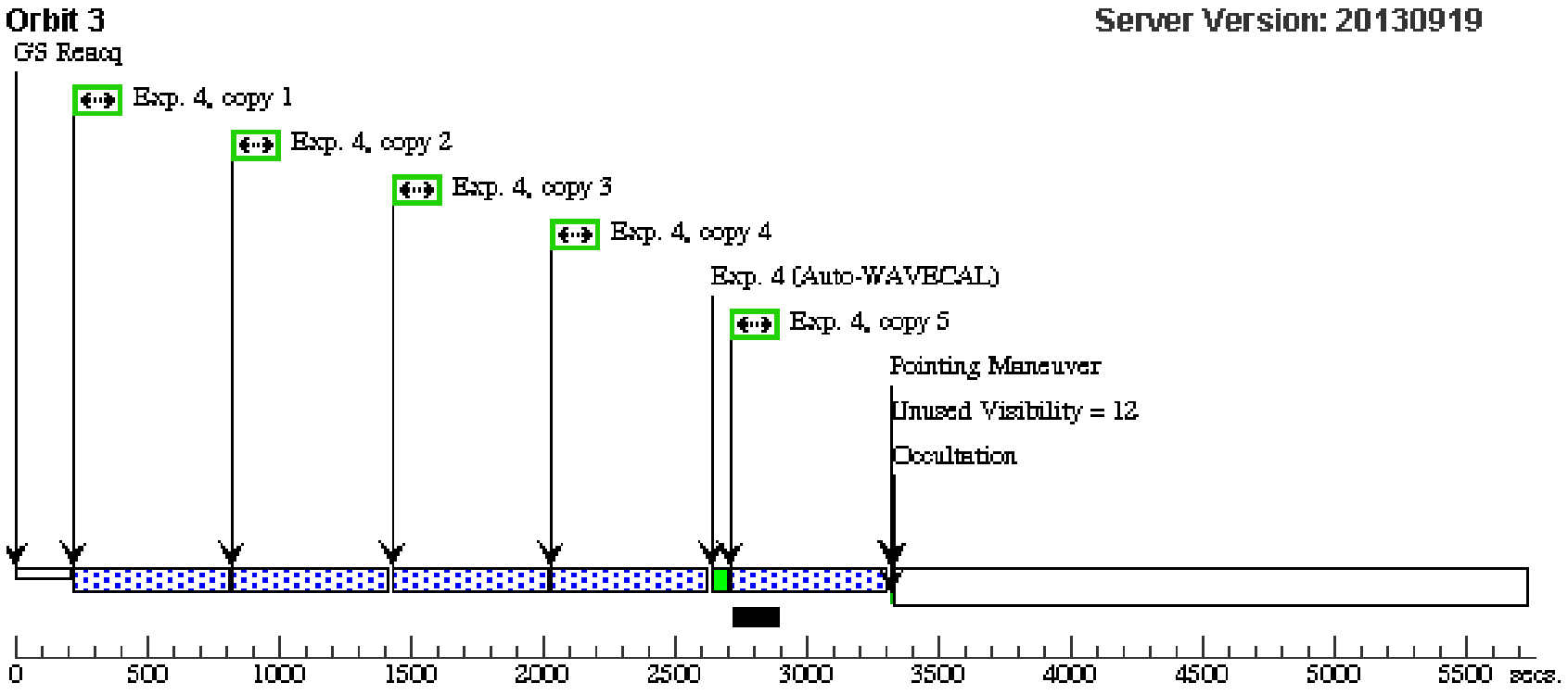
secs.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Exp. 4, copy 5
Pointing Maneuver
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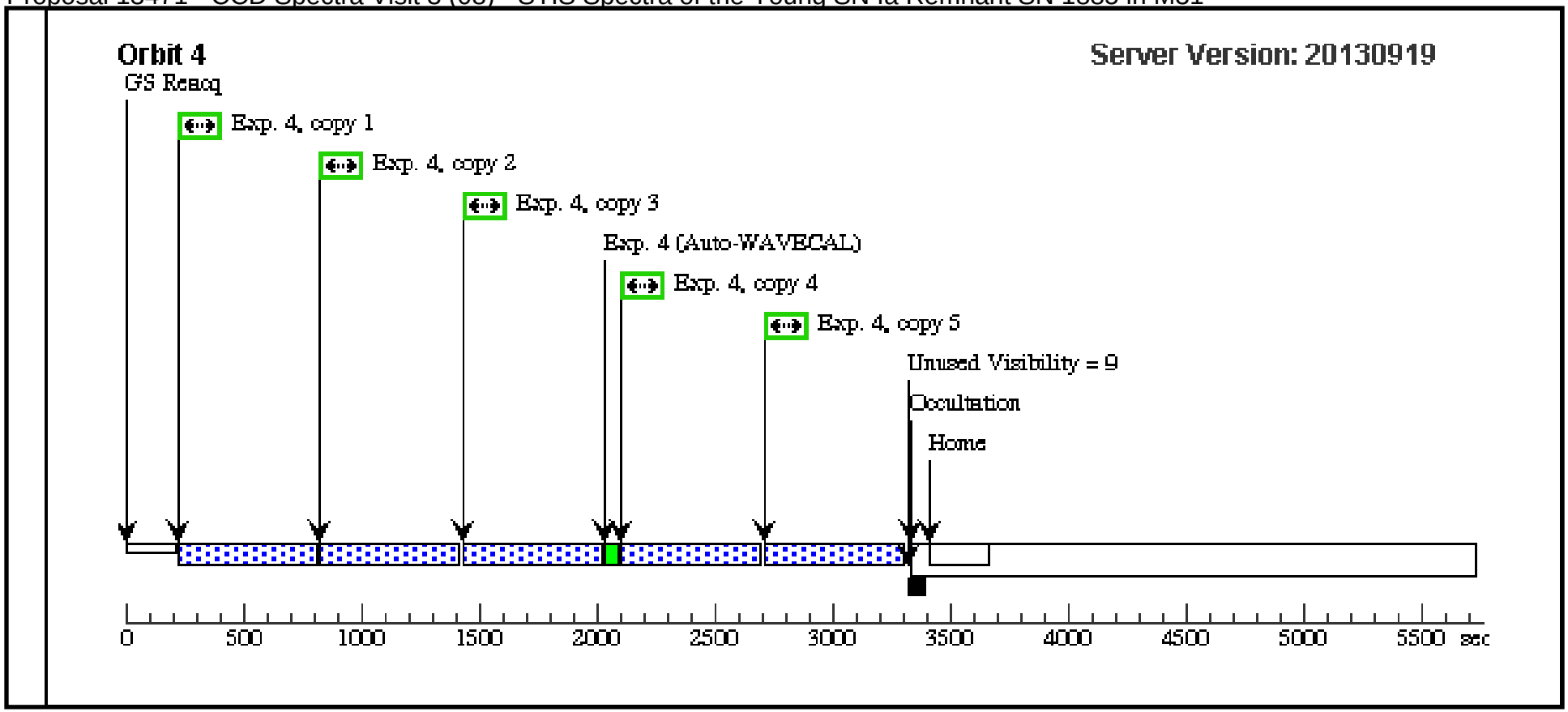
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Exp. 4, copy 3
Exp. 4 (Auto-WAVECAL)
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Exp. 4, copy 5
Unused Visibility = 9
Occultation
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5500
sec

Visit

Proposal 13471, CCD Spectra Visit 4 (09), completed Tue Oct 29 01:04:15 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 89D TO 91D FROM 01

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.3	Center Pattern=false		
	Line Spacing=			

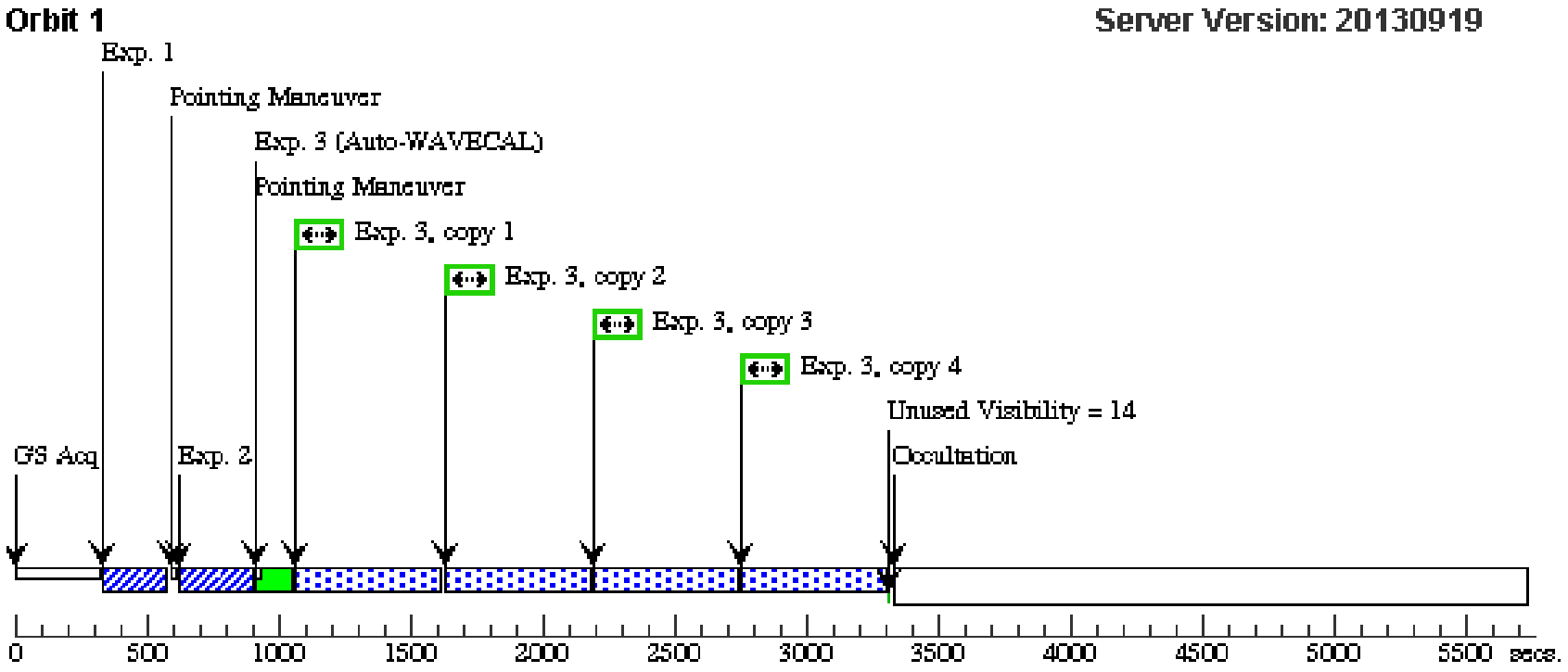
Fixed Targets

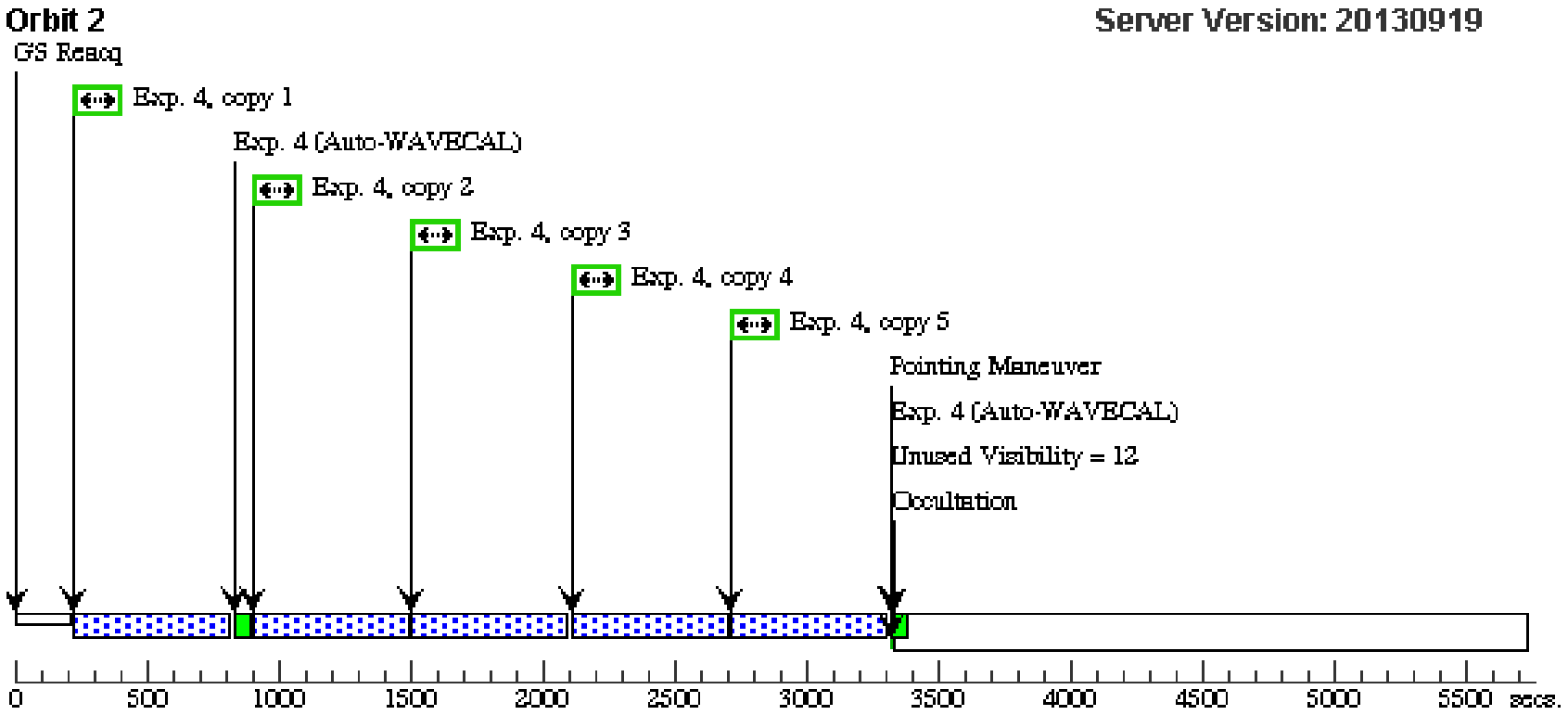
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

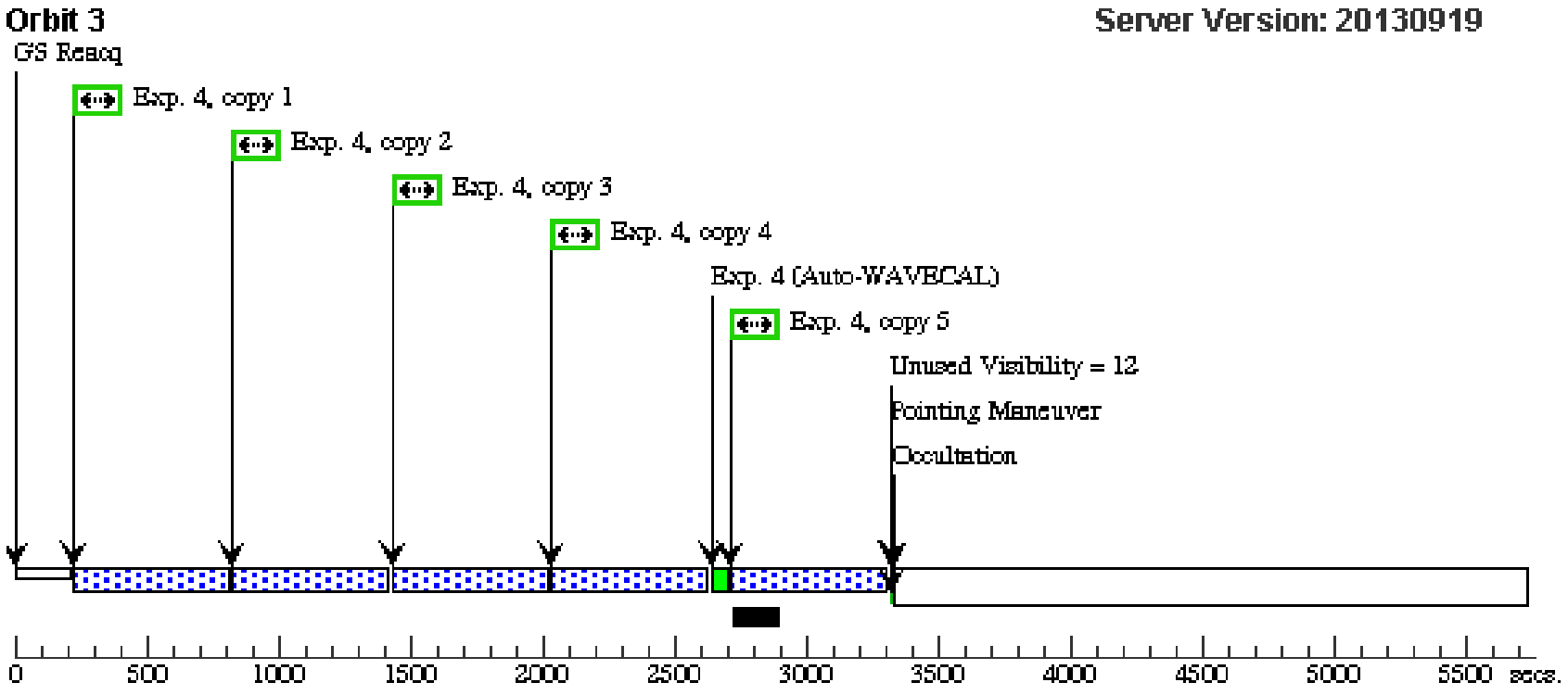
Exposures

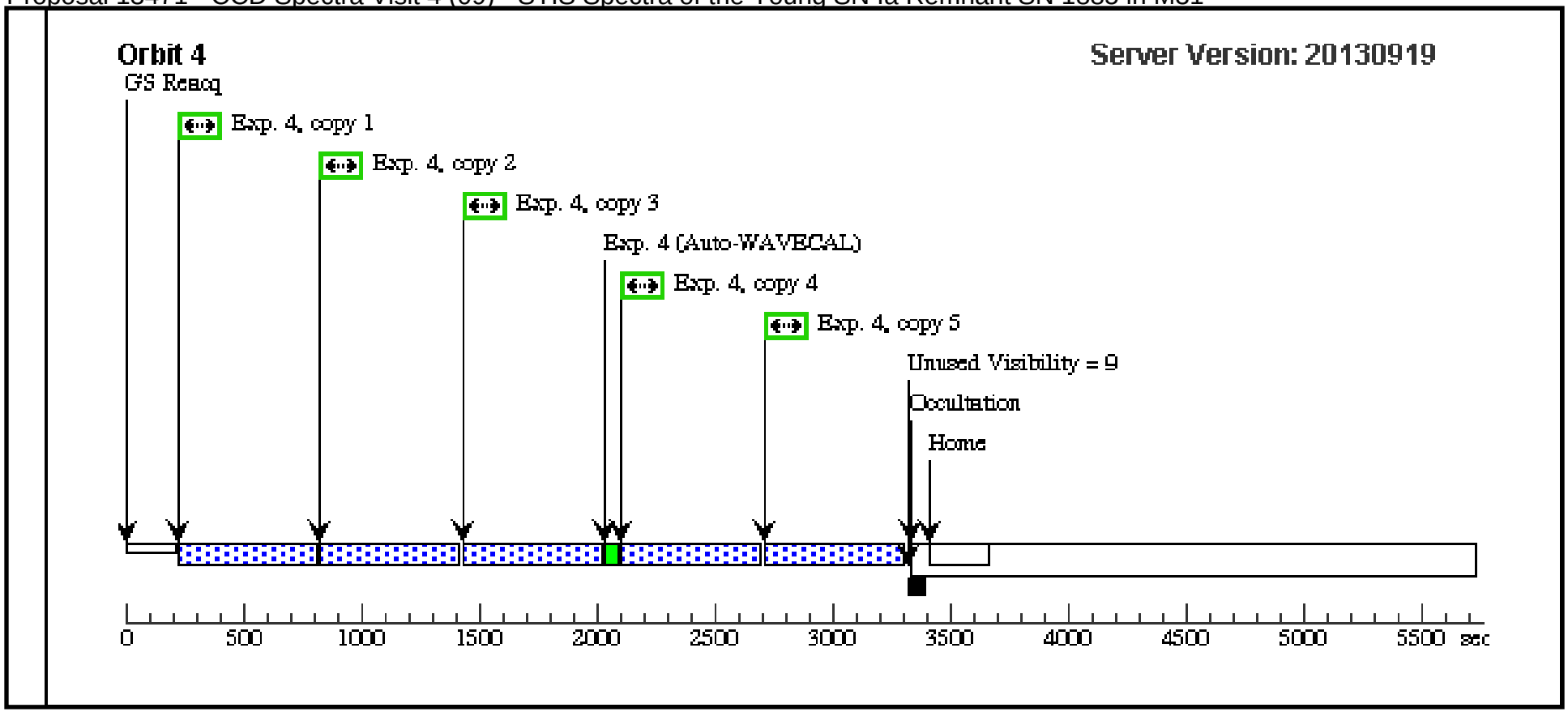
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Pea	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2			535 Secs X 4 (2140 Secs)	
								[==>(Copy 1)] *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]*	***[1]***
4	sets 2-4	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2		Pattern 1, Exps 4-4 in CCD Spectra Visit 4 (09) (1)	577 Secs X 5 (8655 Secs)	
								[==>(Pattern 1, Copy 1)] *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 1, Copy 3)]* *[==>(Pattern 1, Copy 4)]* *[==>(Pattern 1, Copy 5)]*	***[2]***
								[==>(Pattern 2, Copy 1)] *[==>(Pattern 2, Copy 2)]* *[==>(Pattern 2, Copy 3)]* *[==>(Pattern 2, Copy 4)]* *[==>(Pattern 2, Copy 5)]*	***[3]***
								[==>(Pattern 3, Copy 1)] *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 3, Copy 3)]* *[==>(Pattern 3, Copy 4)]* *[==>(Pattern 3, Copy 5)]*	***[4]***

Orbit Structure




Orbit 2
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4, copy 4
Exp. 4, copy 5
Pointing Maneuver
Exp. 4 (Auto-WAVECAL)
Unused Visibility = 12
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4, copy 4
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 5
Unused Visibility = 12
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 4
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 4
Exp. 4, copy 5
Unused Visibility = 9
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Proposal 13471 - CCD Spectra Visit 5 (10) - STIS Spectra of the Young SN Ia Remnant SN 1885 in M31

Visit

Proposal 13471, CCD Spectra Visit 5 (10), scheduled Tue Oct 29 01:04:17 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 89D TO 91D FROM 01

Diagnostics

(CCD Spectra Visit 5 (10)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 5 (10)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 5 (10)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 5 (10)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 5 (10)) Warning (Orbit Planner): PATTERN POSITION OUTSIDE APERTURE

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.3	Center Pattern=false		
	Line Spacing=			

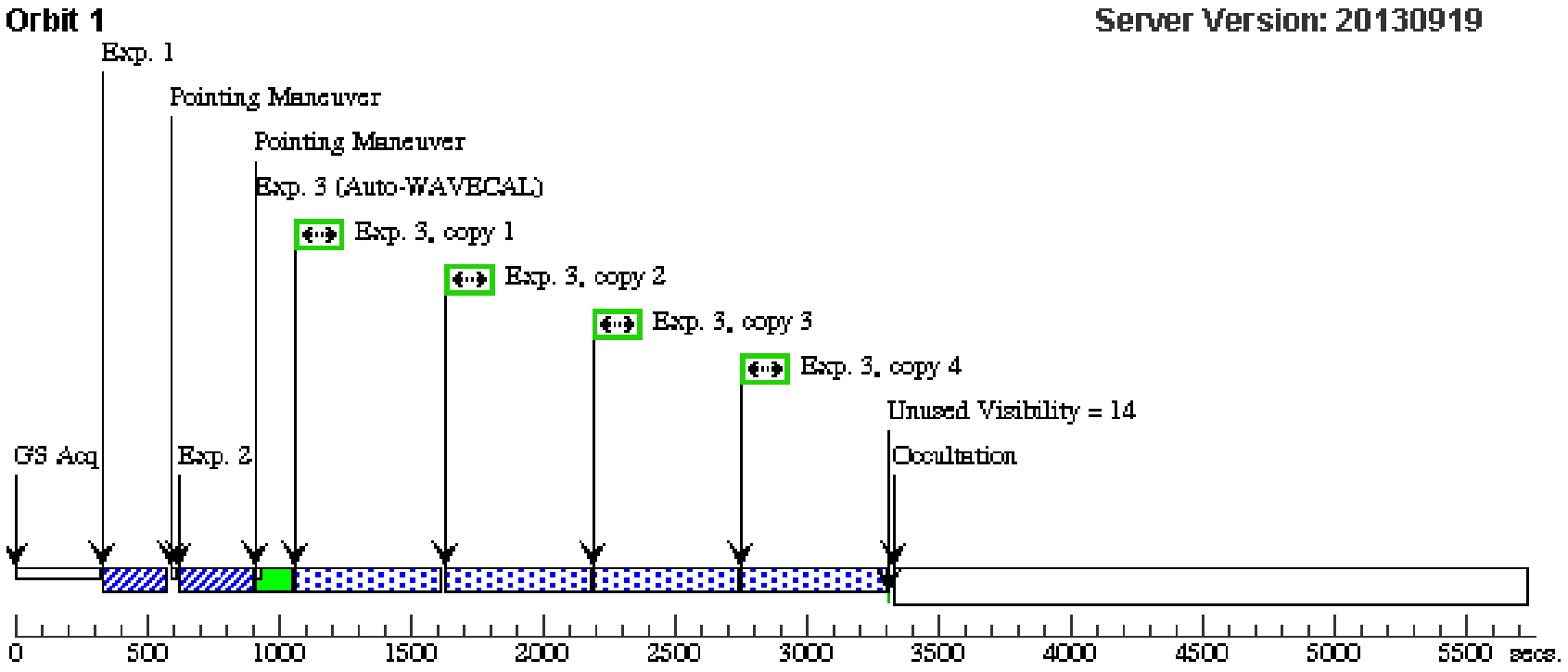
Fixed Targets

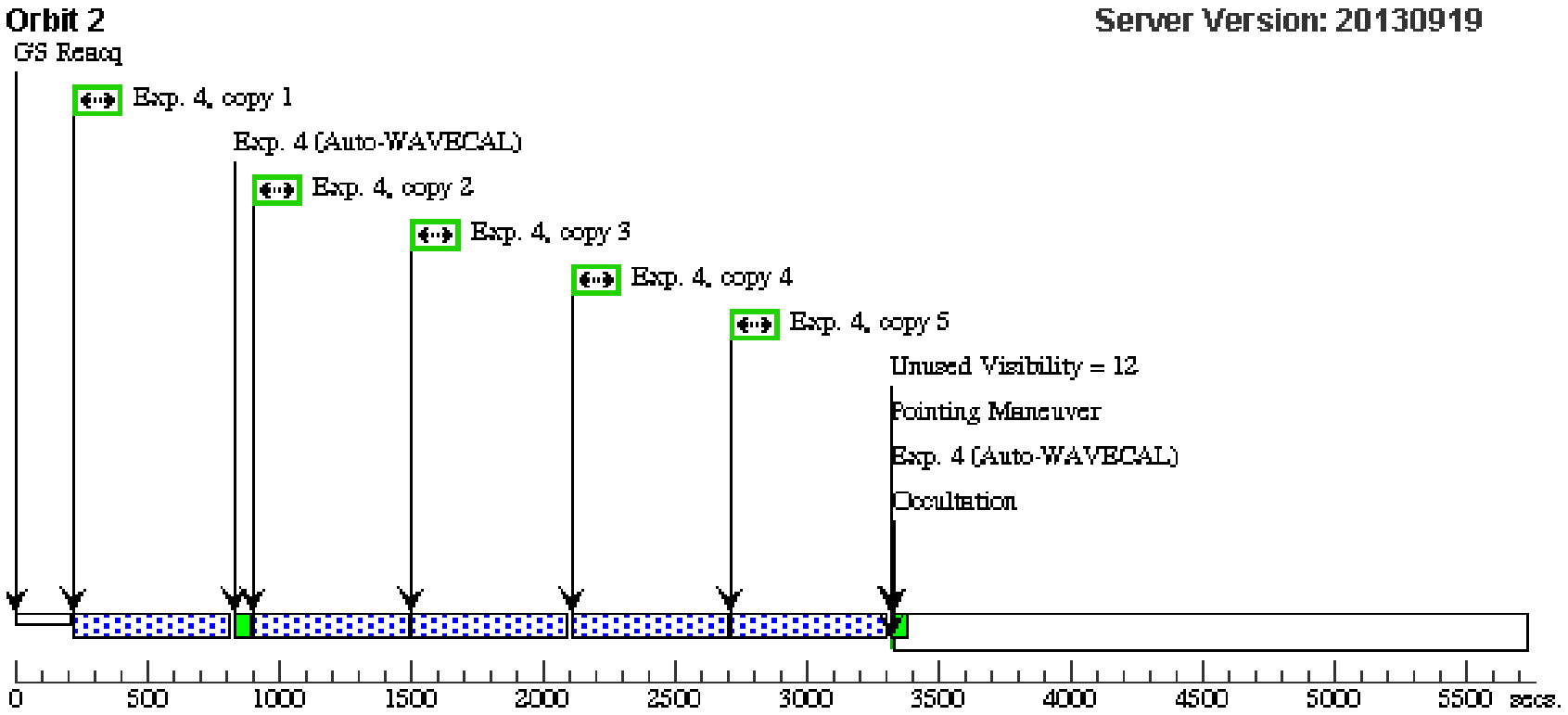
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

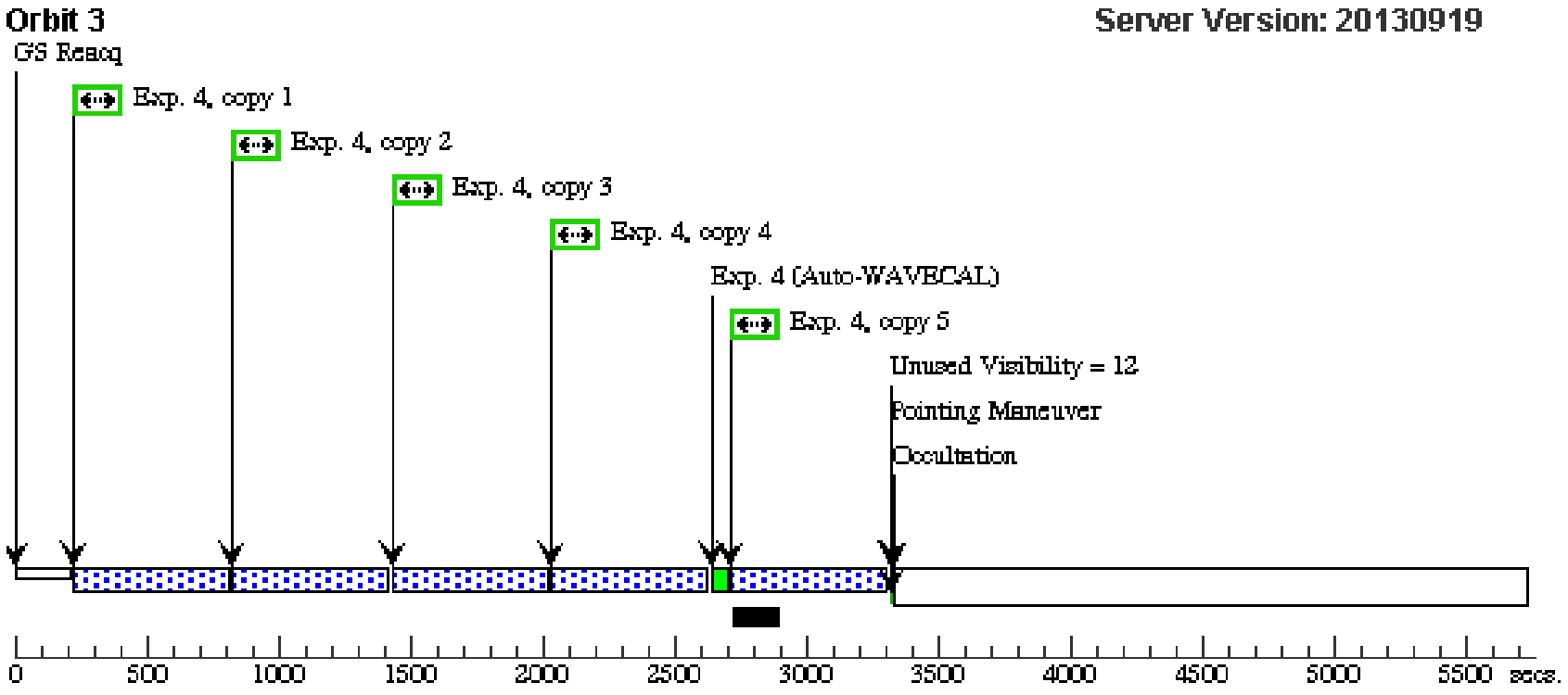
Exposures

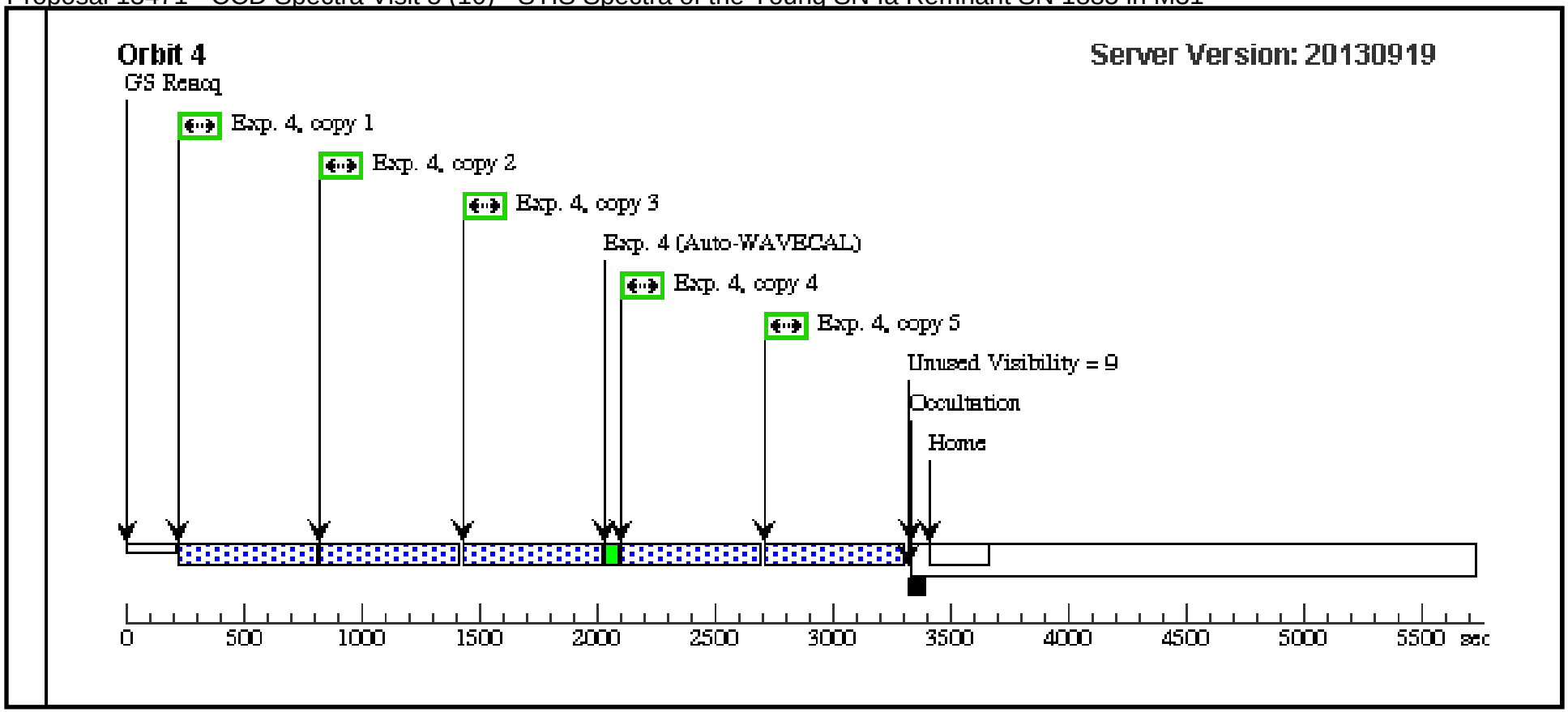
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG 0.2,0.2		535 Secs X 4 (2140 Secs)	
								[==>(Copy 1)]	***[1]***
								[==>(Copy 2)]	
								[==>(Copy 3)]	
								[==>(Copy 4)]	
4	sets 2-4	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG 0.2,0.2	Pattern 1, Exps 4-4 in CCD Spectra Visit 5 (10) (1)	577 Secs X 5 (8655 Secs)	
								[==>(Pattern 1, Copy 1)]	***[2]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 1, Copy 3)]	
								[==>(Pattern 1, Copy 4)]	
								[==>(Pattern 1, Copy 5)]	
								[==>(Pattern 2, Copy 1)]	***[3]***
								[==>(Pattern 2, Copy 2)]	
								[==>(Pattern 2, Copy 3)]	
								[==>(Pattern 2, Copy 4)]	
								[==>(Pattern 2, Copy 5)]	
								[==>(Pattern 3, Copy 1)]	***[4]***
								[==>(Pattern 3, Copy 2)]	
								[==>(Pattern 3, Copy 3)]	
								[==>(Pattern 3, Copy 4)]	
								[==>(Pattern 3, Copy 5)]	

Orbit Structure




Orbit 2
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4, copy 4
Exp. 4, copy 5
Unused Visibility = 12
Pointing Maneuver
Exp. 4 (Auto-WAVECAL)
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4, copy 4
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 5
Unused Visibility = 12
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 4
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 4
Exp. 4, copy 5
Unused Visibility = 9
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Proposal 13471 - CCD Spectra Visit 6 (11) - STIS Spectra of the Young SN Ia Remnant SN 1885 in M31

Visit

Proposal 13471, CCD Spectra Visit 6 (11), completed Tue Oct 29 01:04:21 GMT 2013

Diagnostic Status: Warning

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 89D TO 91D FROM 01

Diagnostics

(CCD Spectra Visit 6 (11)) Warning (Orbit Planner): PATTERN POSITION OUTSIDE APERTURE

(CCD Spectra Visit 6 (11)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 6 (11)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 6 (11)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(CCD Spectra Visit 6 (11)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.3	Center Pattern=false		
	Line Spacing=			

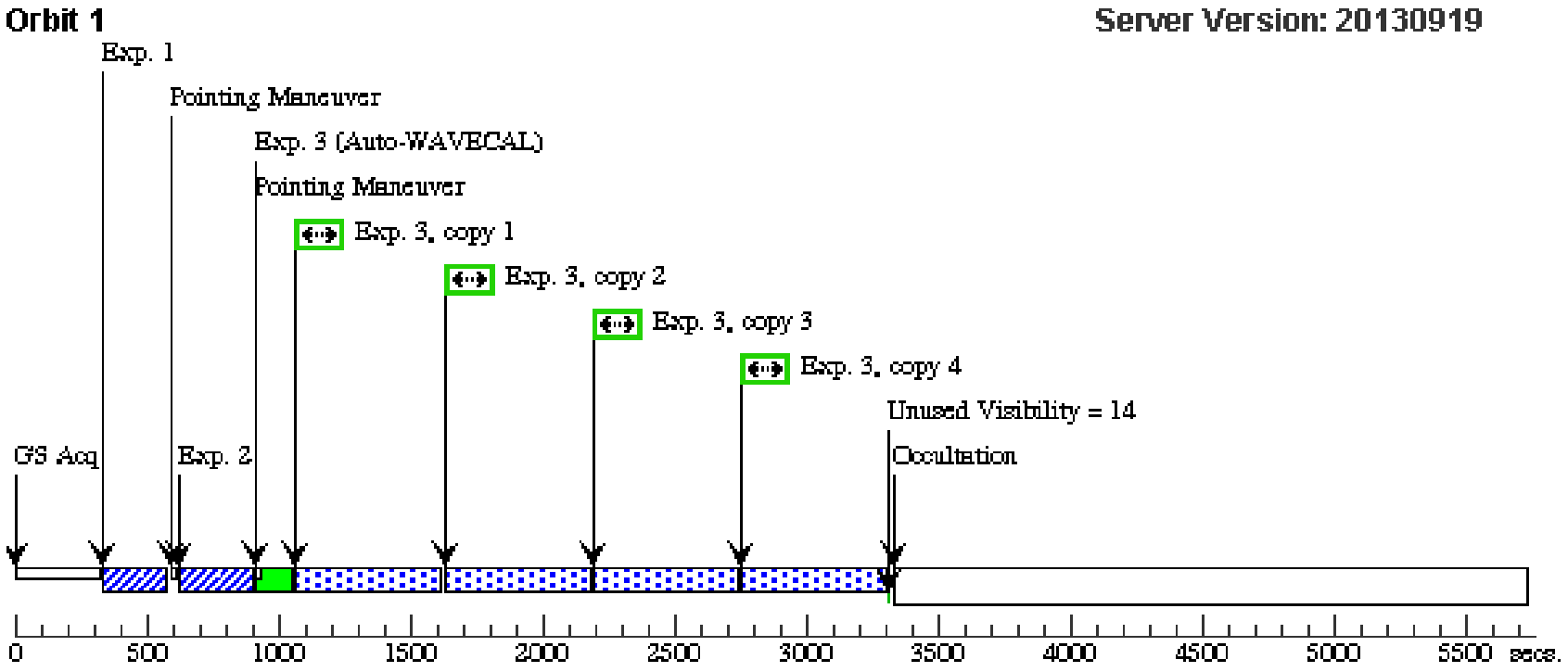
Fixed Targets

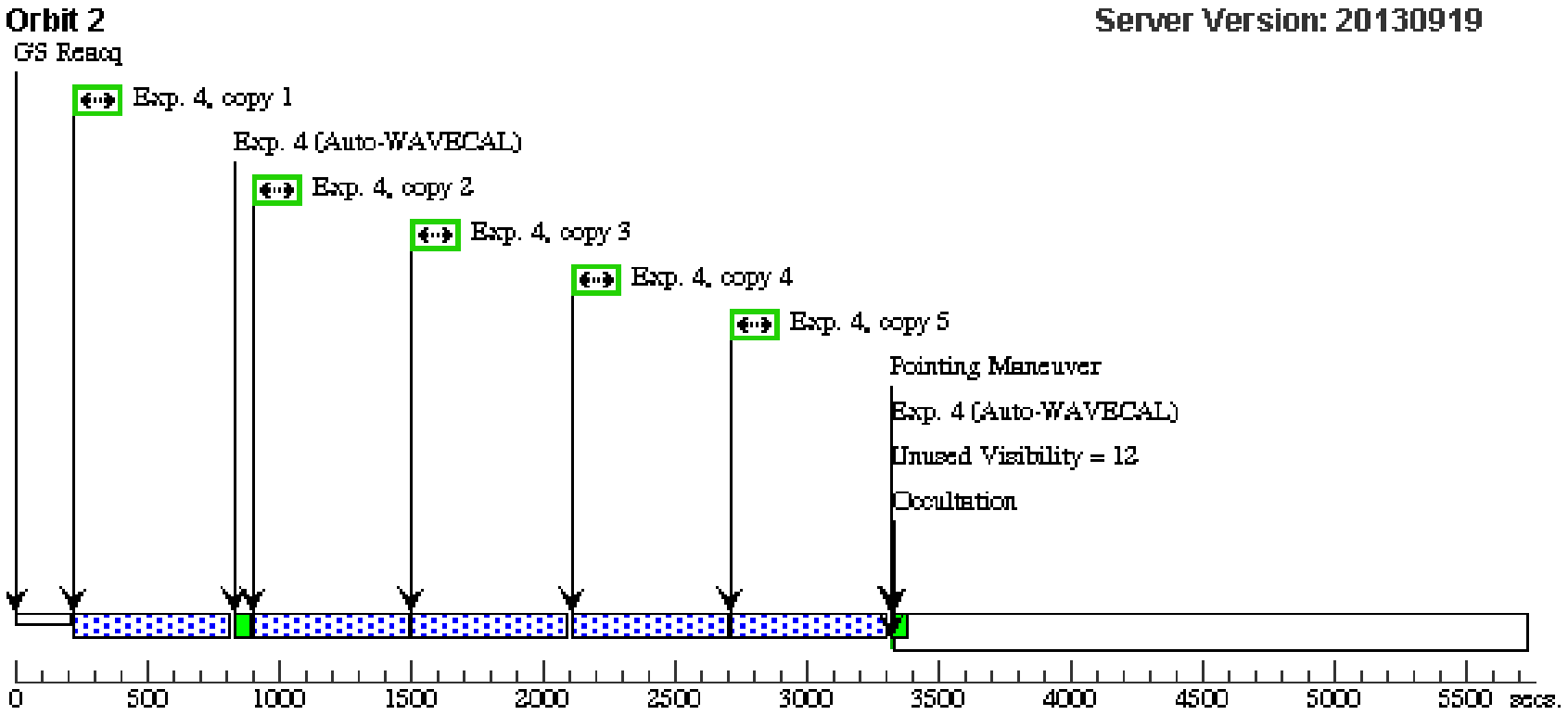
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

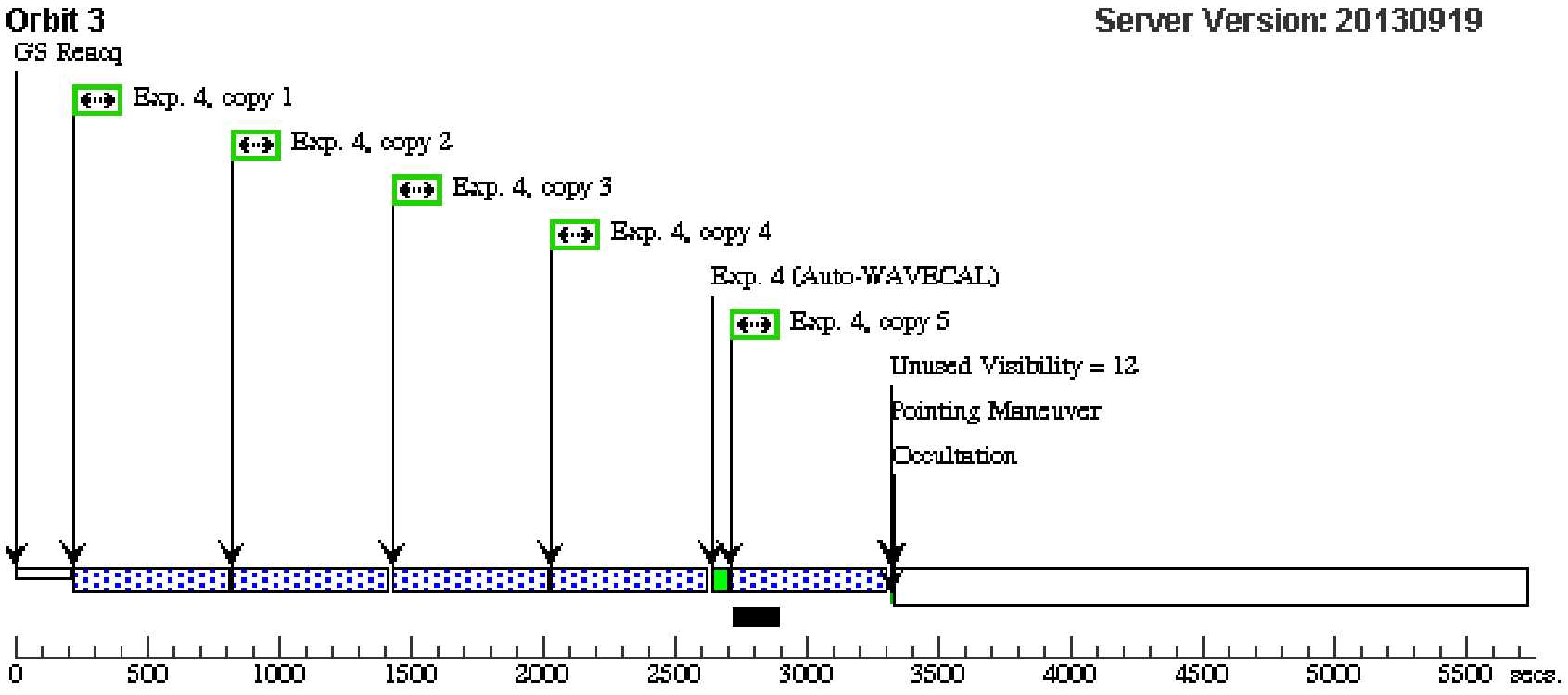
Exposures

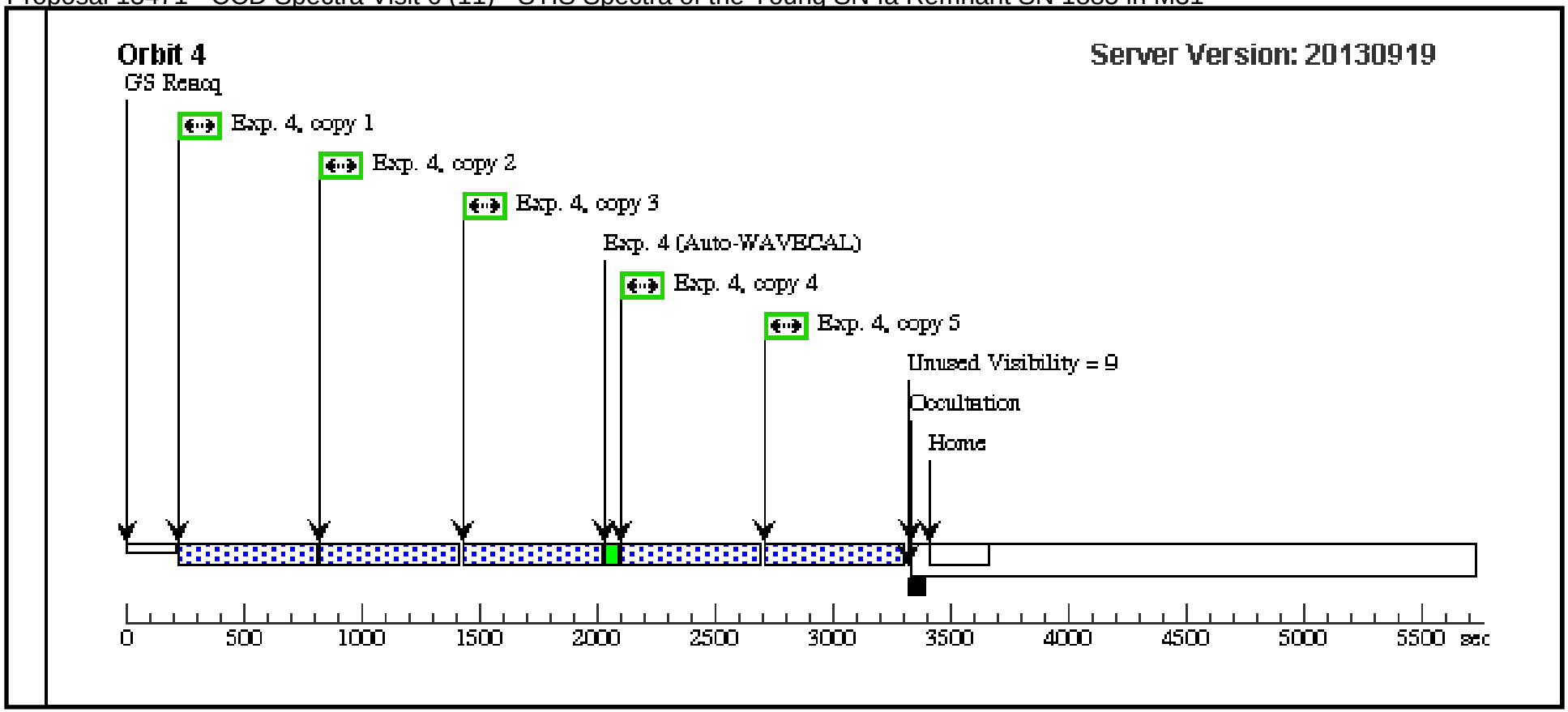
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG -0.2,-0.2		535 Secs X 4 (2140 Secs)	
								[==>(Copy 1)]	***[1]***
								[==>(Copy 2)]	
								[==>(Copy 3)]	
								[==>(Copy 4)]	
4	sets 2-4	(1) NGC224-SN1885	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO; BINAXIS1=2; BINAXIS2=2	POS TARG -0.2,-0.2	Pattern 1, Exps 4-4 in CCD Spectra Visit 6 (11) (1)	577 Secs X 5 (8655 Secs)	
								[==>(Pattern 1, Copy 1)]	***[2]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 1, Copy 3)]	
								[==>(Pattern 1, Copy 4)]	
								[==>(Pattern 1, Copy 5)]	
								[==>(Pattern 2, Copy 1)]	***[3]***
								[==>(Pattern 2, Copy 2)]	
								[==>(Pattern 2, Copy 3)]	
								[==>(Pattern 2, Copy 4)]	
								[==>(Pattern 2, Copy 5)]	
								[==>(Pattern 3, Copy 1)]	***[4]***
								[==>(Pattern 3, Copy 2)]	
								[==>(Pattern 3, Copy 3)]	
								[==>(Pattern 3, Copy 4)]	
								[==>(Pattern 3, Copy 5)]	

Orbit Structure




Orbit 2
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4, copy 4
Exp. 4, copy 5
Pointing Maneuver
Exp. 4 (Auto-WAVECAL)
Unused Visibility = 12
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 3
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4, copy 4
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 5
Unused Visibility = 12
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.


Orbit 4
Server Version: 20130919
GS Reacq
Exp. 4, copy 1
Exp. 4, copy 2
Exp. 4, copy 3
Exp. 4 (Auto-WAVECAL)
Exp. 4, copy 4
Exp. 4, copy 5
Unused Visibility = 9
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13471, MAMA Spectra Visit 1 (12), scheduling Tue Oct 29 01:04:23 GMT 2013

Diagnostic Status: No Diagnostics

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

Special Requirements: SAME ORIENT AS 01

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.3	Center Pattern=false		
	Line Spacing=			

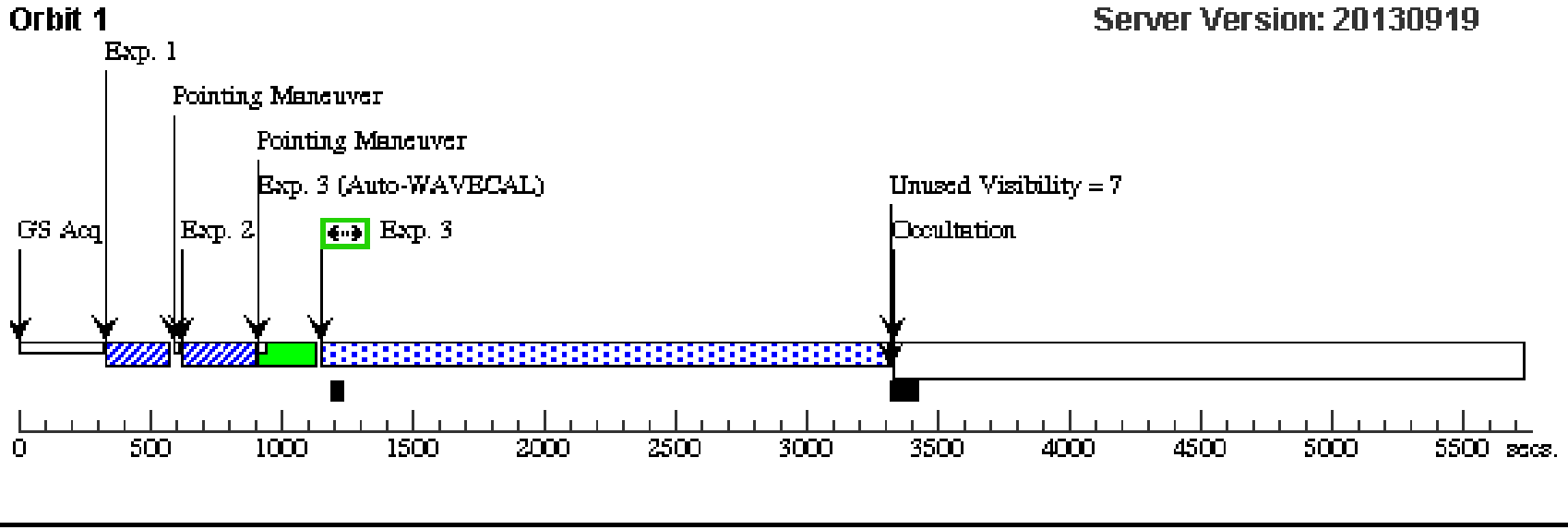
Fixed Targets

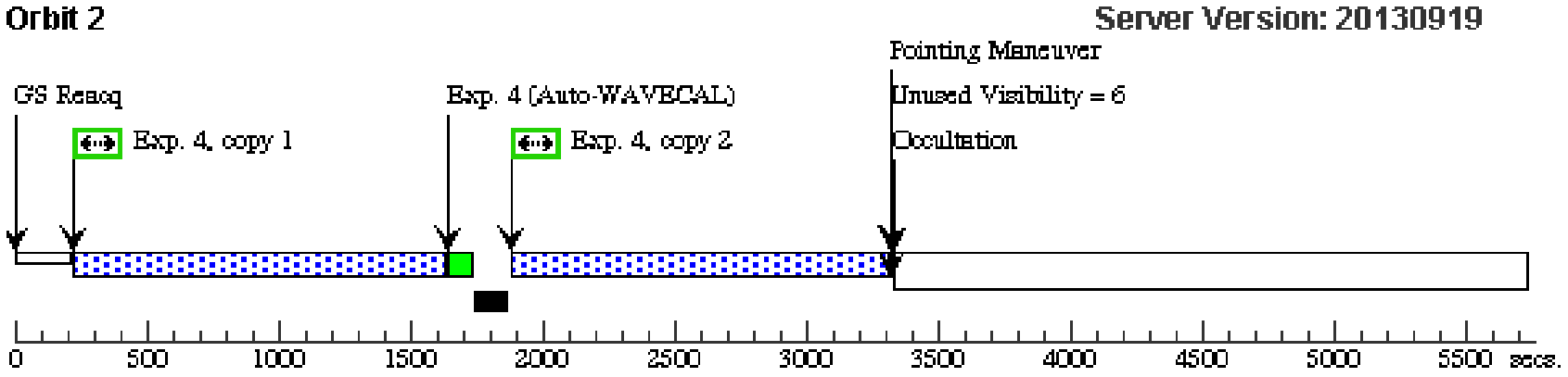
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

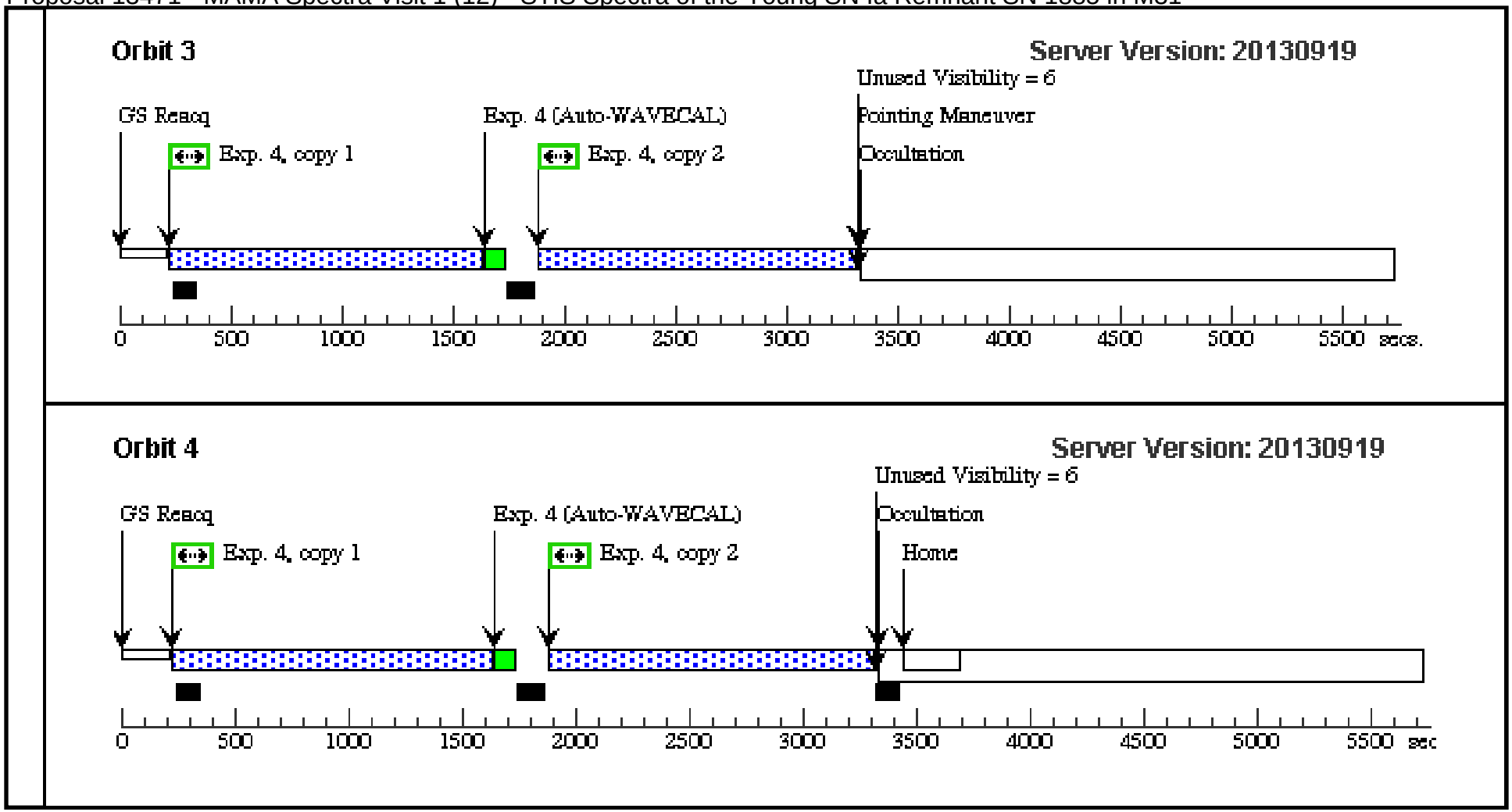
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				2121 Secs (2121 Secs)	
								[==>]	***[1]***
4	set 2 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A			Pattern 1, Exps 4-4 in MAMA Spectra Visit 1 (12) (1)	1395 Secs X 2 (8370 Secs)	
								[==>(Pattern 1, Copy 1)]	***[2]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 2, Copy 1)]	***[3]***
								[==>(Pattern 2, Copy 2)]	
								[==>(Pattern 3, Copy 1)]	***[4]***
								[==>(Pattern 3, Copy 2)]	

Orbit Structure






Orbit 3
Server Version: 20130919
Unused Visibility = 6
GS Reacq
Exp. 4 (Auto-WAVECAL)
Pointing Maneuver
Exp. 4, copy 1
Exp. 4, copy 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20130919
Unused Visibility = 6
GS Reacq
Exp. 4 (Auto-WAVECAL)
Occultation
Exp. 4, copy 1
Exp. 4, copy 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13471, MAMA Spectra Visit 2 (13), scheduling Tue Oct 29 01:04:24 GMT 2013

Diagnostic Status: No Diagnostics

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

Special Requirements: SAME ORIENT AS 12

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.3	Center Pattern=false		
	Line Spacing=			

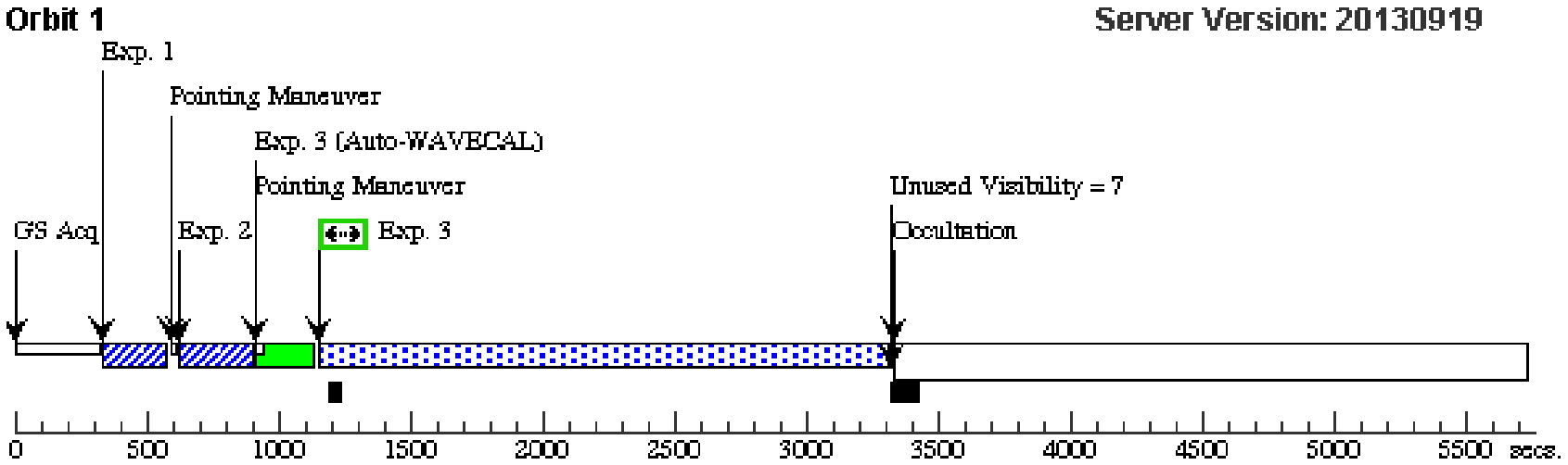
Fixed Targets

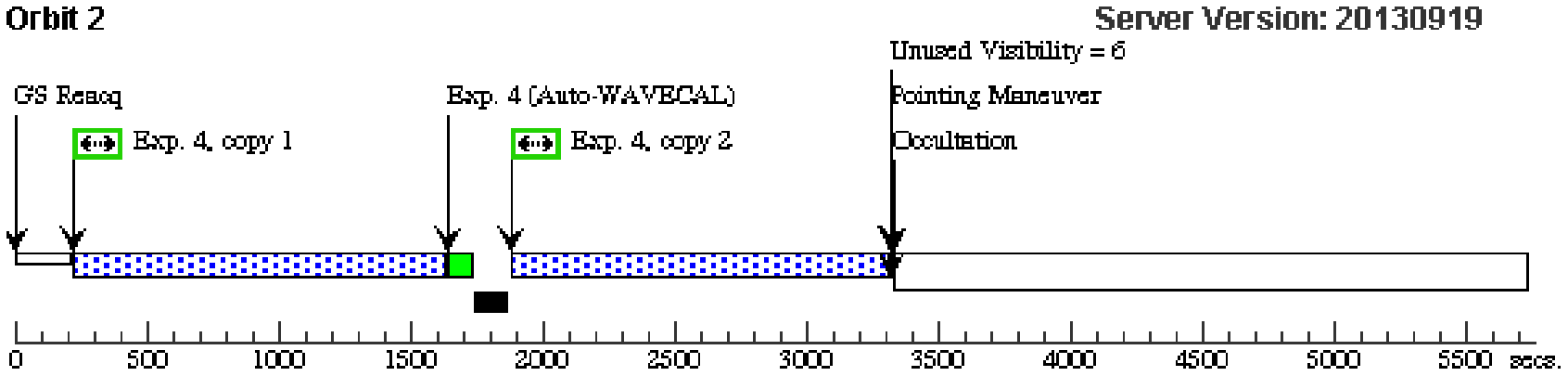
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

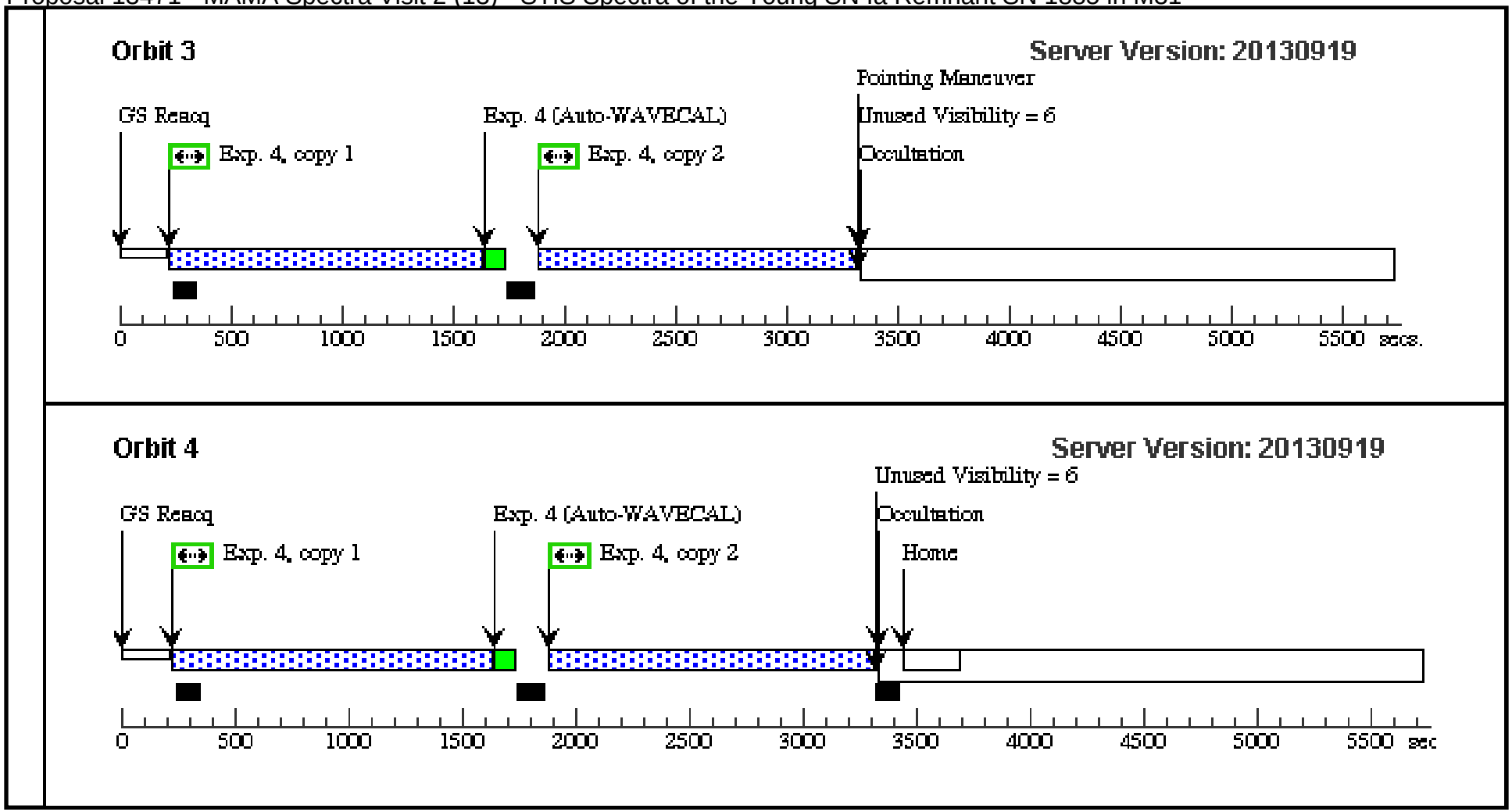
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				2121 Secs (2121 Secs)	
								[==>]	***[1]***
4	set 2 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A			Pattern 1, Exps 4-4 in MAMA Spectra Visit 2 (13) (1)	1395 Secs X 2 (8370 Secs)	
								[==>(Pattern 1, Copy 1)]	***[2]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 2, Copy 1)]	***[3]***
								[==>(Pattern 2, Copy 2)]	
								[==>(Pattern 3, Copy 1)]	***[4]***
								[==>(Pattern 3, Copy 2)]	

Orbit Structure






Orbit 3
Server Version: 20130919
Pointing Maneuver
GS Reacq
Exp. 4 (Auto-WAVECAL)
Unused Visibility = 6
Exp. 4, copy 1
Exp. 4, copy 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20130919
Unused Visibility = 6
GS Reacq
Exp. 4 (Auto-WAVECAL)
Occultation
Exp. 4, copy 1
Exp. 4, copy 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13471, MAMA Spectra Visit 3 (14), scheduling Tue Oct 29 01:04:26 GMT 2013

Diagnostic Status: No Diagnostics

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

Special Requirements: SAME ORIENT AS 12

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(4)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.3	Center Pattern=false		
	Line Spacing=			

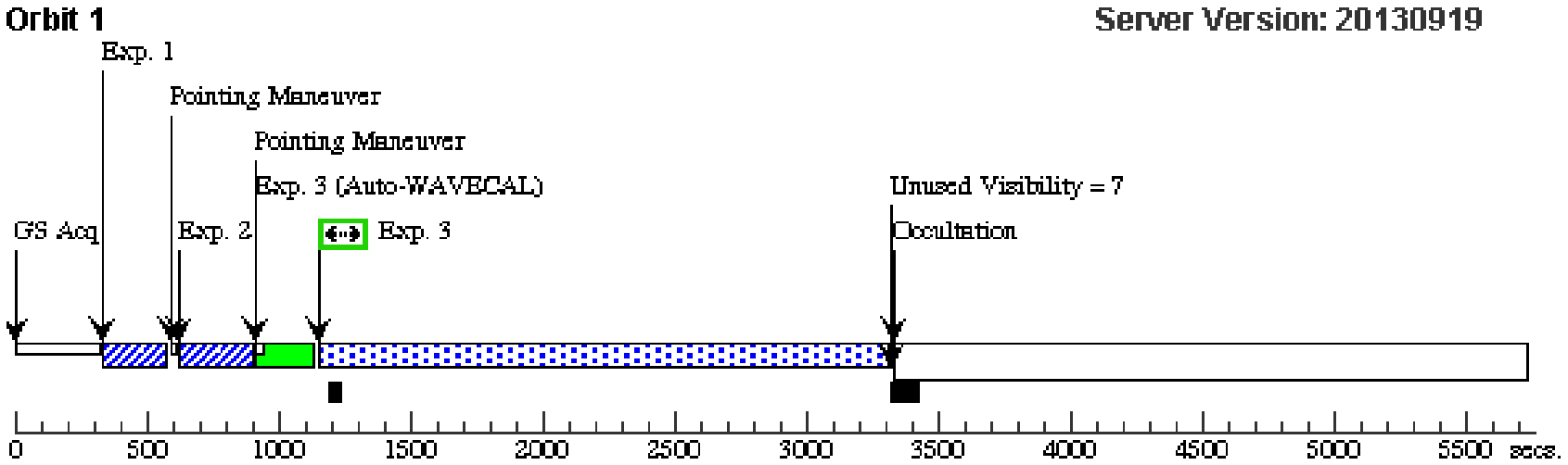
Fixed Targets

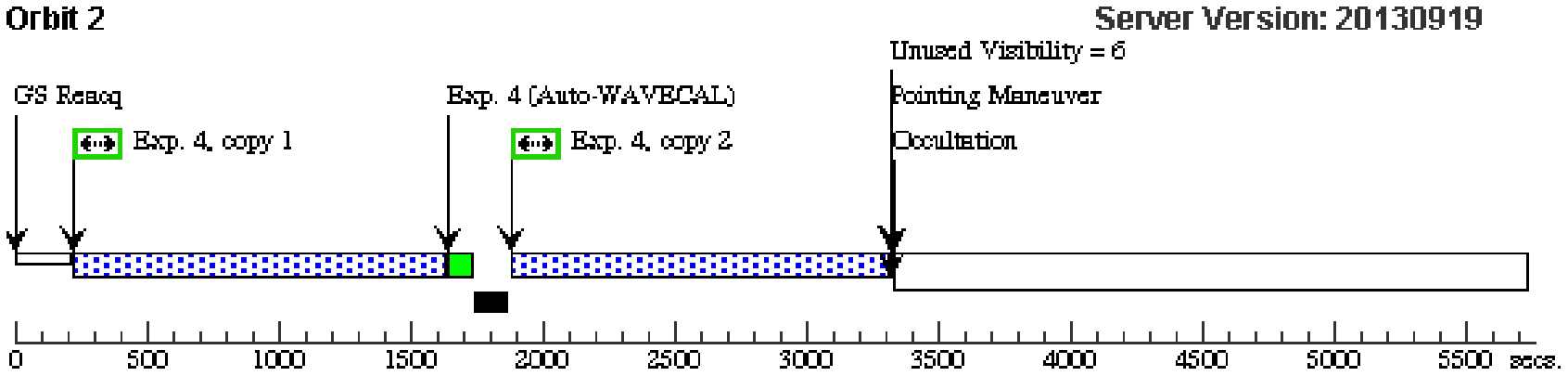
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

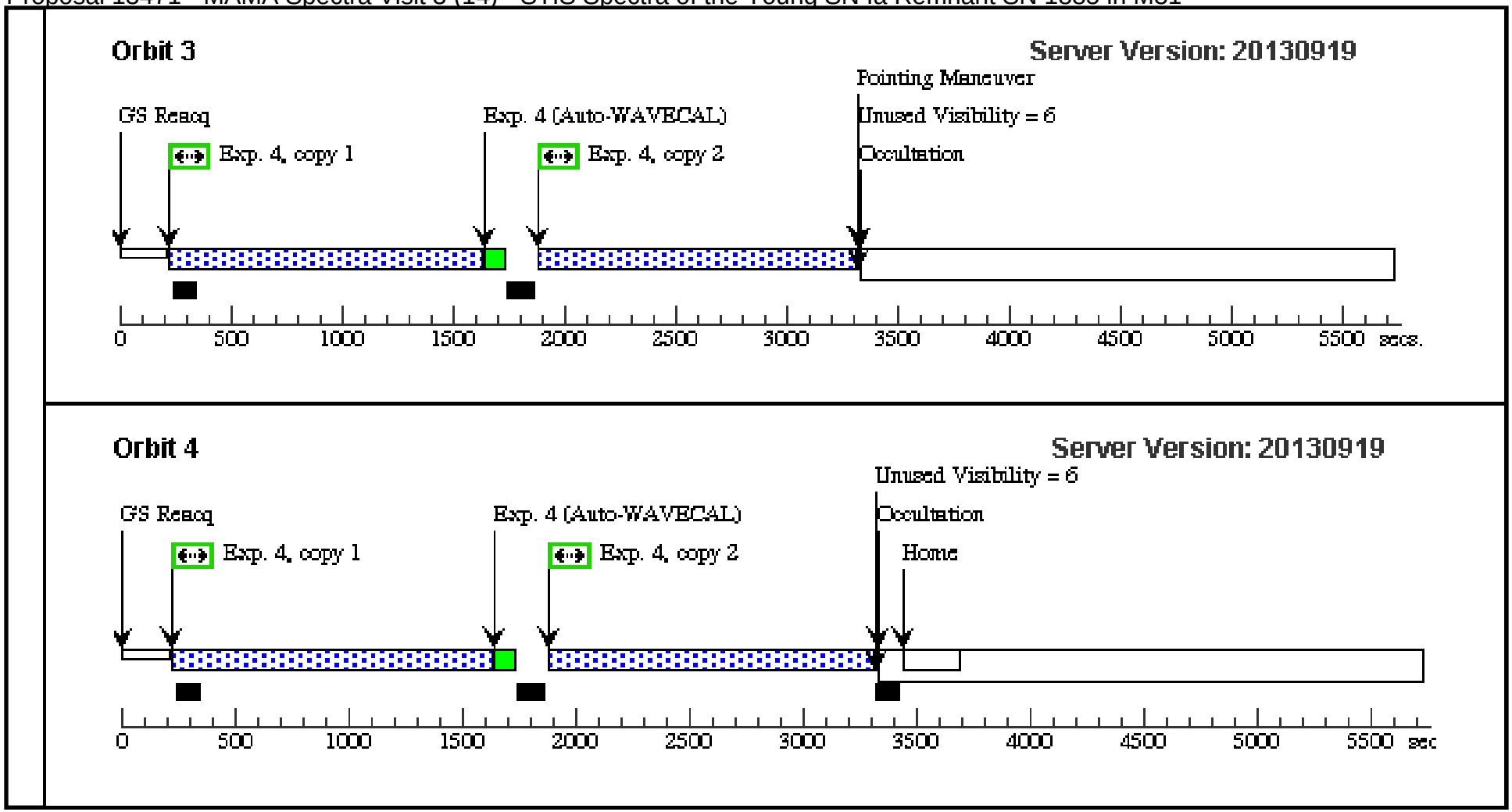
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				2121 Secs (2121 Secs)	
								[==>]	***[1]***
4	set 2 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A			Pattern 1, Exps 4-4 in MAMA Spectra Visit 3 (14) (1)	1395 Secs X 2 (8370 Secs)	
								[==>(Pattern 1, Copy 1)]	***[2]***
								[==>(Pattern 1, Copy 2)]	
								[==>(Pattern 2, Copy 1)]	***[3]***
								[==>(Pattern 2, Copy 2)]	
								[==>(Pattern 3, Copy 1)]	***[4]***
								[==>(Pattern 3, Copy 2)]	

Orbit Structure






Orbit 3
Server Version: 20130919
Pointing Maneuver
GS Reacq
Exp. 4 (Auto-WAVECAL)
Unused Visibility = 6
Exp. 4, copy 1
Exp. 4, copy 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20130919
Unused Visibility = 6
GS Reacq
Exp. 4 (Auto-WAVECAL)
Occultation
Exp. 4, copy 1
Exp. 4, copy 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13471, MAMA Spectra Visit 4 (15), scheduling Tue Oct 29 01:04:27 GMT 2013

Diagnostic Status: No Diagnostics

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

Special Requirements: SAME ORIENT AS 12

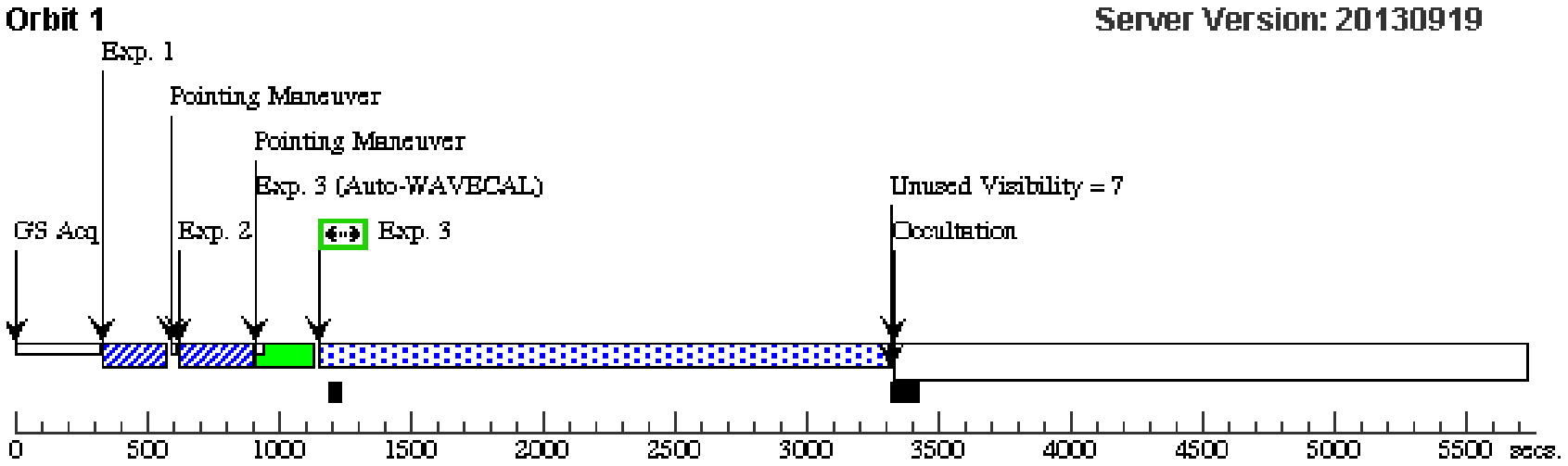
Fixed Targets

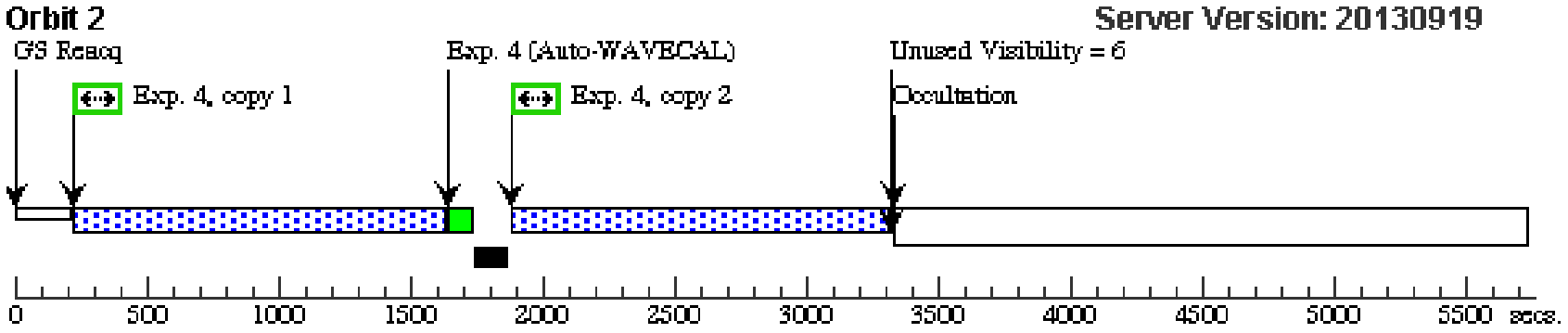
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC224-SN1885	RA: 00 42 43.0430 (10.6793458d)		V=10.0	Reference Frame: ICRS
	Alt Name1: SN1885	Dec: +41 16 4.43 (41.26790d)			
		Equinox: J2000			
Comments: This is the light absorbing remnant of SN 1885 lying in front of the M31 bulge.					
(2)	SN1885-OFFSET	RA: 00 42 42.2410 (10.6760042d)		V=16.5	Reference Frame: ICRS
		Dec: +41 15 45.77 (41.26271d)			
		Equinox: J2000			
Comments: This is the brightest source (star) very near the SN 1885 remnant in M31's bulge. We will use it as the offsetting object to do a blind offset. Its has a B mag of 17.7 but an uncertain V mag.					

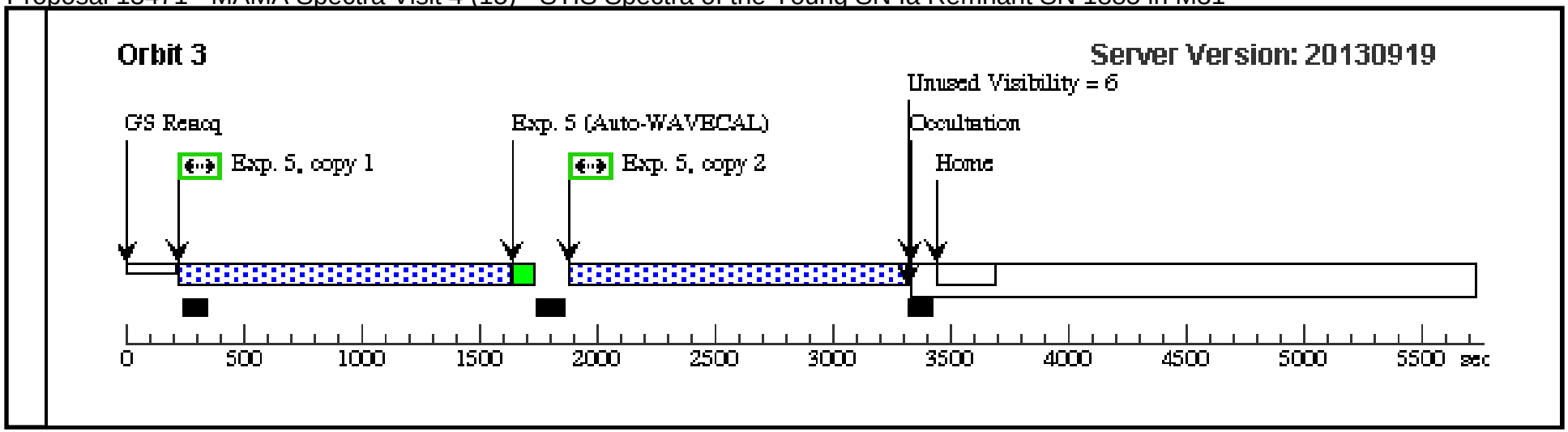
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ Image	(2) SN1885-OFFSET	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs (5 Secs)	
								[==>]	***[1]***
2	Offset star ACQ/Peak	(2) SN1885-OFFSET	STIS/CCD, ACQ/PEAK, 52X0.1E1	MIRROR				5 Secs (5 Secs)	
								[==>]	***[1]***
3	set 1 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				2121 Secs (2121 Secs)	
								[==>]	***[1]***
4	set 2 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				1395 Secs X 2 (2790 Secs)	
								[==>(Copy 1)] *[==>(Copy 2)]*	***[2]***
5	set 3 (516969)	(1) NGC224-SN1885	STIS/NUV-MAMA, ACCUM, 52X0.5	G230L 2376 A				1395 Secs X 2 (2790 Secs)	
								[==>(Copy 1)] *[==>(Copy 2)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20130919
Unused Visibility = 6
GS Reacq
Exp. 5 (Auto-WAVECAL)
Occultation
Exp. 5, copy 1
Exp. 5, copy 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec