12531 - Tracking the Continuing Evolution of SN 1993J with COS and WFC3

Cycle: 19, 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) SN1993J	WFC3/UVIS	1	12-Aug-2011 21:43:00.0	yes
02	(1) SN1993J	WFC3/UVIS	1	12-Aug-2011 21:43:03.0	yes
03	(1) SN1993J	WFC3/UVIS	1	12-Aug-2011 21:43:06.0	yes
04	(1) SN1993J	WFC3/IR WFC3/UVIS	1	12-Aug-2011 21:43:11.0	yes
05	(1) SN1993J	WFC3/UVIS	1	12-Aug-2011 21:43:15.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
06	(1) SN1993J	COS/FUV COS/NUV	3	12-Aug-2011 21:43:21.0	yes
07	(1) SN1993J	COS/NUV	4	12-Aug-2011 21:43:26.0	yes
08	(1) SN1993J	COS/NUV	4	12-Aug-2011 21:43:32.0	yes

16 Total Orbits Used

ABSTRACT

SN 1993J is the best-studied supernova (SN) in terms of circumstellar interaction, and it is the second-nearest SN in modern times. Its progenitor lost most of its H envelope in binary Roche-lobe overflow prior to exploding as a Type IIb SN, so it enables us to investigate a different type of SN and progenitor star than SN 1987A. It is now making a transition into the SN remnant phase, where X-rays from the SN shock propagate inward to illuminate the processed ejecta. Our HST observations up to year 2000 gave conclusive evidence for CNO processing in the outer envelope of the SN. Optical observations with Keck now show a critical transition from a hydrogen-dominated to an oxygen-dominated spectrum, as deeper layers of the stellar interior are exposed and illuminated. We propose to complement these optical observations with FUV and NUV spectra, which trace important ionization levels of several lines of carbon, nitrogen, oxygen, and silicon that cannot be observed in optical spectra, but are essential for accurate abundances. These data will provide a quantitative estimate of the nucleosynthetic products in the ejecta near the core. Moreover, the widths of emission lines will allow us to follow the interaction of the ejecta with the circumstellar gas, as the SN turns into a SN remnant. In addition, we propose imaging in the UV, optical, and near-IR for characterizing the SN environment, in particular the properties of the putative companion star from the original binary system; we will also use these data to eliminate continuum contamination in the spectra. We will also make coordinated multiwavelength observations and conduct detailed spectral modeling.

OBSERVING DESCRIPTION

Obtain imaging (UV to IR) and spectra of SN 1993J.

Imaging:

F218W	1 orbit
F275W	1 orbit
F336W	1 orbit

F438W, F555W, F625W 1 orbit

F814W, F850LP,F105W,

F125W, F160W 1 orbit

Spectra:

G140L at 1105 3 orbits

G230L at 2950 4 orbits

G230L at 2635 2 orbits

G230L at 3360 2 orbits (these two settings done in single 4 orbit block)

Visit

Proposal 12531, Visit 01, implementation Sat Aug 13 01:43:37 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

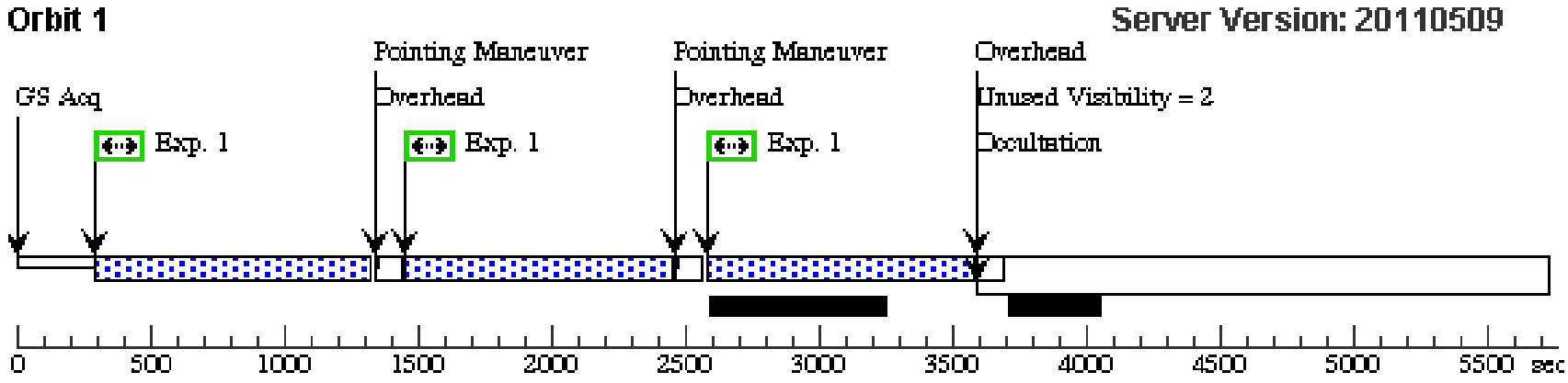
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F218W	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F218W			Pattern 3, Exps 1-1 in Visit 01 (3)	900 Secs *[==>1000.0 Secs (Pattern 1)]* *[==>1000.0 Secs (Pattern 2)]* *[==>1000.0 Secs (Pattern 3)]*	*[1]*

Orbit Structure



Visit

Proposal 12531, Visit 02, implementation Sat Aug 13 01:43:38 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

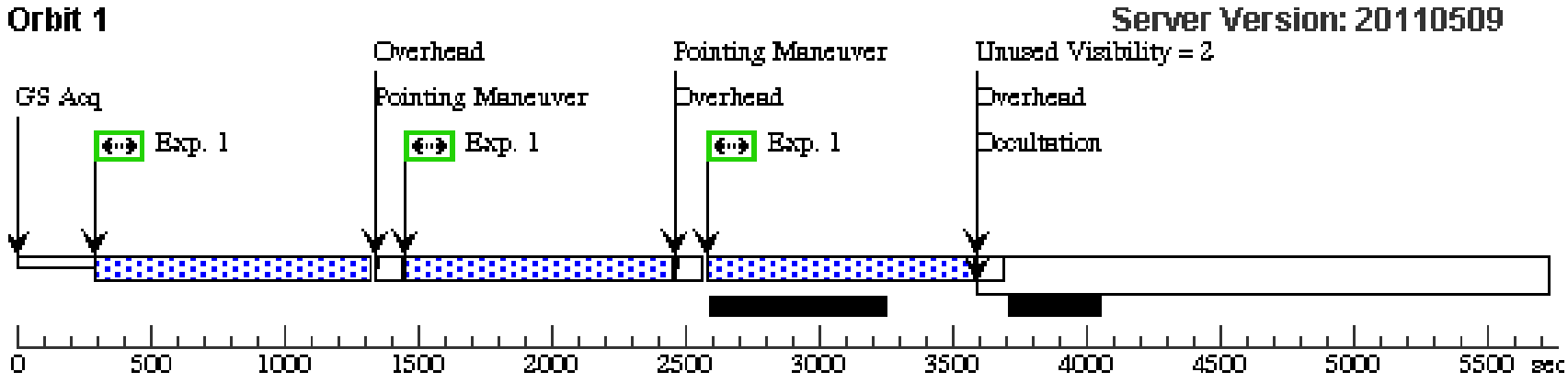
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F275W	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F275W			Pattern 3, Exps 1-1 in Visit 02 (3)	900 Secs *[==>1000.0 Secs (Pattern 1)]* *[==>1000.0 Secs (Pattern 2)]* *[==>1000.0 Secs (Pattern 3)]*	*[1]*

Orbit Structure



Visit

Proposal 12531, Visit 03, implementation Sat Aug 13 01:43:38 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

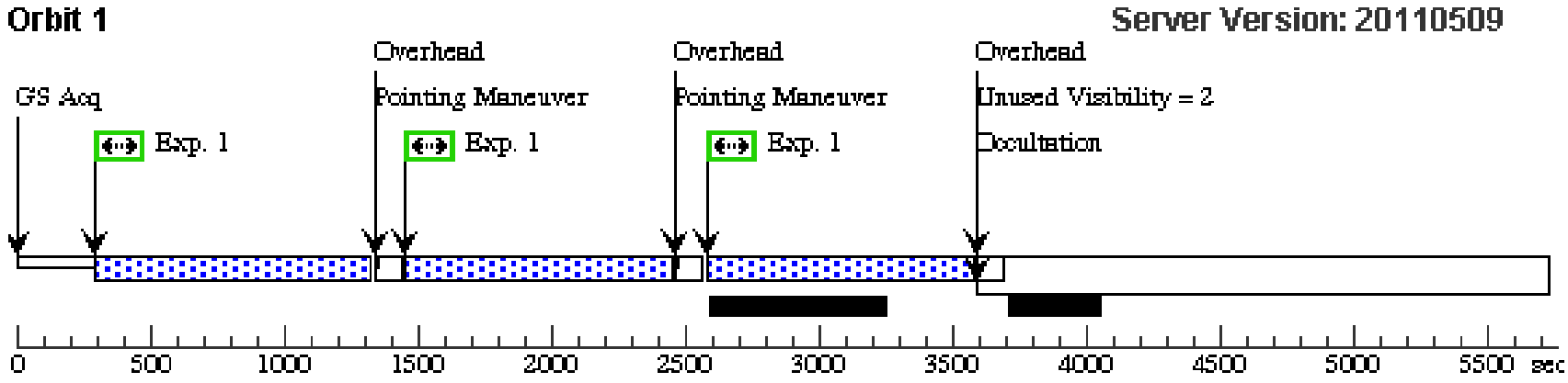
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F336W	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F336W			Pattern 3, Exps 1-1 in Visit 03 (3)	900 Secs *[==>1000.0 Secs (Pattern 1)]* *[==>1000.0 Secs (Pattern 2)]* *[==>1000.0 Secs (Pattern 3)]*	*[1]*

Orbit Structure



Visit

Proposal 12531, Visit 04, implementation Sat Aug 13 01:43:39 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: (none)

Patterns

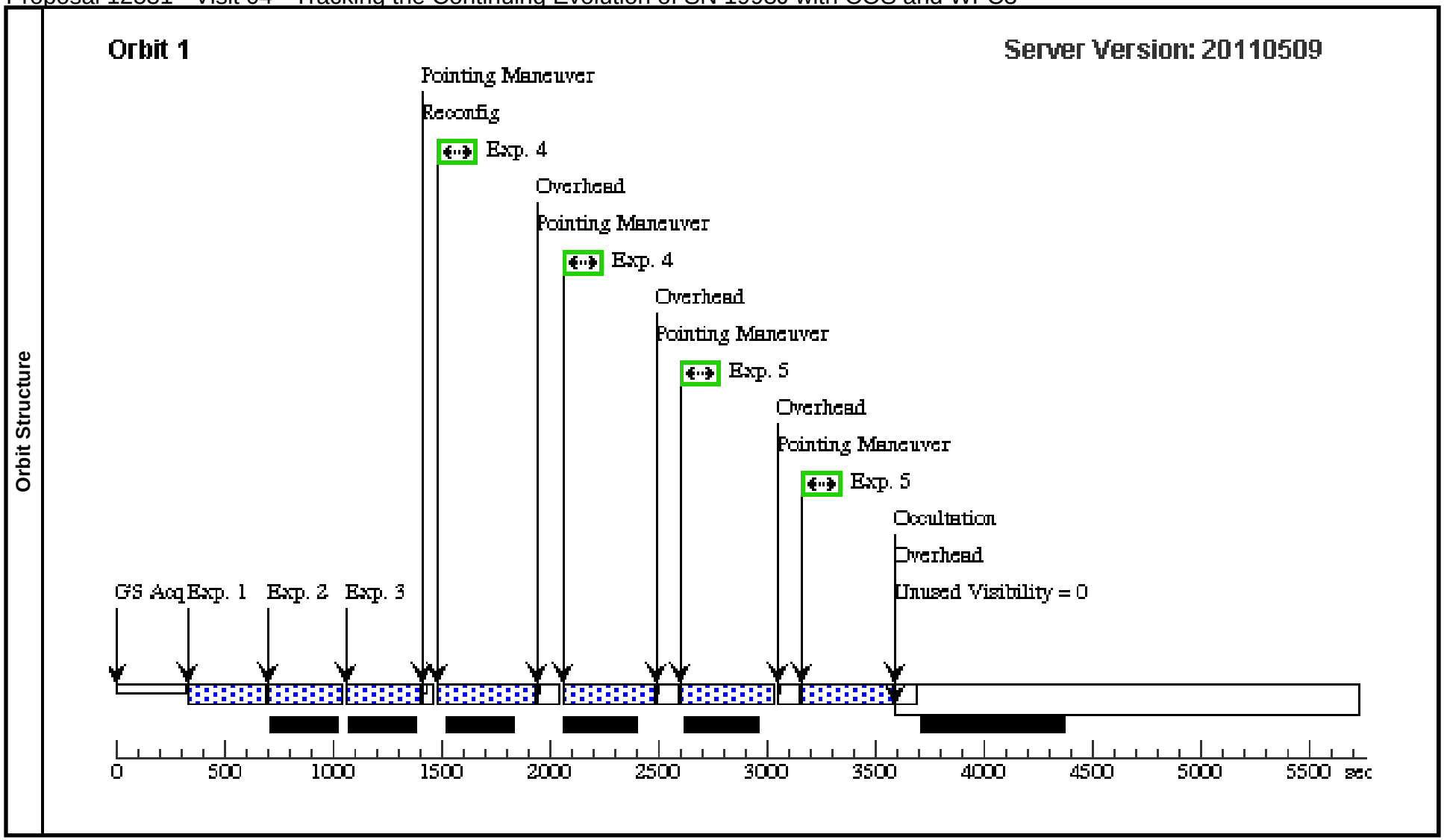
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(4), (5)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F105W	(1) SN1993J	WFC3/IR, MULTIACCUM, IR	F105W	SAMP-SEQ=SPARS25; NSAMP=14			*[==>]*	***[1]***
2	F125W	(1) SN1993J	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS25; NSAMP=14			*[==>]*	***[1]***
3	F160W	(1) SN1993J	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS25; NSAMP=14			*[==>]*	***[1]***
4	F814W	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F814W			Pattern 2, Exps 4-4 in Visit 04 (2)	415 Secs *[==>418.0 Secs (Pattern 1)]* *[==>418.0 Secs (Pattern 2)]*	***[1]***
5	F850LP	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F850LP			Pattern 2, Exps 5-5 in Visit 04 (2)	415 Secs *[==>418.0 Secs (Pattern 1)]* *[==>418.0 Secs (Pattern 2)]*	***[1]***


Orbit 1
Server Version: 20110509
Orbit Structure
Pointing Maneuver
Reconfig
Exp. 4
Overhead
Pointing Maneuver
Exp. 4
Overhead
Pointing Maneuver
Exp. 5
Overhead
Pointing Maneuver
Exp. 5
Occultation
Overhead
Unused Visibility = 0
GS Acq
Exp. 1
Exp. 2
Exp. 3
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12531, Visit 05, implementation Sat Aug 13 01:43:39 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (2), (3)

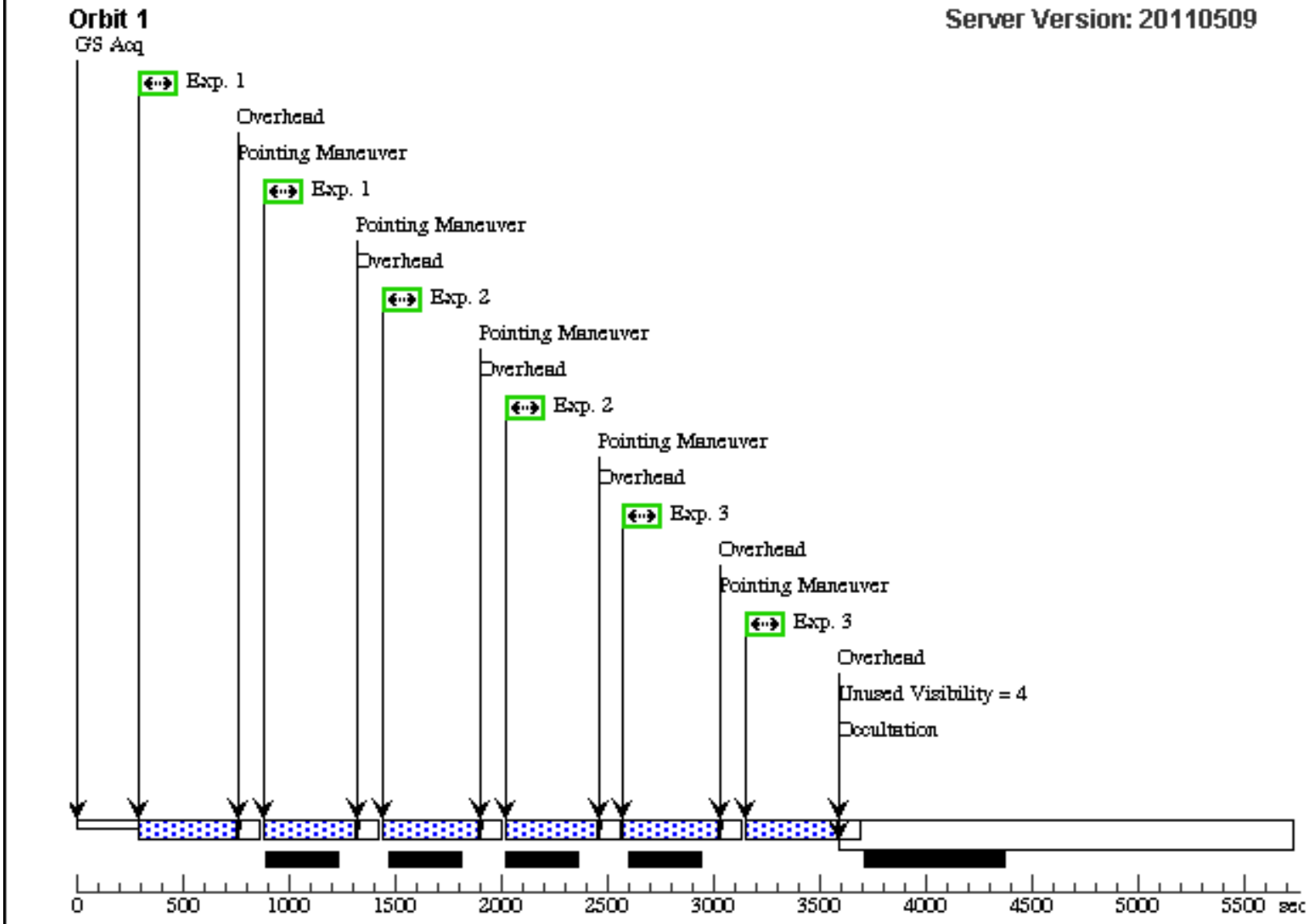
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F438W	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F438W			Pattern 2, Exps 1-1 in Visit 05 (2)	350 Secs *[==>428.0 Secs (Pattern 1)]* *[==>428.0 Secs (Pattern 2)]*	***[1]***
2	F555W	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F555W			Pattern 2, Exps 2-2 in Visit 05 (2)	350 Secs *[==>428.0 Secs (Pattern 1)]* *[==>428.0 Secs (Pattern 2)]*	***[1]***
3	F625W	(1) SN1993J	WFC3/UVIS, ACCUM, UVIS	F625W			Pattern 2, Exps 3-3 in Visit 05 (2)	350 Secs *[==>428.0 Secs (Pattern 1)]* *[==>428.0 Secs (Pattern 2)]*	***[1]***

Orbit Structure



Visit

Proposal 12531, Visit 06, implementation Sat Aug 13 01:43:40 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Diagnostics

(Visit 06) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

(Visit 06) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

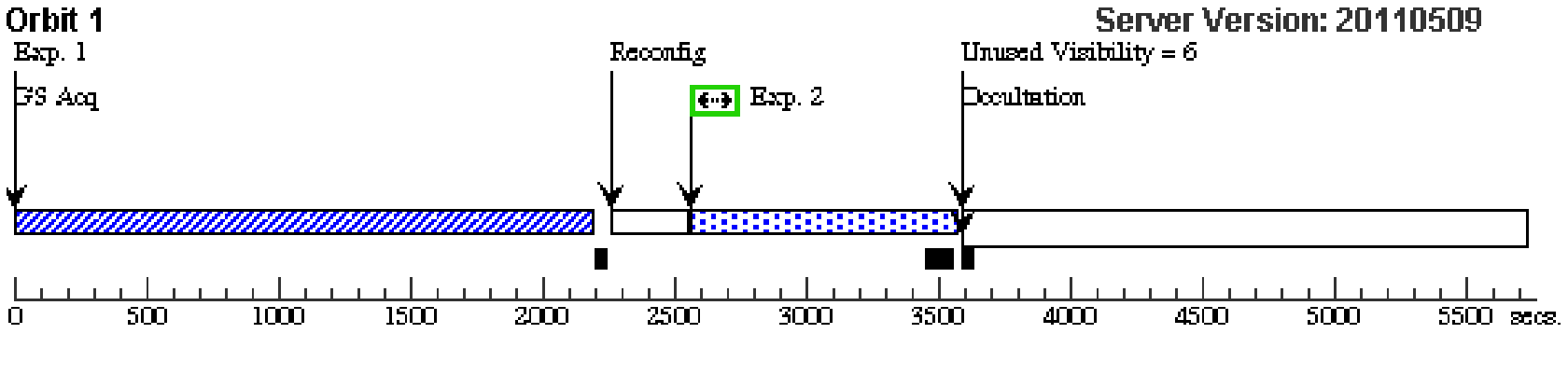
Fixed Targets

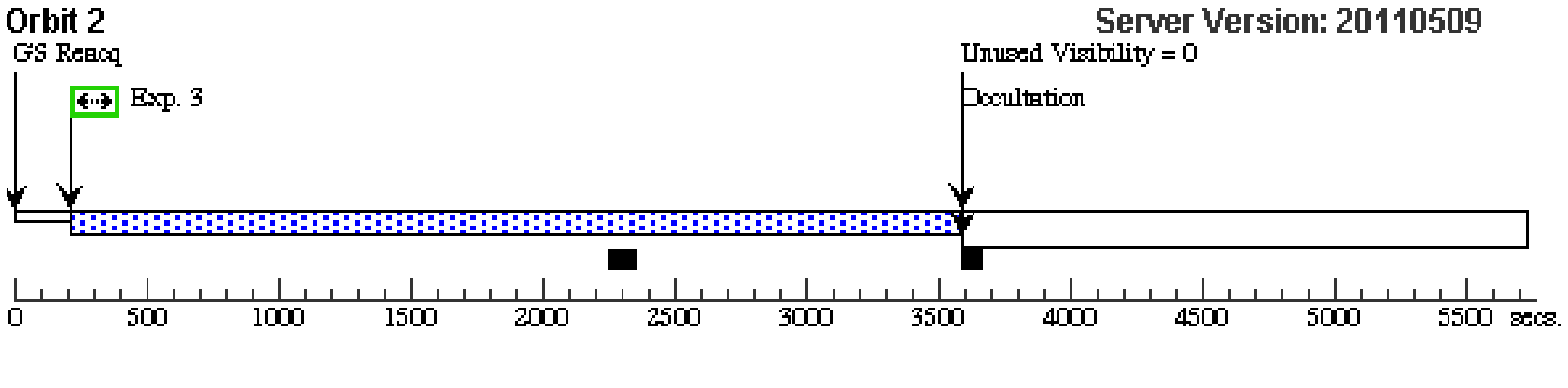
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

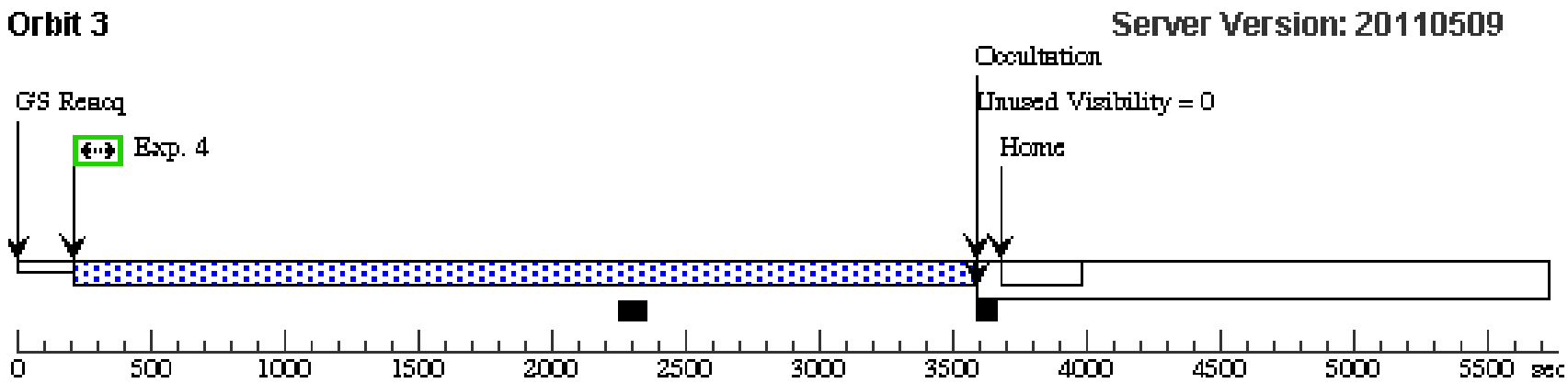
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	(183681)	(1) SN1993J	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				900 Secs *[==>]*	 ***[1]***
2	(184019)	(1) SN1993J	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=740; FP-POS=1; FLASH=YES			840 Secs *[==>]*	 ***[1]***
3	(184019)	(1) SN1993J	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=2000; FP-POS=2; FLASH=YES			3200 Secs *[==>3313.0 Secs]*	 ***[2]***
4	(184019)	(1) SN1993J	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=2000; FP-POS=3; FLASH=YES			3200 Secs *[==>3313.0 Secs]*	 ***[3]***

Orbit Structure







Visit

Proposal 12531, Visit 07, implementation Sat Aug 13 01:43:40 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: COS/NUV

Special Requirements: (none)

Diagnostics

(Visit 07) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

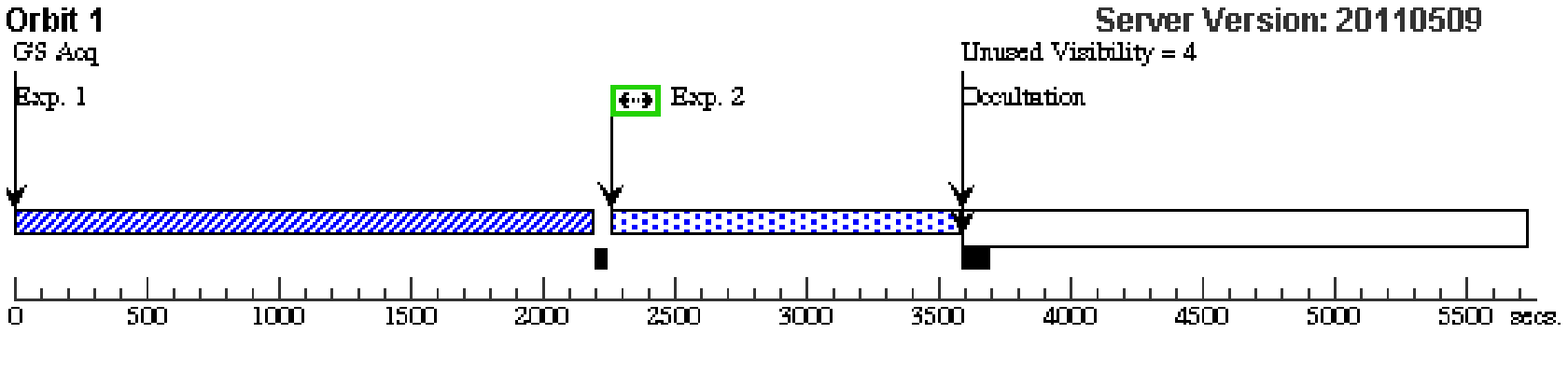
Fixed Targets

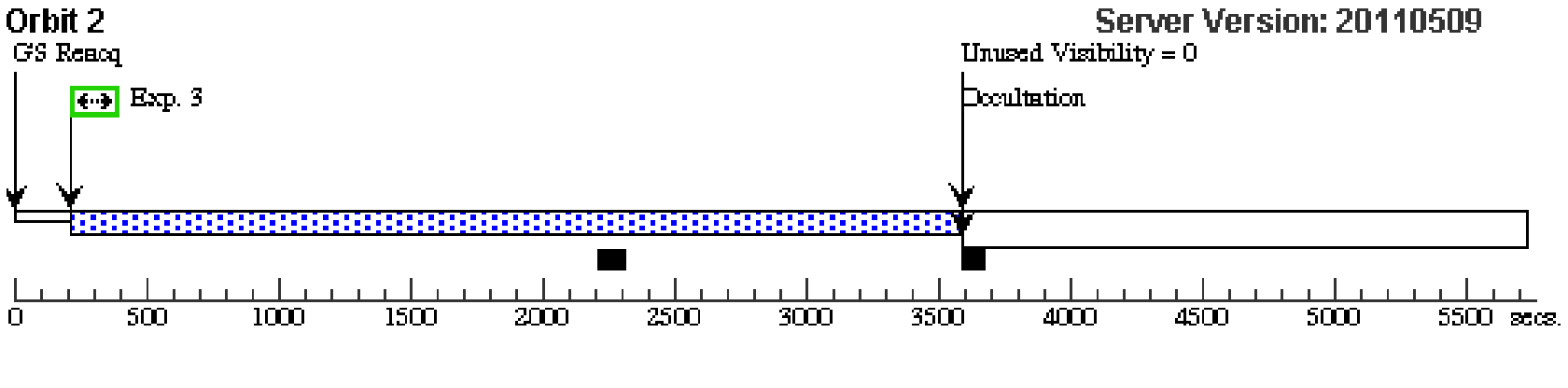
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

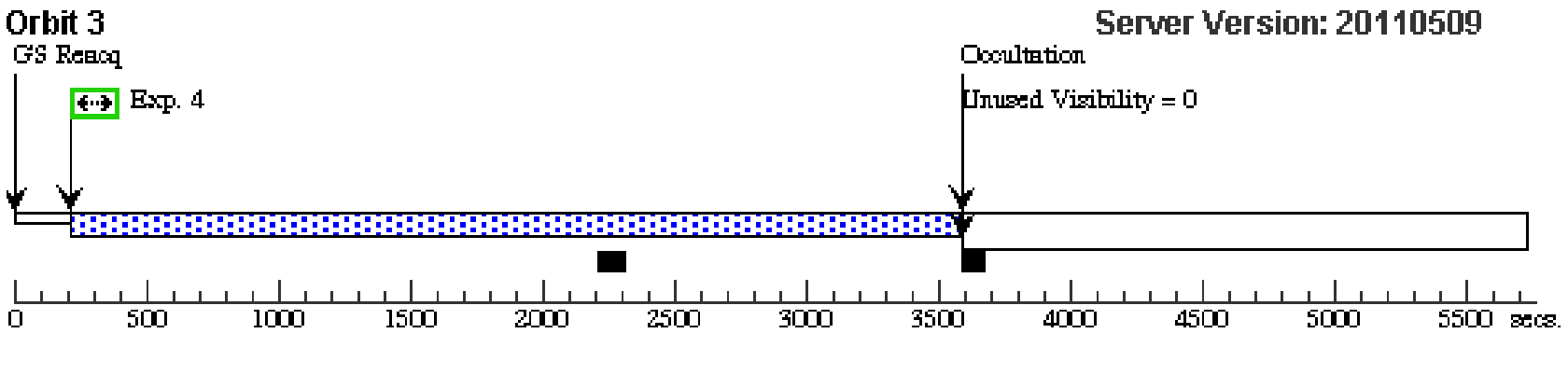
Exposures

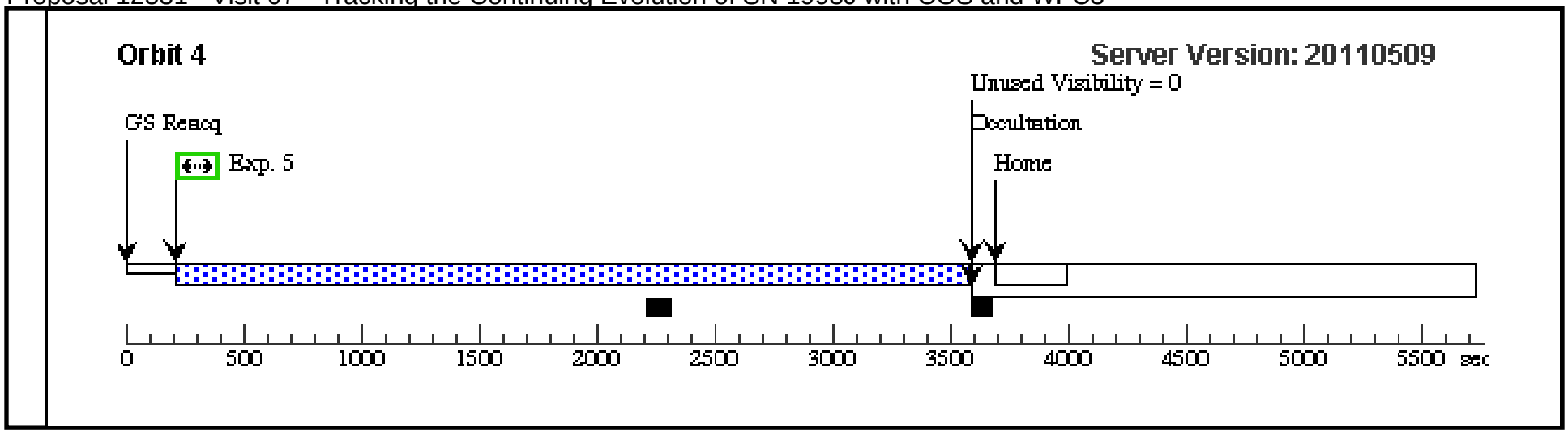
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	(183681)	(1) SN1993J	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				900 Secs *[==>]*	 ***[1]***
2	(184019)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=1200; FP-POS=1; FLASH=YES			1200 Secs *[==>]*	 ***[1]***
3	(184025)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=2000; FP-POS=2; FLASH=YES			3200 Secs *[==>3350.0 Secs]*	 ***[2]***
4	(184025)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=2000; FP-POS=3; FLASH=YES			3200 Secs *[==>3350.0 Secs]*	 ***[3]***
5	(184025)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=2000; FP-POS=4; FLASH=YES			3200 Secs *[==>3350.0 Secs]*	 ***[4]***

Orbit Structure








Orbit 4
Server Version: 20110509
Unused Visibility = 0
GS Reacq
Occultation
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1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12531, Visit 08, implementation Sat Aug 13 01:43:41 GMT 2011

Diagnostic Status: Warning

Scientific Instruments: COS/NUV

Special Requirements: (none)

Diagnostics

(Visit 08) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

(Visit 08) Warning (Form): If the target coordinates are not known to 0.4" (or better) an ACQ/SEARCH should precede the ACQ/IMAGE.

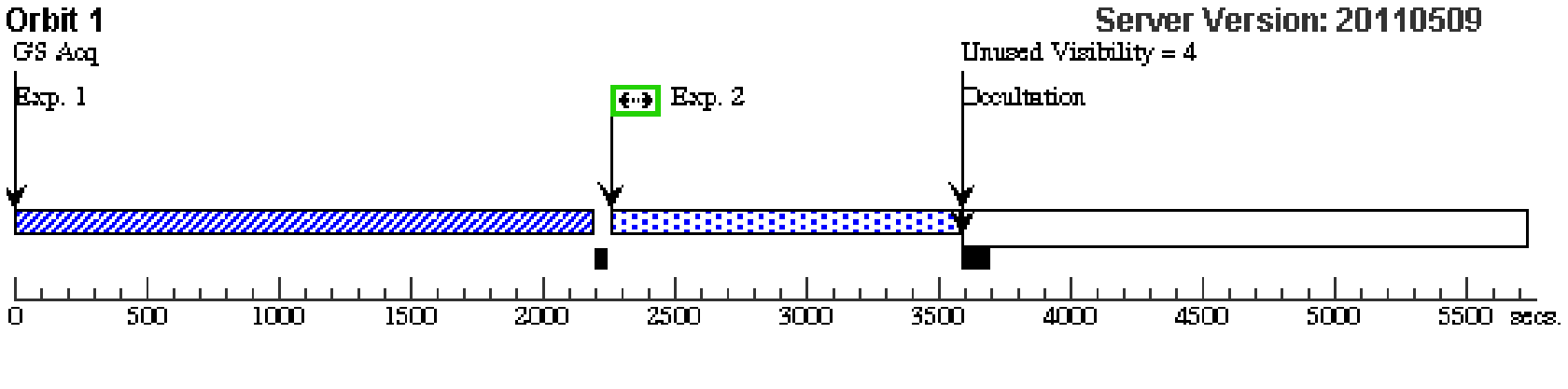
Fixed Targets

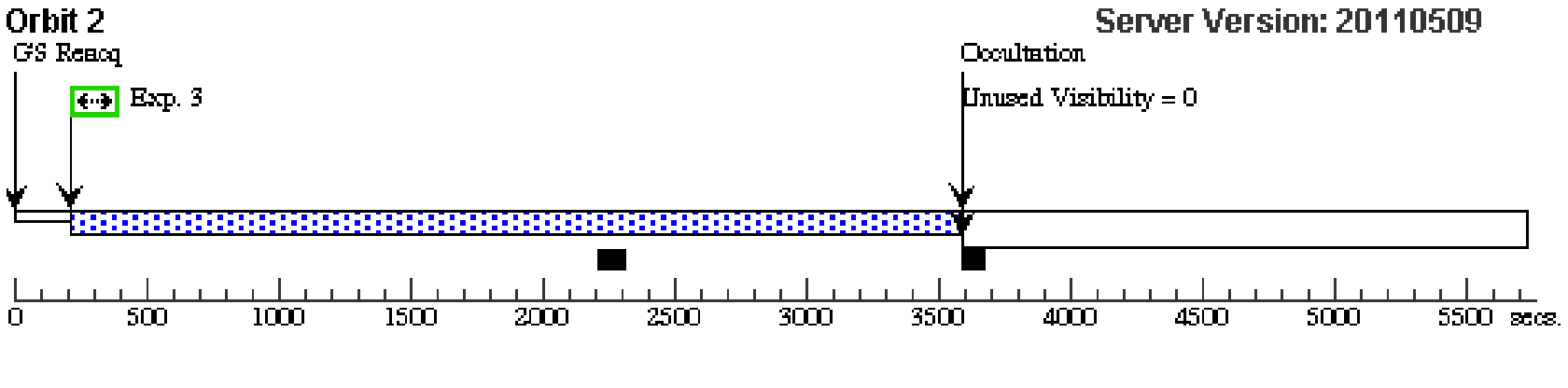
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN1993J	RA: 09 55 24.9500 (148.8539583d) Dec: +69 01 13.40 (69.02039d) Equinox: J2000		V=21.0+/-0.2	Reference Frame: ICRS

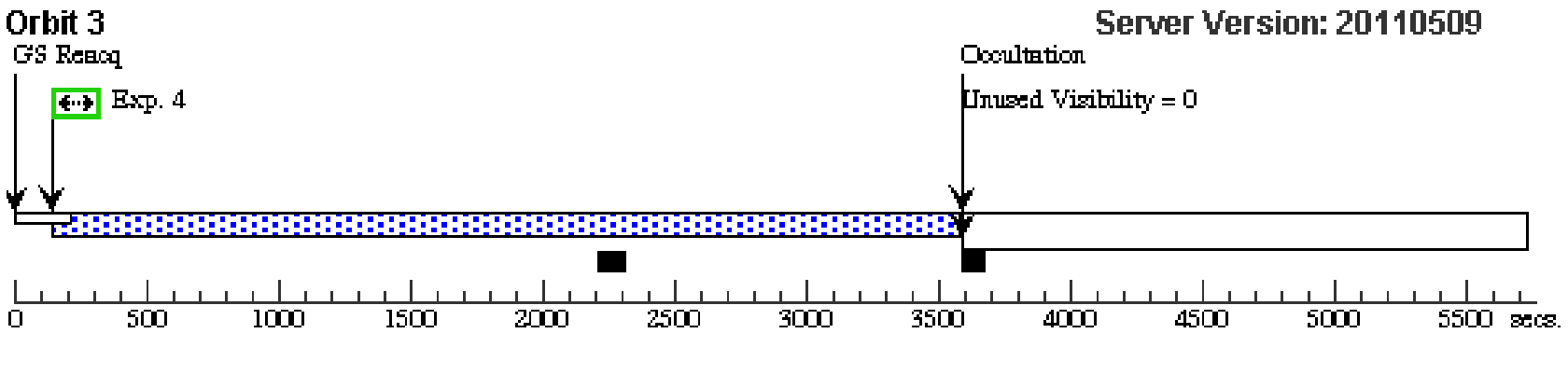
Exposures

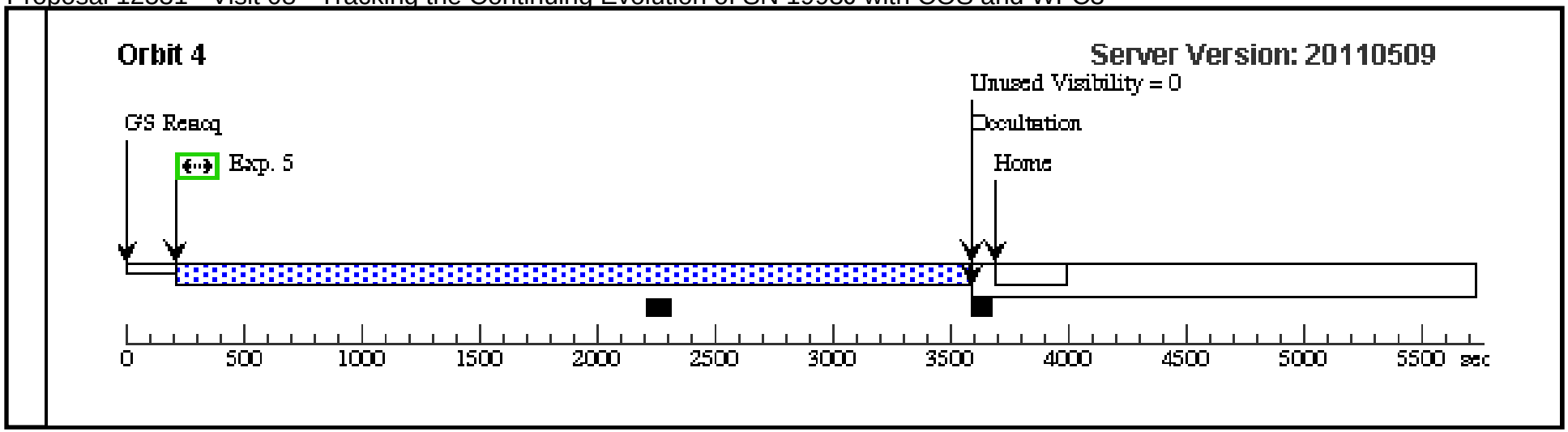
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	(183681)	(1) SN1993J	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				900 Secs *[==>]*	*[1]*
2	(184032)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=1200; FP-POS=1; FLASH=YES			1200 Secs *[==>]*	*[1]*
3	(184032)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=2000; FP-POS=2; FLASH=YES			3200 Secs *[==>3350.0 Secs]*	*[2]*
4	(184033)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 3360 A	BUFFER-TIME=2000; FP-POS=3; FLASH=YES			3200 Secs *[==>3350.0 Secs]*	*[3]*
5	(184033)	(1) SN1993J	COS/NUV, TIME-TAG, PSA	G230L 3360 A	BUFFER-TIME=2000; FP-POS=4; FLASH=YES			3200 Secs *[==>3350.0 Secs]*	*[4]*

Orbit Structure








Orbit 4
Server Version: 20110509
Unused Visibility = 0
GS Reacq
Occultation
Exp. 5
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec