13341 - The Stellar Origins of Supernovae

Cycle: 21, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Schuyler D. Van Dyk (PI) (Contact)	**California Institute of Technology**	**vandyk@ipac.caltech.edu**
Prof. Alex V. Filippenko (CoI)	University of California - Berkeley	alex@astro.berkeley.edu
Dr. Nathan Smith (CoI)	University of Arizona	nathans@as.arizona.edu
Dr. Ryan Foley (CoI)	University of Illinois at Urbana - Champaign	rfoley@illinois.edu
Dr. Adam Miller (CoI)	Jet Propulsion Laboratory	adam.miller@jpl.nasa.gov

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) PSNJ10543413+5417569	WFC3/UVIS	1	07-Oct-2014 21:01:02.0	yes
02	(2) SN2014BC	WFC3/UVIS	1	07-Oct-2014 21:01:06.0	yes
03	(3) ASASSN14HA	WFC3/UVIS	1	07-Oct-2014 21:01:09.0	yes
04	(5) SN2010JL	WFC3/UVIS	1	07-Oct-2014 21:01:11.0	yes

4 Total Orbits Used

ABSTRACT

Supernovae (SNe) have a profound effect on galaxies, and have been used recently as precise cosmological probes, resulting in the Nobel-distinguished discovery of the accelerating Universe. They are clearly very important events deserving of intense study. Yet, even with over 6100 known SNe, we know relatively little about the stars which give rise to these powerful explosions. The main limitation has been the lack of spatial resolution in pre-SN imaging data. However, since 1999 our team has been at the vanguard of directly identifying SN progenitor stars in HST

images. From this exciting line of study, the emerging trend from 9 detections for Type II-Plateau SNe is that their progenitors appear to be relatively low mass (8 to 20 Msun) red supergiants, although more cases are needed. Additionally, evidence is growing that the progenitors of Type II-narrow SNe may be related to luminous blue variables. However, the nature of the progenitors of Type Ib/c SNe, a subset of which are associated with the amazing gamma-ray bursts, remains ambiguous. Furthermore, we remain in the continually embarrassing situation that we still do not yet know which progenitor systems explode as Type Ia SNe, which are currently being used for precision cosmology. In Cycles 16 and 17 we had great success with our approved ToO programs. As of this proposal deadline, we had not yet triggered our Cycle 20 program. We therefore propose to continue this project to determine the identities of the progenitors of 4 SNe within, generally, about 20 Mpc, which we expect to occur during Cycle 21, through ToO observations using WFC3/UVIS.

OBSERVING DESCRIPTION

We plan for four ToO triggers during Cycle 21. If we detect one or more candidate stellar objects within a 1-sigma positional uncertainty in ACS, WFPC2, or WFC3 pre-supernova archival image(s), we will request a trigger to pinpoint the location of the SN in the pre-SN images and attempt to confirm the progenitor candidate. Our plan is to image with WFC3/UVIS, to provide the highest possible spatial resolution. Our strategy, generally, is to acquire several short-exposure dithered images in V (F555W, 10-s) or I (F814W, 30-s), for the 3 core-collapse visits (which will likely best match with the available archival image data), and in U (F336W, 20-s) or B (F438W, 20-s) for a putative, nearby (<10 Mpc) SN Ia visit, since these SNe will likely be too bright in redder bands, but fade more rapidly in the blue. We will be using the UVIS 1Kx1K subarray near amplifier C. Since the exposures are quite short, we will also be using post-flash with 12 e- for each exposure, in order to mitigate against CTE losses. The initial Phase II observations are meant to be representative of a typical trigger. Each of the four possible ToOs has an initial placeholder position of RA(J2000)=0, Dec(J2000)=0. We will likely request triggers when the SN is still fairly bright, depending on its age at discovery, but limit this, generally, to m >14 mag. We therefore may alter exposure times and bands, depending on the expected brightness of a given SN when it is scheduled and depending on the bands of the pre-SN images available for the SN site in the HST archive. This may also result in changes in the dither strategy for a given visit. The ToOs are not intended to be high-impact, and will be requested to occur after 2 to 3 weeks from discovery, so there should be no disruption of normal scheduling.

Visit

Proposal 13341, Visit 01, completed Wed Oct 08 01:01:13 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1-6)

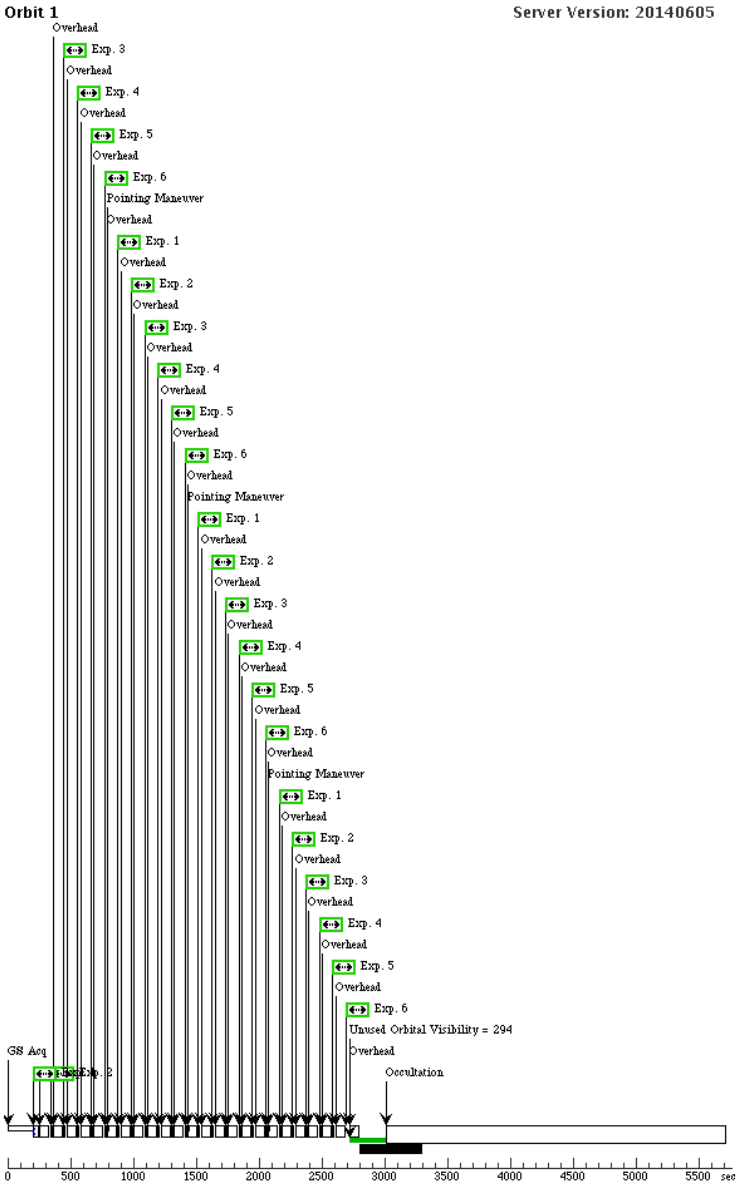
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	PSNJ10543413+5417569	RA: 10 54 34.3518 (163.6431325d) Dec: +54 18 1.45 (54.30040d) Equinox: J2000		V=15.6+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) PSNJ10543413+5417569	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=12	GS ACQ SCENARIO SINGLE	Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) PSNJ10543413+5417569	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=12		Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
3		(1) PSNJ10543413+5417569	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=12		Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
4		(1) PSNJ10543413+5417569	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=12		Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
5		(1) PSNJ10543413+5417569	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=12		Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
6		(1) PSNJ10543413+5417569	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=12		Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 13341, Visit 02, completed Wed Oct 08 01:01:14 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1-6)

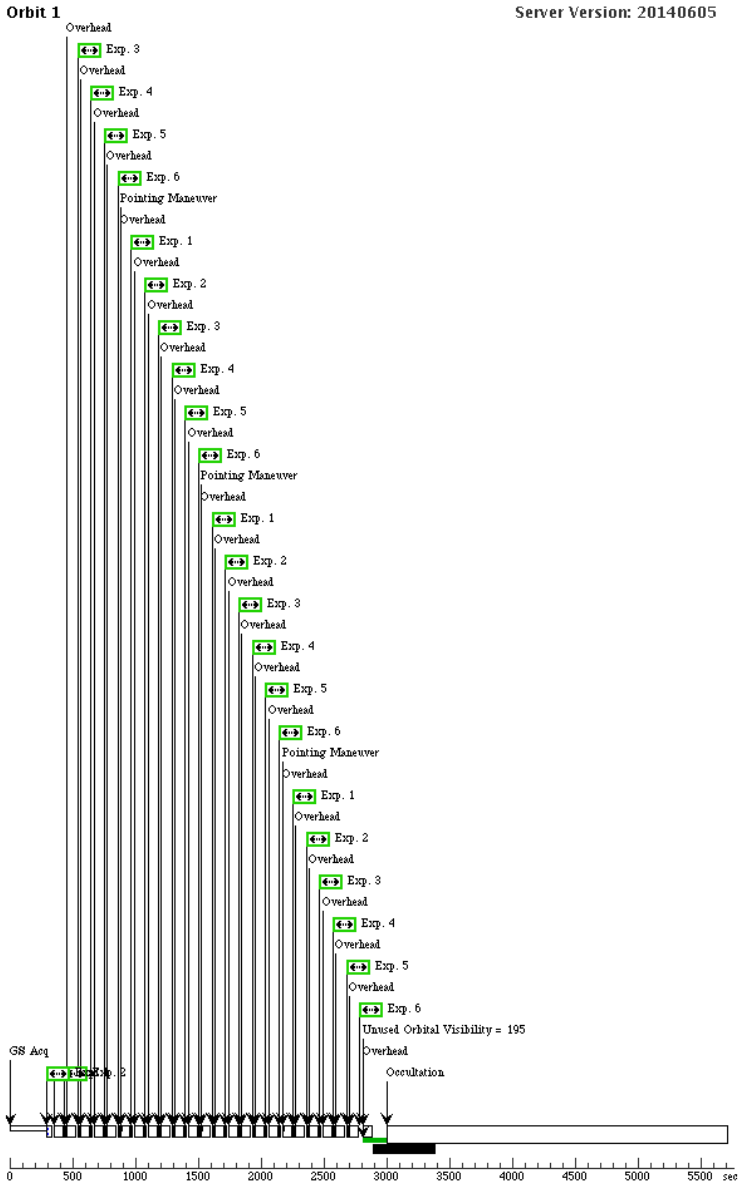
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN2014BC	RA: 12 18 57.7100 (184.7404583d) Dec: +47 18 11.30 (47.30314d) Equinox: J2000		V=15.0+/-1.0	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SN2014BC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(2) SN2014BC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
3		(2) SN2014BC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
4		(2) SN2014BC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
5		(2) SN2014BC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
6		(2) SN2014BC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	10 Secs (40 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure



Visit

Proposal 13341, Visit 03, completed Wed Oct 08 01:01:14 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%; BEFORE 06-OCT-2014:00:00:00; ON HOLD

On Hold Comments: Pending ToO activation.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1-6)

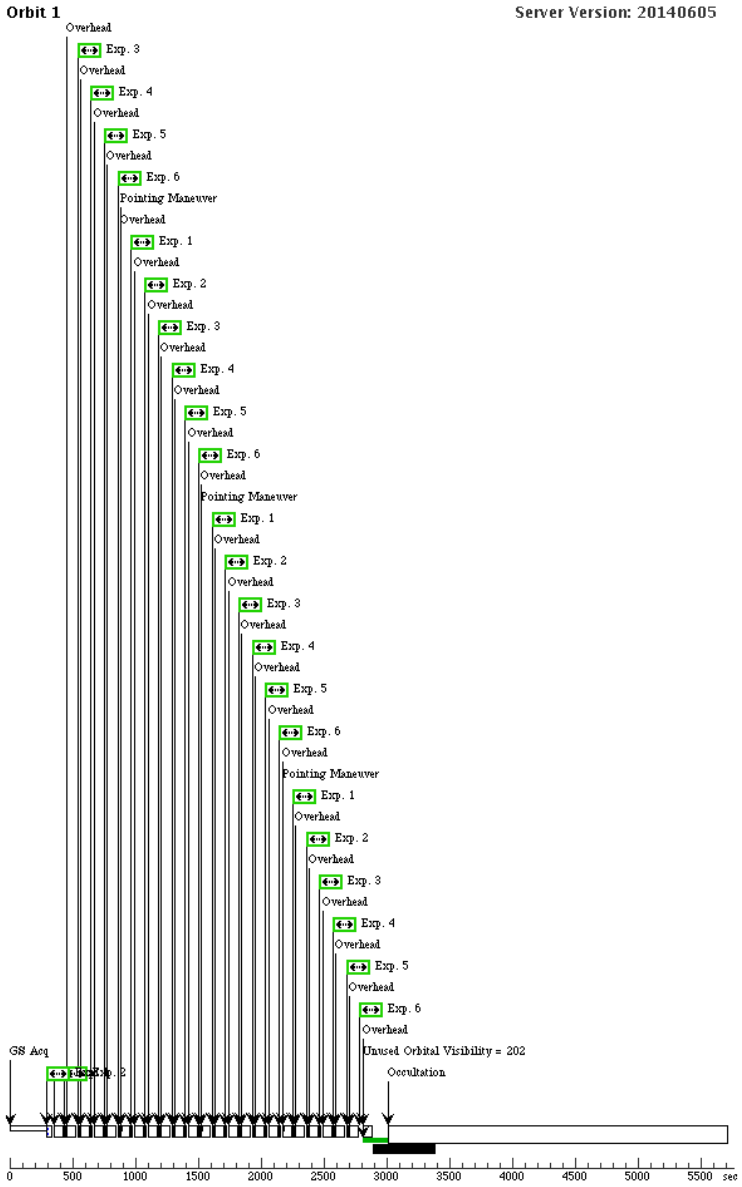
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	ASASSN14HA	RA: 04 20 1.4100 (65.0058750d) Dec: -54 56 17.00 (-54.93806d) Equinox: J2000		V=14.6+/-0.2	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) ASASSN14HA	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
2		(3) ASASSN14HA	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
3		(3) ASASSN14HA	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
4		(3) ASASSN14HA	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
5		(3) ASASSN14HA	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
6		(3) ASASSN14HA	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs)	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	

Orbit Structure



Visit

Proposal 13341, Visit 04, implementation Wed Oct 08 01:01:14 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: SCHED 100%; ON HOLD

On Hold Comments: Pending ToO activation.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	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		(1-2)

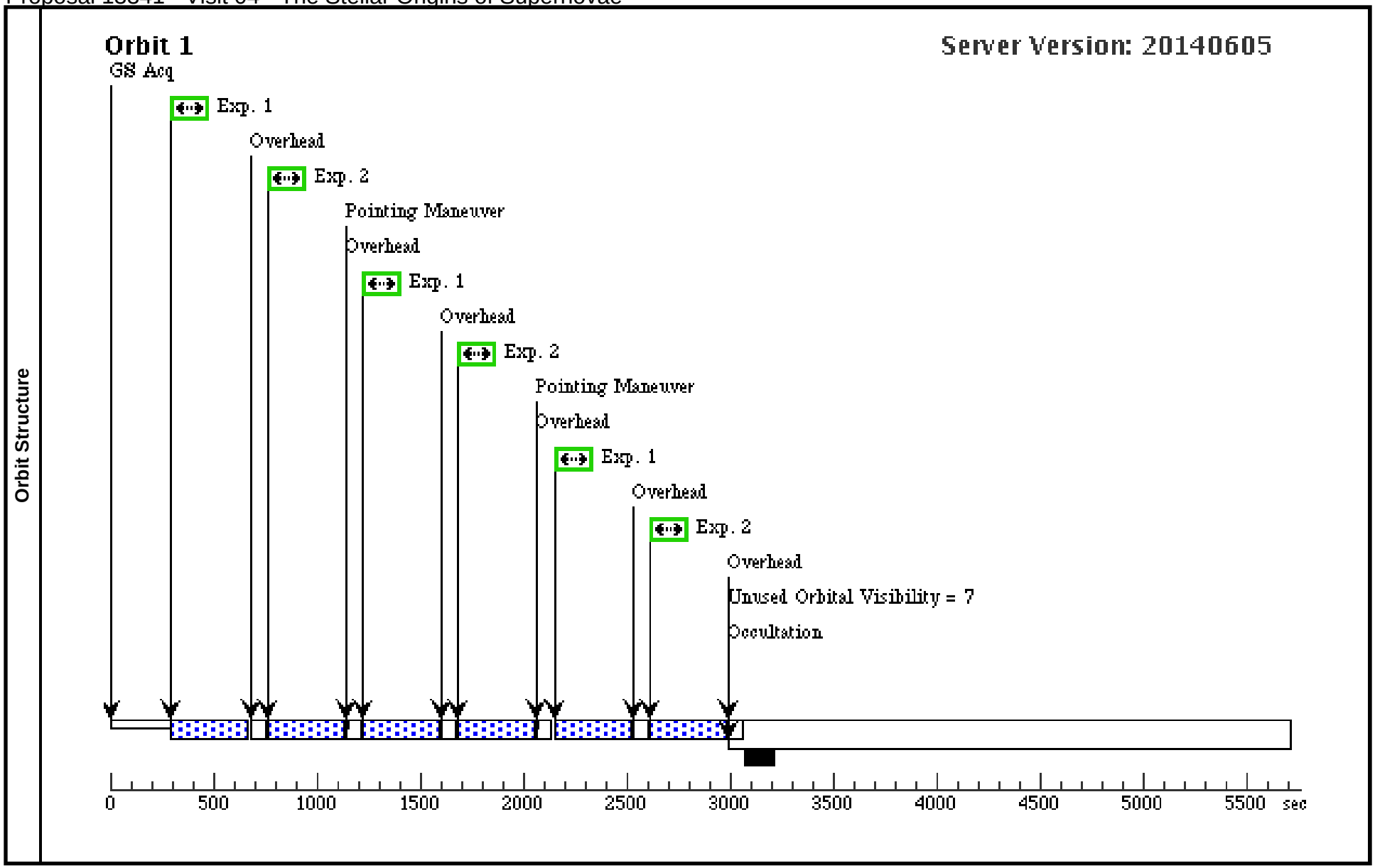
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	SN2010JL	RA: 09 42 53.3300 (145.7222083d) Dec: +09 29 41.80 (9.49494d) Equinox: J2000		V=19.4+/-0.5 U=18.7+/-0.5	Reference Frame: SIMBAD

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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(5) SN2010JL	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=12	GS ACQ SCENARIO BASE1B3	Pattern 2, Exps 1-2 in Visit 04 (2)	345 Secs (1035 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2		(5) SN2010JL	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F275W	FLASH=12		Pattern 2, Exps 1-2 in Visit 04 (2)	345 Secs (1035 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20140605
GS Acq
Exp. 1
Overhead
Exp. 2
Pointing Maneuver
Overhead
Exp. 1
Overhead
Exp. 2
Pointing Maneuver
Overhead
Exp. 1
Overhead
Exp. 2
Overhead
Unused Orbital Visibility = 7
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec