



13683 - The Stellar Origins of Supernovae

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) SNHUNT275	WFC3/UVIS	1	02-Oct-2015 21:05:22.0	yes
02	(2) SN2010BT	WFC3/UVIS	1	02-Oct-2015 21:05:28.0	yes
03	(3) PSNJ20372558+6607115	WFC3/UVIS	1	02-Oct-2015 21:05:32.0	yes
04	(4) SN2014DT	WFC3/UVIS	1	02-Oct-2015 21:05:36.0	yes

4 Total Orbits Used

ABSTRACT

Supernovae (SNe) have a profound effect on galaxies, and have been used 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 6300 IAU-designated 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 M_{sun}) 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, 17, and 20 we had great success with our approved ToO programs. As of this proposal deadline, we have had one trigger (SN 2014G) so far with our Cycle 21 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 22, through ToO observations using WFC3/UVIS.

OBSERVING DESCRIPTION

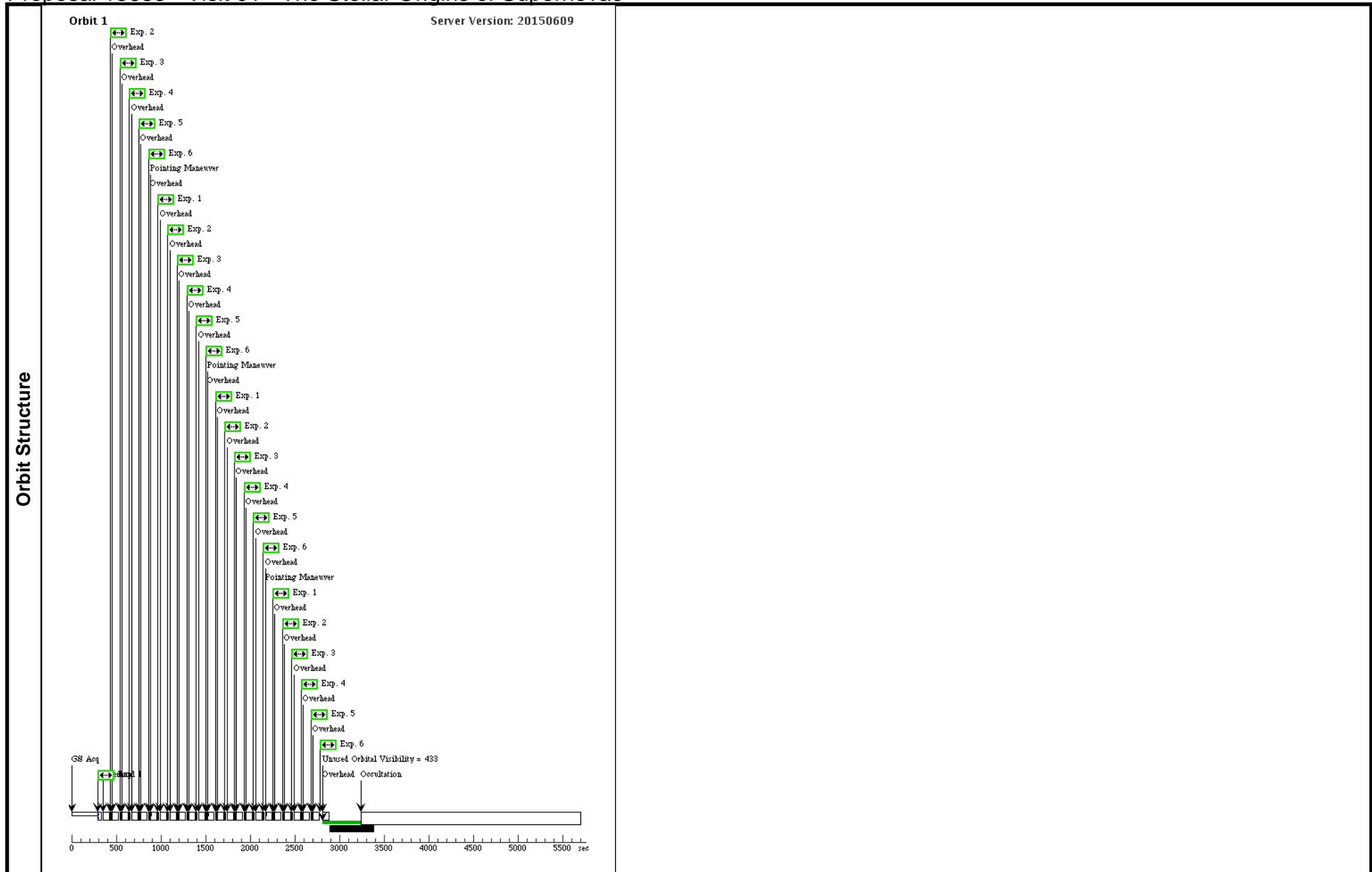
We plan for four ToO triggers during Cycle 22. If we detect one or more candidate stellar objects within a 1-sigma positional uncertainty in ACS, WFPC2, or WFC3 pre-supernova archival image(s), we will request a trigger to pinpoint the location of the SN in the pre-SN images and attempt to confirm the 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 UVIS2 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.

Proposal 13683 - Visit 01 - The Stellar Origins of Supernovae

Visit	Proposal 13683, Visit 01, implementation Sat Oct 03 01:05:39 GMT 2015 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)					
	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)	SNHUNT275	RA: 09 09 35.0900 (137.3962083d) Dec: +33 07 22.00 (33.12278d) Equinox: J2000		V=15.5+/-1.0	Reference Frame: ICRS

Proposal 13683 - Visit 01 - The Stellar Origins of Supernovae

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	(1) SNHUNT275	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12	GS ACQ SCENARIO BASE1B3	Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	2	(1) SNHUNT275	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	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) SNHUNT275	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	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) SNHUNT275	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	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) SNHUNT275	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	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) SNHUNT275	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 01 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



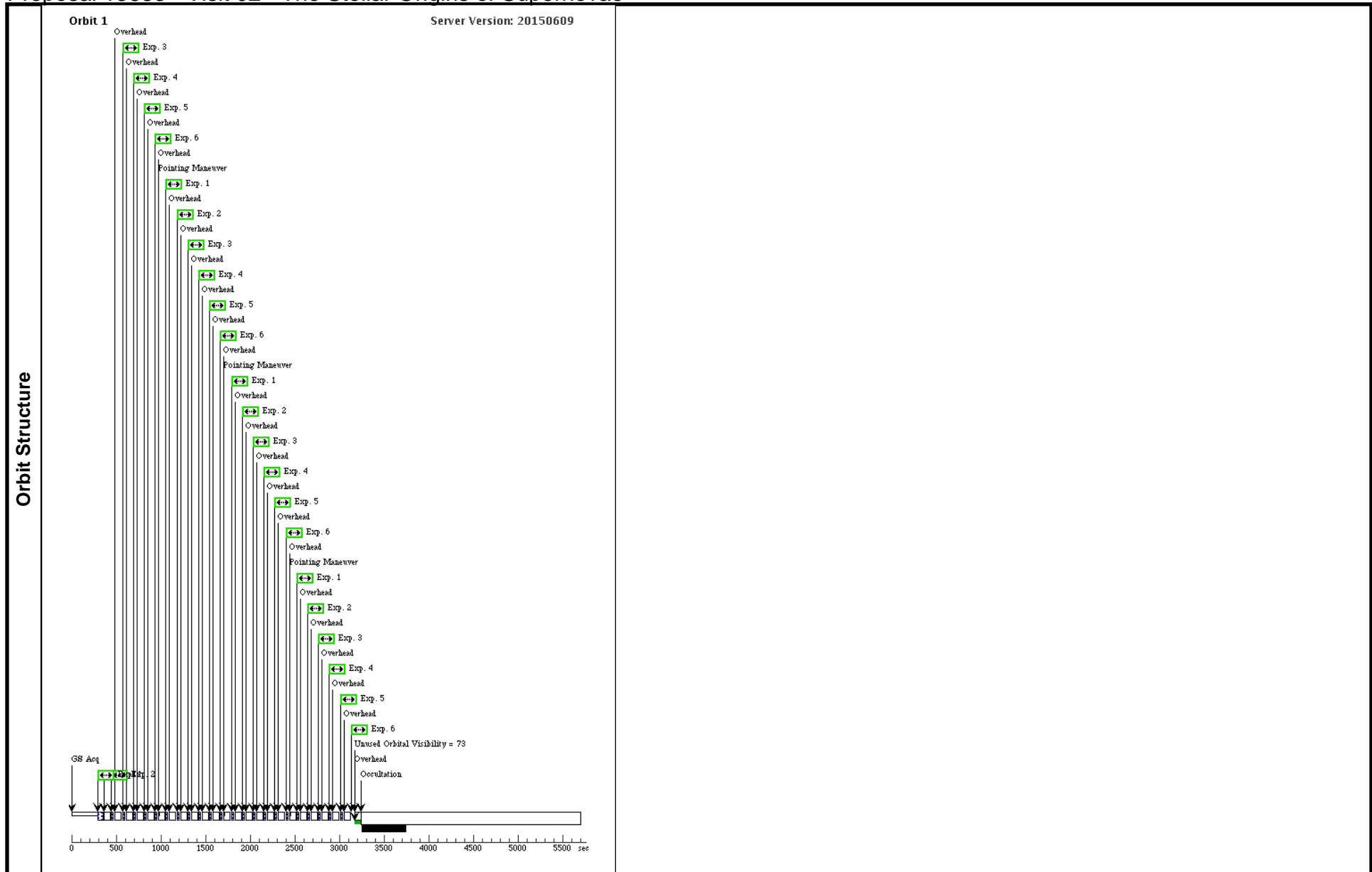
Proposal 13683 - Visit 02 - The Stellar Origins of Supernovae

Sat Oct 03 01:05:39 GMT 2015

Visit	Proposal 13683, Visit 02, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)					
	Patterns	# (1)	Primary Pattern Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Secondary Pattern Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false	Exposures (1-6)	
Fixed Targets	# (2)	Name SN2010BT	Target Coordinates RA: 21 48 20.2800 (327.0845000d) Dec: -34 57 17.70 (-34.95492d) Equinox: J2000	Targ. Coord. Corrections	Fluxes V=22.5+/-1.0	Miscellaneous Reference Frame: ICRS

Proposal 13683 - Visit 02 - The Stellar Origins of Supernovae

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	(2) SN2010BT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	25 Secs (100 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	2	(2) SN2010BT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	25 Secs (100 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	3	(2) SN2010BT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	25 Secs (100 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	4	(2) SN2010BT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	25 Secs (100 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	5	(2) SN2010BT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	25 Secs (100 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	6	(2) SN2010BT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 02 (1)	25 Secs (100 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]

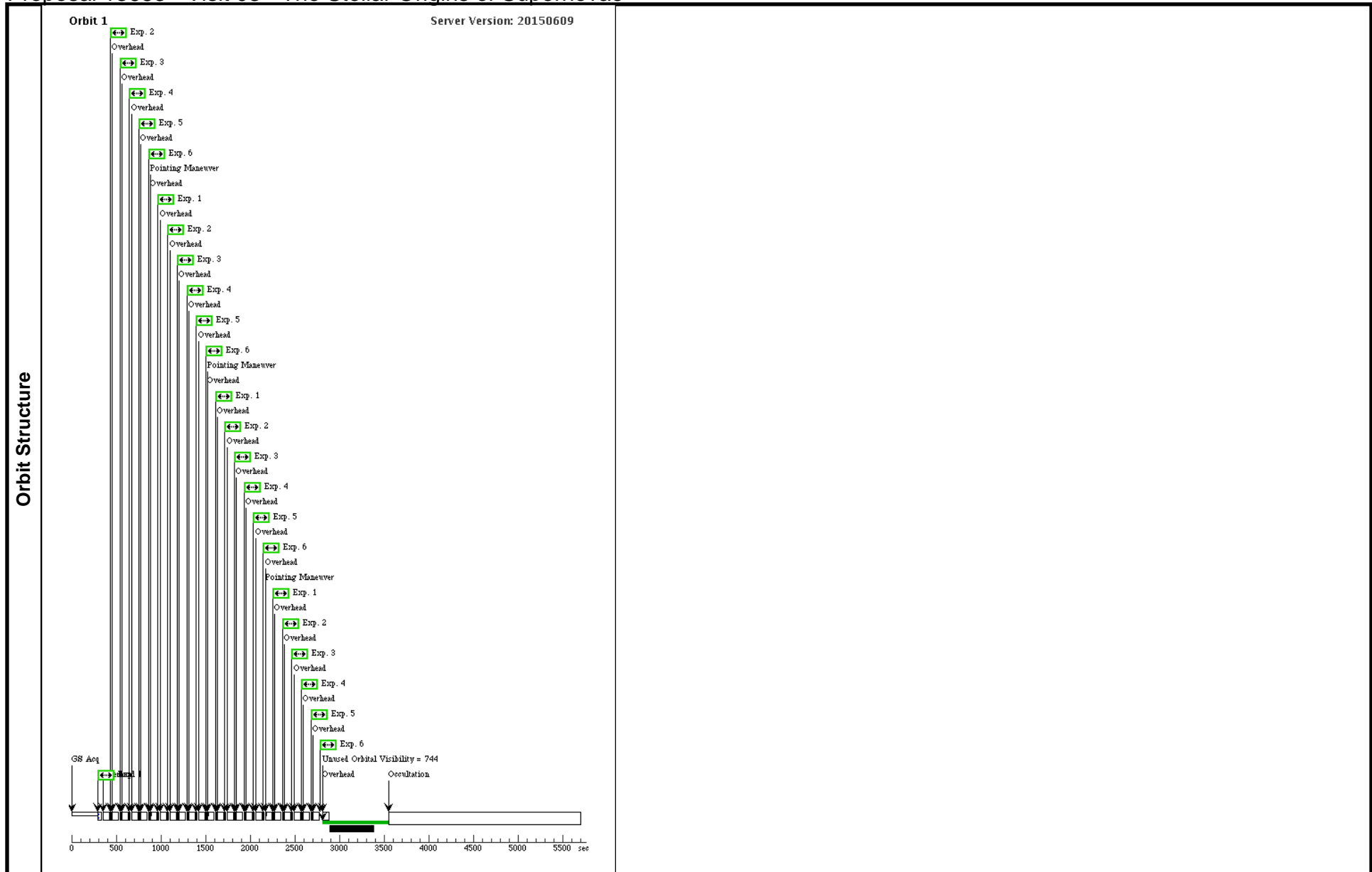


Proposal 13683 - Visit 03 - The Stellar Origins of Supernovae

Visit	Proposal 13683, Visit 03, completed Sat Oct 03 01:05:40 GMT 2015 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)					
	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)	PSNJ20372558+6607115	RA: 20 37 25.5800 (309.3565833d) Dec: +66 07 11.50 (66.11986d) Equinox: J2000		V=15.5+/-1.0	Reference Frame: ICRS

Proposal 13683 - Visit 03 - The Stellar Origins of Supernovae

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	(3) PSNJ20372558+6607115	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	2	(3) PSNJ20372558+6607115	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	3	(3) PSNJ20372558+6607115	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	4	(3) PSNJ20372558+6607115	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	5	(3) PSNJ20372558+6607115	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	6	(3) PSNJ20372558+6607115	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=12		Pattern 1, Exps 1-6 in Visit 03 (1)	10 Secs (40 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



Proposal 13683 - Visit 04 - The Stellar Origins of Supernovae

Sat Oct 03 01:05:40 GMT 2015

Visit	Proposal 13683, Visit 04, completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	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		(1-5)					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(4)	SN2014DT	RA: 12 21 57.5300 (185.4897083d) Dec: +04 28 18.70 (4.47186d) Equinox: J2000		V=15+/-0.5 B=16+/-0.5	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(4) SN2014DT	(4) SN2014DT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F438W	FLASH=12		Pattern 1, Exps 1-5 in Visit 04 (1)	20 Secs (80 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	2	(4) SN2014DT	(4) SN2014DT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F438W	FLASH=12		Pattern 1, Exps 1-5 in Visit 04 (1)	20 Secs (80 Secs)	
									[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	3	(4) SN2014DT	(4) SN2014DT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F438W	FLASH=12		Pattern 1, Exps 1-5 in Visit 04 (1)	20 Secs (80 Secs)	
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]	
4	(4) SN2014DT	(4) SN2014DT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F438W	FLASH=12		Pattern 1, Exps 1-5 in Visit 04 (1)	20 Secs (80 Secs)		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]	
5	(4) SN2014DT	(4) SN2014DT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F438W	FLASH=12		Pattern 1, Exps 1-5 in Visit 04 (1)	20 Secs (80 Secs)		
								[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]	

