



13787 - Massive stars dying alone: Extremely remote environments of SN2009ip and SN2010jp

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) SN2009IP	WFC3/UVIS	1	26-Feb-2015 21:02:15.0	yes
04	(2) SN2010JP	WFC3/UVIS	2	26-Feb-2015 21:02:16.0	yes
03	(1) SN2009IP	WFC3/UVIS	2	26-Feb-2015 21:02:17.0	yes
02	(1) SN2009IP	WFC3/UVIS	1	26-Feb-2015 21:02:17.0	yes
05	(2) SN2010JP	WFC3/UVIS	2	26-Feb-2015 21:02:18.0	yes

8 Total Orbits Used

ABSTRACT

We propose an imaging study of the astonishingly remote environments of two recent supernovae (SNe): SN2009ip and SN2010jp. Both were unusual Type IIn explosions that crashed into dense circumstellar material (CSM) ejected by the star shortly before explosion. The favored progenitors of these SNe are very massive luminous blue variable (LBV) stars. In fact, SN2009ip presents an extraordinary case where the LBV-like progenitor was actually detected directly in archival HST data, and where we obtained spectra and photometry for numerous pre-SN eruptions. No

other SN has this treasure trove of detailed information about the progenitor (not even SN1987A). SN2010jp represents a possible collapsar-powered event, since it showed evidence of a fast bipolar jet in spectra and a low ^{56}Ni mass; this would be an analog of the black-hole forming explosions that cause gamma ray bursts, but where the relativistic jet is damped by a residual H envelope on the star. In both cases, the only viable models for these SNe involve extremely massive (initial masses of 40-100 M_{sun}) progenitor stars. This seems at odds with their extremely remote environments in the far outskirts of their host galaxies, with no detected evidence for an underlying massive star population in ground-based data (nor in the single shallow WFPC2/F606W image of SN2009ip). Here we propose deep UV HST images to search for any mid/late O-type stars nearby, deep red images to detect any red supergiants, and an H-alpha image to search for any evidence of ongoing star formation in the vicinity. These observations will place important and demanding constraints on the initial masses and ages of these progenitors.

OBSERVING DESCRIPTION

We will be obtaining deep WFC3 images in the V (555W), I (814W) and Halpha (665/667N) for two recent SNe 2010jp and 2009IP. Additionally, for SN 2009IP we will also obtain UV (F275W) imaging to look for O star companions. These observations will be taken over 8 orbits; 4 orbits for SN 2009ip, and 4 orbits for SN 2010jp.

For SN 2009ip a full orbit is needed for F275W, two full orbits for Halpha (665N), and one orbit for F814W and F555W.

For SN 2010jp, which is further away with higher extinction, two full orbits are needed for Halpha (657N), an orbit and a half for F555W, and half an orbit for F814W.

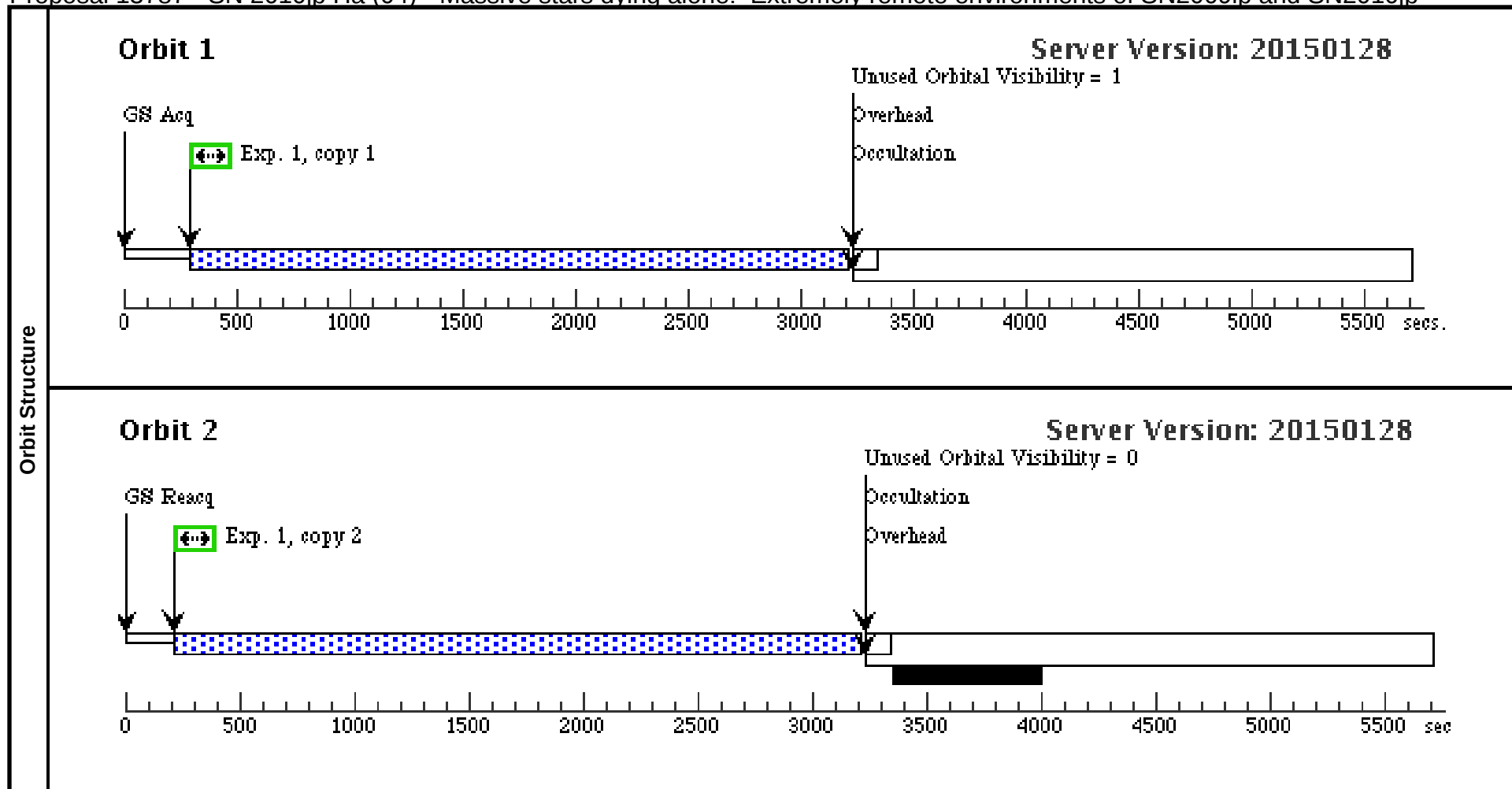
There are no timing constraints for our observations, although if possible we would like the visits for each SNe to occur as close to each other as is feasible.

Proposal 13787 - SN2009ip UV (01) - Massive stars dying alone: Extremely remote environments of SN2009ip and SN2010jp

Visit	Proposal 13787, SN2009ip UV (01), scheduling Fri Feb 27 02:02:19 GMT 2015								
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: GROUP 01,02,03 WITHIN 7D								
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous			
	(1)	SN2009IP	RA: 22 23 8.2600 (335.7844167d) Dec: -28 56 52.40 (-28.94789d) Equinox: J2000		V=21	Reference Frame: ICRS			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]
	1	UV	(1) SN2009IP	WFC3/UVIS, ACCUM, UVIS	F275W	FLASH=12	GS ACQ SCENARI O BASE1B3		2900 Secs (2900 Secs) [==>]
									[1]
Orbit Structure	Orbit 1 Server Version: 20150128								
	GS Acq Exp. 1 Overhead Unused Orbital Visibility = 0 Occultation 0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 sec								

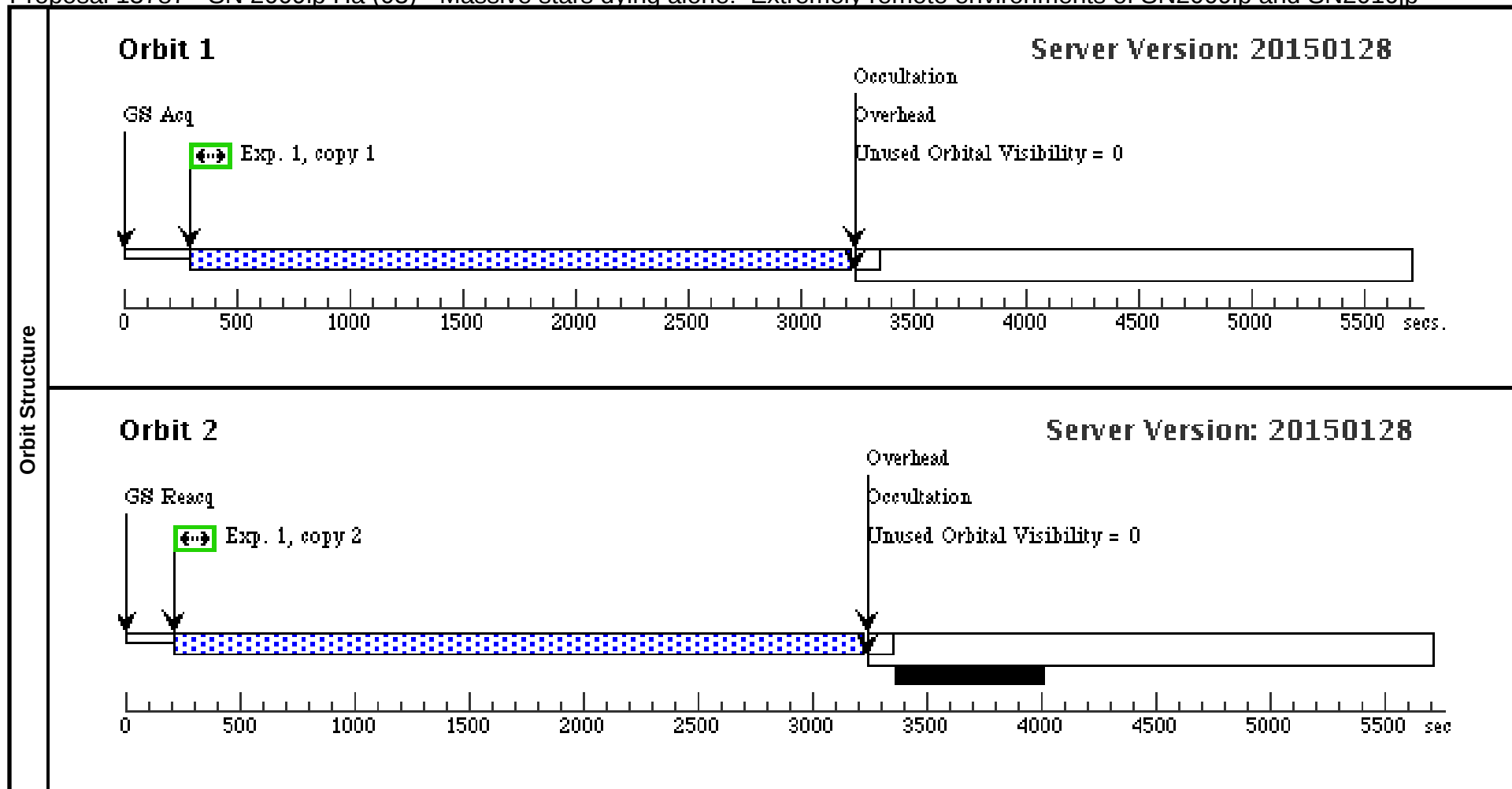
Proposal 13787 - SN 2010jp Ha (04) - Massive stars dying alone: Extremely remote environments of SN2009ip and SN2010jp

Visit	Proposal 13787, SN 2010jp Ha (04), implementation Fri Feb 27 02:02:19 GMT 2015									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SAME ORIENT AS 05; GROUP 04,05 WITHIN 7D									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(2)	SN2010JP	RA: 06 16 30.6300 (94.1276250d) Dec: -21 24 36.20 (-21.41006d) Equinox: J2000			V=25	Reference Frame: ICRS			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Halp	(2) SN2010JP	WFC3/UVIS, ACCUM, UVIS	F665N	FLASH=12	POS TARG 41.3119 5860320133,20.8077 81574989164		2890 Secs X 2 (5892 Secs)	
									[==>(Copy 1)]	[1]
									[==>3002.0 Secs (Copy 2)]	[2]



Proposal 13787 - SN 2009ip Ha (03) - Massive stars dying alone: Extremely remote environments of SN2009ip and SN2010jp

Visit	Proposal 13787, SN 2009ip Ha (03), scheduling Fri Feb 27 02:02:19 GMT 2015 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SAME ORIENT AS 01									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SN2009IP	RA: 22 23 8.2600 (335.7844167d) Dec: -28 56 52.40 (-28.94789d) Equinox: J2000		V=21	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Halp	(1) SN2009IP	WFC3/UVIS, ACCUM, UVIS	F657N	FLASH=12	GS ACQ SCENARI O BASE1B3		2900 Secs X 2 (5911 Secs)	
									[==>(Copy 1)]	[1]
									[==>3011.0 Secs (Copy 2)]	[2]



Proposal 13787 - SN 2009ip VI (02) - Massive stars dying alone: Extremely remote environments of SN2009ip and SN2010jp

Visit	Proposal 13787, SN 2009ip VI (02), scheduling Fri Feb 27 02:02:19 GMT 2015									
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SAME ORIENT AS 01									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	SN2009IP	RA: 22 23 8.2600 (335.7844167d) Dec: -28 56 52.40 (-28.94789d) Equinox: J2000		V=21	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	I	(1) SN2009IP	WFC3/UVIS, ACCUM, UVIS	F814W		GS ACQ SCENARI O BASE1B3		1100 Secs (1100 Secs)	
									[==>]	[1]
	2	V	(1) SN2009IP	WFC3/UVIS, ACCUM, UVIS	F555W				1650 Secs (1650 Secs)	
									[==>]	[1]
Orbit Structure	Orbit 1 Server Version: 20150128									
	GS Acq Exp. 1 Exp. 2 Overhead Unused Orbital Visibility = 14 Occultation 0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 sec									

Proposal 13787 - SN 2010jp VI (05) - Massive stars dying alone: Extremely remote environments of SN2009ip and SN2010jp

Visit	Proposal 13787, SN 2010jp VI (05), implementation Fri Feb 27 02:02:19 GMT 2015 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	SN2010JP	RA: 06 16 30.6300 (94.1276250d) Dec: -21 24 36.20 (-21.41006d) Equinox: J2000		V=25	Reference Frame: ICRS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	V Full	(2) SN2010JP	WFC3/UVIS, ACCUM, UVIS	F555W		POS TARG 41.3119 5860320133,20.8077 81574989164		2900 Secs (2891 Secs) [==>2891.0 Secs]	
										[1]
	2	V	(2) SN2010JP	WFC3/UVIS, ACCUM, UVIS	F555W		POS TARG 41.3119 5860320133,20.8077 81574989164		1300 Secs (1328 Secs) [==>1328.0 Secs]	
										[2]
	3	I	(2) SN2010JP	WFC3/UVIS, ACCUM, UVIS	F814W		POS TARG 41.3119 5860320133,20.8077 81574989164		1500 Secs (1528 Secs) [==>1528.0 Secs]	
										[2]

