17603 - Did the progenitor of the Type IIb SN2011dh actually have a binary companion?

Cycle: 31, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. Justyn Robert Maund (PI) (ESA Member) (Contact)	**Royal Holloway, University of London**

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SN-2011DH	WFC3/UVIS	2	13-Feb-2024 18:00:16.0	yes
02	(1) SN-2011DH	WFC3/IR WFC3/UVIS	3	13-Feb-2024 18:00:17.0	yes

5 Total Orbits Used

ABSTRACT

The progenitors of Type IIb SNe retain a small amount of hydrogen (<0.1Msun), making them sensitive probes of the mass loss processes (stellar winds, interactions with binary companions) that affect the evolution of massive stars. SN 2011dh is one of the best observed SNe in the last 20 years, with a peculiar Yellow Supergiant progenitor detected in HST pre-explosion images. Since 2011, late-time UV imaging of the site of SN2011dh had revealed a constant UV-bright source that was assumed for the last 11 years to be the companion to the progenitor, responsible for its peculiar appearance. In 2023, observations of the host galaxy of SN2011dh have revealed that, in the time since the last multiwavelength observations in 2017, the UV brightness of SN2011dh was not constant but has plummeted! Here we propose a deep, multi-wavelength set of observations to probe whether a companion star is truly present, and eliminate other scenarios including the formation of new dust in the fading SN

and the role of a light echo.

OBSERVING DESCRIPTION

We require deep UV to near-infrared imaging of the site of SN2011dh. In order to capture the evolution of SN2011dh, we require an observation in the next 2 - 3 months (which has been implemented in the visit planner).

Each observation, with each filter, is split into two subexposures with a dither offset. We are using the default 2-point line dither patterns for the UVIS and IR channels to allow for rejection of cosmic rays, hot pixels and blobs. We have grouped filters ([F657N and F336W], [F275W and F814W], [F555W, F125W and F160W]) to acquire exposures with alternating filters within the 2-point dither pattern so all observations can fit within the 5 orbit allocation. The pointing is centered on the position of SN2011dh, and we are using the 1k x 1k CTE subarray (for UVIS) to minimize readout time and the effects of CTE - for the IR image we are acquiring the full frame.

Proposal 17603 - Visit 01 - Did the progenitor of the Type IIb SN2011dh actually have a binary companion?

Visit

Proposal 17603, Visit 01, implementation Tue Feb 13 23:00:17 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: BEFORE 30-APR-2024:00:00:00

Diagnostics

(Exposure 2 (Pattern 2, Exps 1-2 in Visit 01)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

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)

Fixed Targets

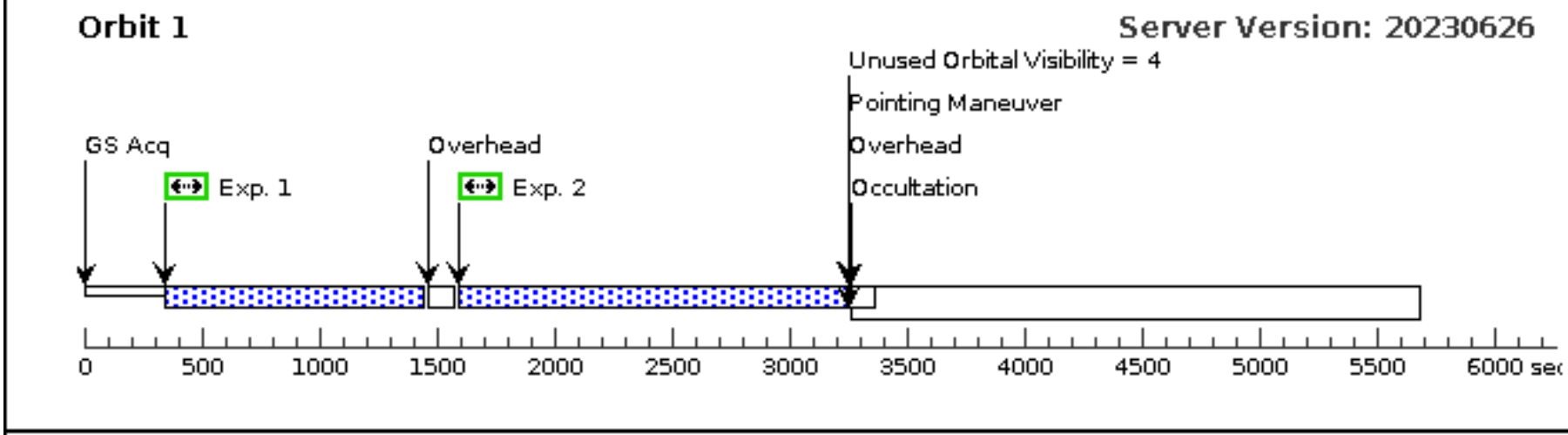
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-2011DH	RA: 13 30 5.1055 (202.5212729d) Dec: +47 10 10.92 (47.16970d) Equinox: J2000	Epoch of Position: 2000	V=25.0	Reference Frame: SIMBAD

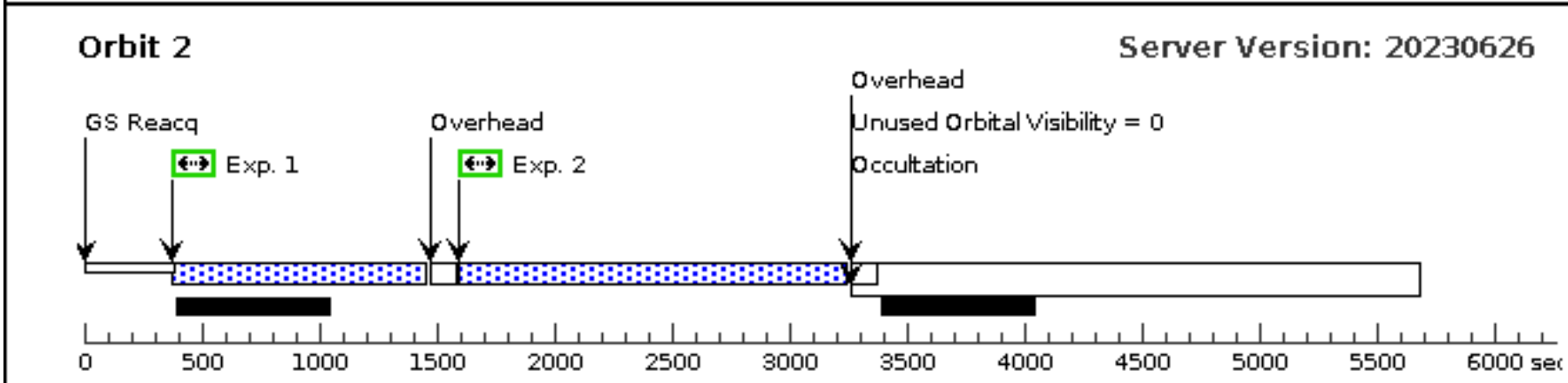
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=EXT-STAR
Description=[SUPERNOVA TYPE II]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SN-2011DH	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F657N	FLASH=20		Pattern 2, Exps 1-2 in Visit 01 (2)	950 Secs (2145 Secs)	
								[==>1075.0 Secs (Pattern 1)]	***[1]***
								[==>1070.0 Secs (Pattern 2)]	***[2]***
2		(1) SN-2011DH	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F336W	FLASH=20		Pattern 2, Exps 1-2 in Visit 01 (2)	1500 Secs (3250 Secs)	
								[==>1625.0 Secs (Pattern 1)]	***[1]***
								[==>1625.0 Secs (Pattern 2)]	***[2]***

Orbit Structure





Visit

Proposal 17603, Visit 02, implementation Tue Feb 13 23:00:18 GMT 2024

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: BEFORE 30-APR-2024:00:00:00

Diagnostics

(Exposure 1 (Pattern 2, Exps 1-2 in Visit 02)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 2 (Pattern 2, Exps 1-2 in Visit 02)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

(Exposure 5 (Pattern 2, Exps 5-5 in Visit 02)) Warning (Form): FLASH level may be too high for this exposure or a long subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-IR-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.636 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(3-4)
(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), (5)

Fixed Targets

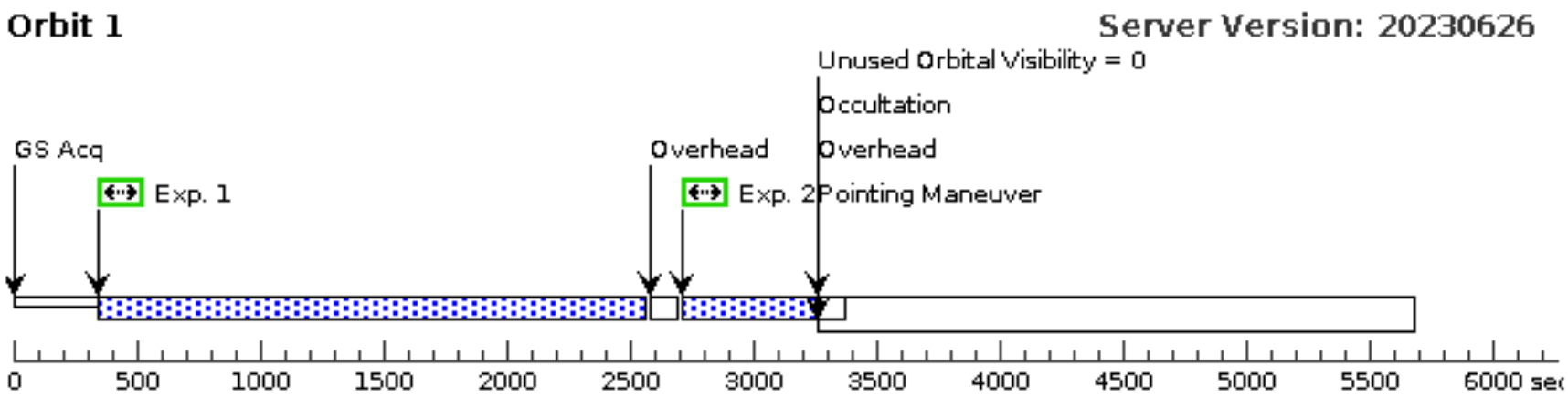
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-2011DH	RA: 13 30 5.1055 (202.5212729d) Dec: +47 10 10.92 (47.16970d) Equinox: J2000	Epoch of Position: 2000	V=25.0	Reference Frame: SIMBAD

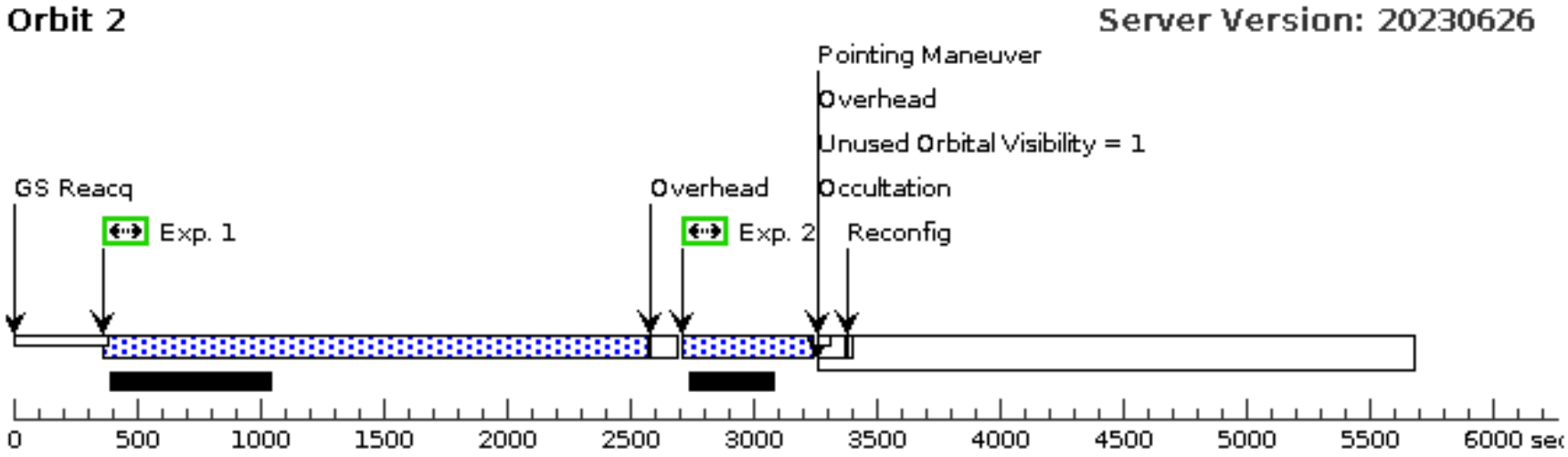
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=EXT-STAR
Description=[SUPERNOVA TYPE II]
Extended=NO

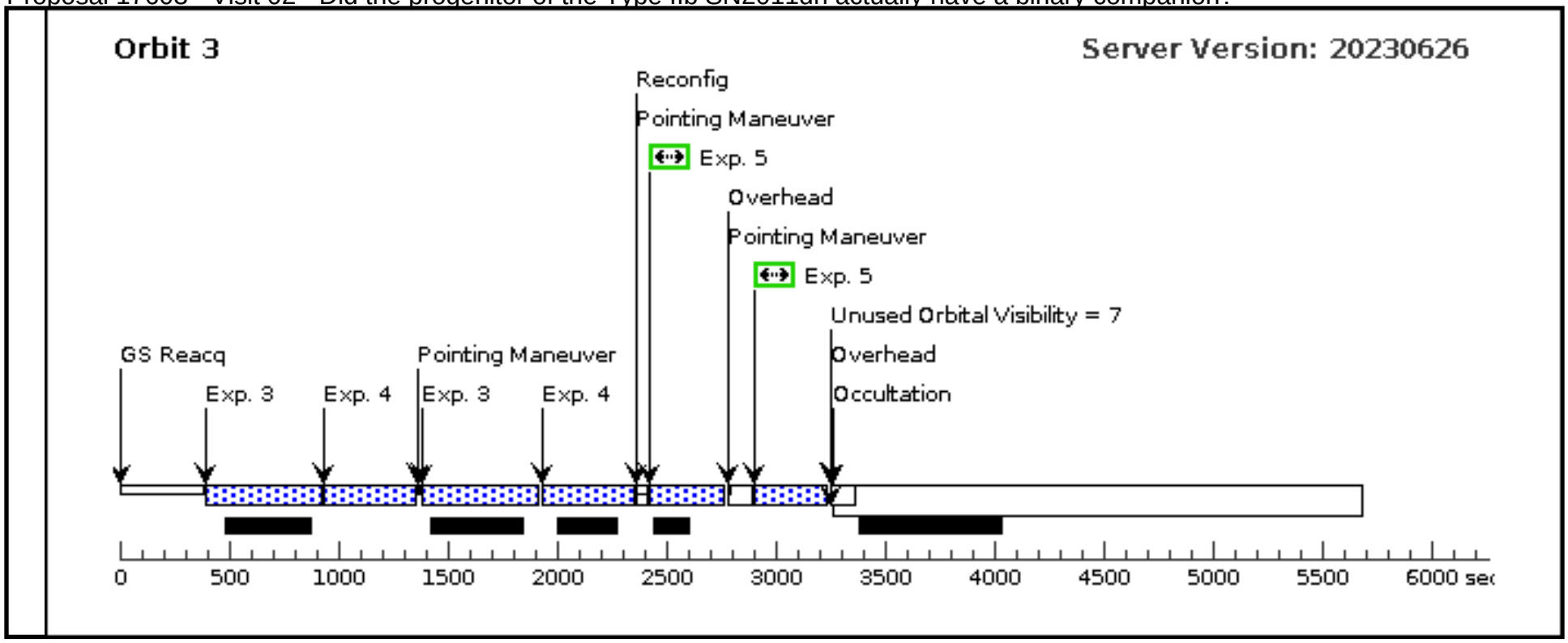
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SN-2011DH	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F275W	FLASH=20		Pattern 2, Exps 1-2 in Visit 02 (2)	2100 Secs (4383 Secs)	
								[==>2194.0 Secs (Pattern 1)]	***[1]***
								[==>2189.0 Secs (Pattern 2)]	***[2]***
2		(1) SN-2011DH	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W	FLASH=20		Pattern 2, Exps 1-2 in Visit 02 (2)	425 Secs (1033 Secs)	
								[==>519.0 Secs (Pattern 1)]	***[1]***
								[==>514.0 Secs (Pattern 2)]	***[2]***
3		(1) SN-2011DH	WFC3/IR, MULTIACCUM, IR	F160W	SAMP-SEQ=SPARS50; NSAMP=11		Pattern 1, Exps 3-4 in Visit 02 (1)	502.936801 Secs (1005.874 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[3]***
4		(1) SN-2011DH	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=9		Pattern 1, Exps 3-4 in Visit 02 (1)	402.935899 Secs (805.872 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[3]***
5		(1) SN-2011DH	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F555W	FLASH=20		Pattern 2, Exps 5-5 in Visit 02 (2)	335 Secs (670 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[3]***

Orbit Structure



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Occultation
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Exp. 4
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Exp. 3
Exp. 4
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