13684 - A Wolf-Rayet Progenitor for iPTF13bvn?

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) IPTF-13BVN	WFC3/UVIS	4	07-Jul-2014 21:01:12.0	yes

4 Total Orbits Used

ABSTRACT

Determining the nature of the progenitor stars responsible for core-collapse supernovae (SNe) is a vital problem for massive stellar evolution and, e.g., the chemical history of galaxies. Up to this point, the progenitor, or progenitor systems, responsible for the stripped-envelope Type Ib and Ic SNe are still not understood unambiguously. For the recent Type Ib SN iPTF13bvn in the spiral galaxy NGC 5806, a putative progenitor star was identified at the exact SN position in pre-SN, multi-band HST ACS images. The luminosity and colors for this object have been characterized as being consistent with a single, massive (M_initial > 31--35 Msun) Wolf-Rayet star. Notwithstanding uncertainties in the measurements of the object's brightness and also its host galaxy properties, such as distance and inclination, the progenitor of iPTF13bvn has been suggested by others, instead, to be much less massive and possibly in an interacting binary system. We propose here to deeply reimage the SN site in B and V with WFC3 to determine the status of the putative progenitor, when the SN itself has faded well below the brightness of the progenitor. We will be testing the Wolf-Rayet progenitor scenario and, at the same time, placing constraints on the interacting binary scenario. This can be done in Cycle 22 and only with HST.

OBSERVING DESCRIPTION

We will observe the site of the Type Ib SN iPTF13bvn once again, this time quite deeply, in F438W and F555W with WFC3/UVIS. The total exposure times will be 5720 and 5610 s, respectively. These will allow us not only to determine whether the putative Wolf-Rayet star progenitor has vanished, which is one progenitor scenario, but also to undertake an investigation of the other possible scenario, an interacting binary system. If the progenitor's binary companion has brightness V ~ 27.5 mag (and approx the color of a A0I star), we should then be able to detect it at S/N~5 and 7, respectively. We should be able to put a strict (3-sigma) constraint of V>28.4 mag for anything remaining at the SN site. The galaxy NGC 5806 has already been host to two other recent SNe, so it could host other future SNe. These images will be the deepest available in these two bands for this galaxy, so the data will have archival value for the entire community for a variety of studies. For these reasons, we are imaging much of the entire galaxy, placing the pointing center at UVIS-CENTER, line dithering to fill both the chip gap (using a POS TARG offset between exposure pairs) and to subsample the PSF as well in each band. Scheduling these observations in the 2015 June 11 to September 16 visibility window should be sufficient, since the SN itself should have faded to at least V ~ 28.6 mag, if not fainter.

Visit

Proposal 13684, Visit 01, implementation Tue Jul 08 01:01:13 GMT 2014

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(3)	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), (4)

Fixed Targets

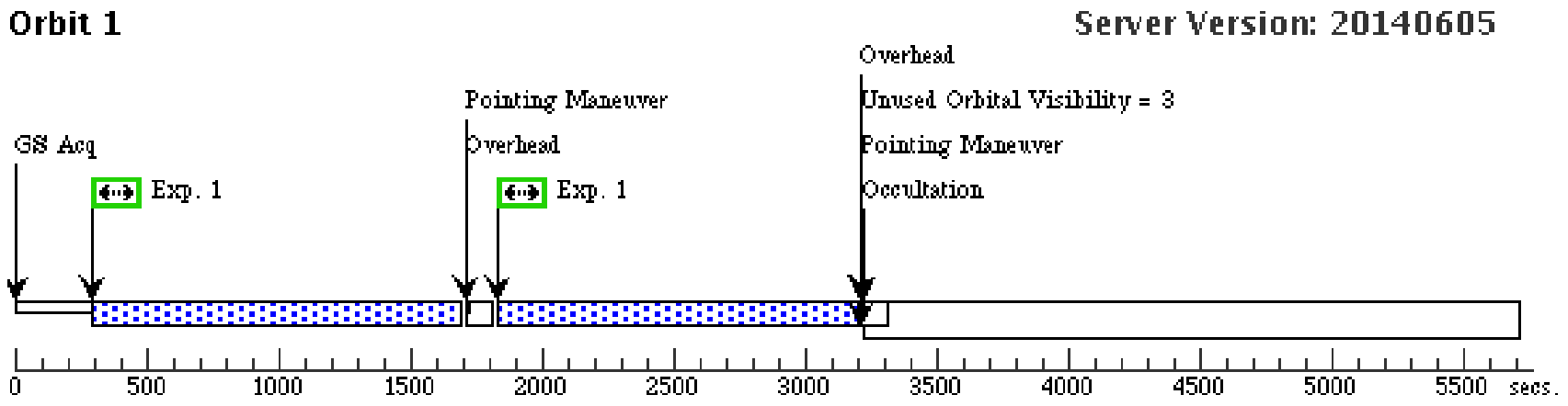
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	IPTF-13BVN	RA: 15 00 0.6900 (225.0028750d) Dec: +01 53 27.90 (1.89108d) Equinox: J2000		V=26.0+/-0.5 B=26.0	Reference Frame: SIMBAD

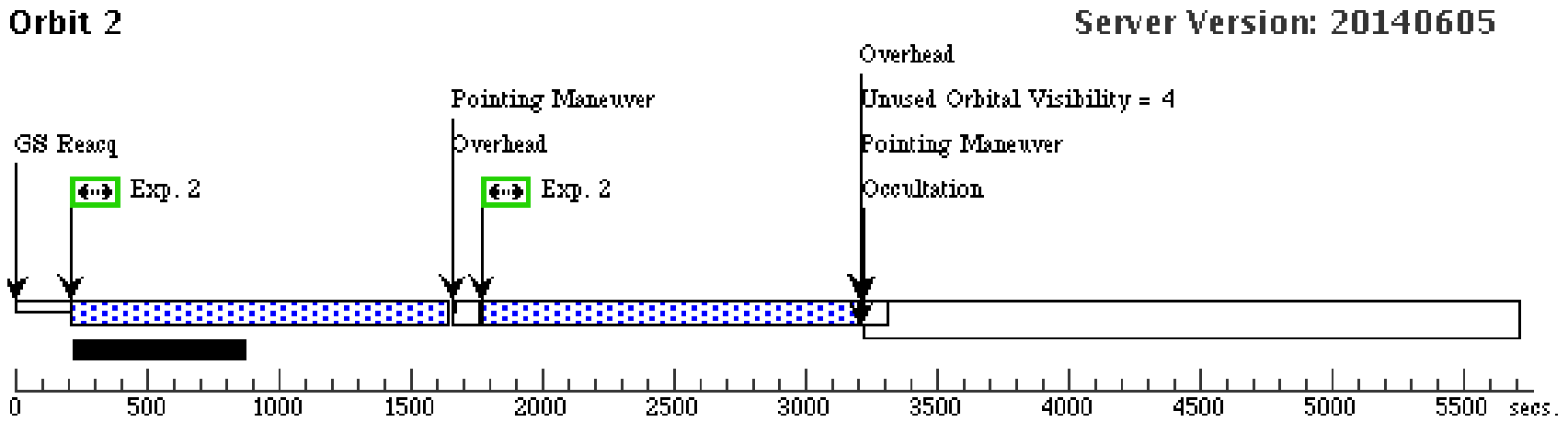
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

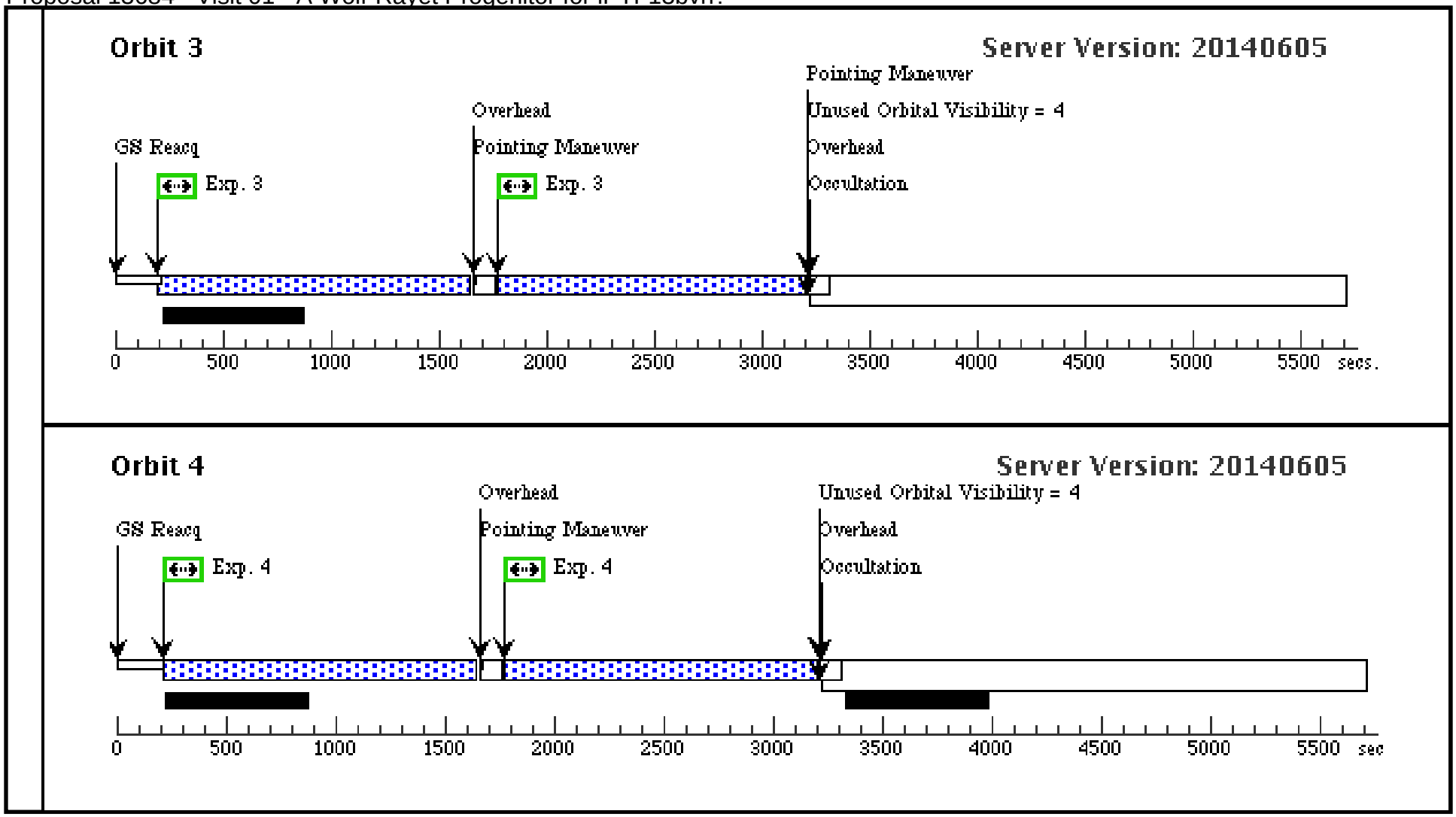
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) IPTF-13BVN	WFC3/UVIS, ACCUM, UVIS-CENTER	F555W		GS ACQ SCENARIO BASE1B3	Pattern 3, Exps 1-1 in Visit 01 (3)	1375 Secs (2750 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[1]***
2		(1) IPTF-13BVN	WFC3/UVIS, ACCUM, UVIS-CENTER	F555W		POS TARG 0.178,2.393	Pattern 3, Exps 2-2 in Visit 01 (3)	1430 Secs (2860 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***
3		(1) IPTF-13BVN	WFC3/UVIS, ACCUM, UVIS-CENTER	F438W			Pattern 3, Exps 3-3 in Visit 01 (3)	1430 Secs (2860 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[3]***
4		(1) IPTF-13BVN	WFC3/UVIS, ACCUM, UVIS-CENTER	F438W		POS TARG 0.178,2.393	Pattern 3, Exps 4-4 in Visit 01 (3)	1430 Secs (2860 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[4]***

Orbit Structure






Orbit 3
Server Version: 20140605
Pointing Maneuver
Unused Orbital Visibility = 4
Overhead
Overhead
Pointing Maneuver
GS Reacq
Occultation
Exp. 3
Exp. 3
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 4
Server Version: 20140605
Overhead
Unused Orbital Visibility = 4
GS Reacq
Pointing Maneuver
Overhead
Occultation
Exp. 4
Exp. 4
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec