12170 - A direct UV search for the progenitor of the nearby type Ib SN 2007fo

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) SN2007FO	ACS/WFC	1	06-Jul-2010 21:51:12.0	yes
02	(1) SN2007FO	WFC3/UVIS	1	06-Jul-2010 21:51:18.0	yes

2 Total Orbits Used

ABSTRACT

Understanding the explosive death of massive stars is a key open question in astrophysics. Direct observational information about the pre-explosion properties of supernova progenitors would provide explosion models with a set of initial conditions, and a crucial complement to supernova observations that constrain the explosive outcome. In recent years, identifying the progenitors of the most nearby supernovae in pre-explosion HST images has allowed significant progress in this field. However, this is limited mostly to H-rich type II supernova explosions of red supergiants. The improtant class of stripped (H-poor) type Ib and Ic supernovae, which are especially interesting due to their possible relation to long Gamma-Ray Bursts, remain obscure, with many attempts to discover progenitors yielding only upper limits. The hunt for these elusive progenitors is difficult probably due to a combination of factors: SN Ib/c are intrinsically rare, and their stripped progenitors (probably blue Wolf-Rayet stars) are difficult to

detect in archival pre-explosion HST images, mostly obtained in red bands. The nearby type Ib SN 2007fo exploded in NGC 7714, a galaxy with archival imaging uniquely extending to the UV. We have used ground-based Gemini AO imaging of the supernova to localize it on the pre-explosion HST grid, and found that it resides in a complicated area where a single progenitor cannot be pinpointed (though candidates exist). Next, we propose to reimage this location and compare the post-explosion images to archival templates in order to robustly identify the progenitor. Using image-subtraction we will compare the two HST epochs, identify objects that decay or disappear, and thus locate the progenitor of this SN, a very exciting prospect. Failing to detect the progenitor would place strong limits on its luminosity, adding to the growing body of information on SN progenitors. A modest investment of 2 HST orbits has the potential to reveal the first W-R progenitor of a type Ib supernova.

OBSERVING DESCRIPTION

We will observe the location of SN 2007fo in the optical with ACS (1 orbit, split between F814W and F606W) and the UV with WFC3/UVIS (1 orbit split between F390W and F300X). Filters were selected to match available pre-explosion data, and durations were tuned to exceed the sensitivity of the reference data set in all bands, while maximizing orbit use efficiency.

Visit

Proposal 12170, Visit 01 Wed Jul 07 01:51:23 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

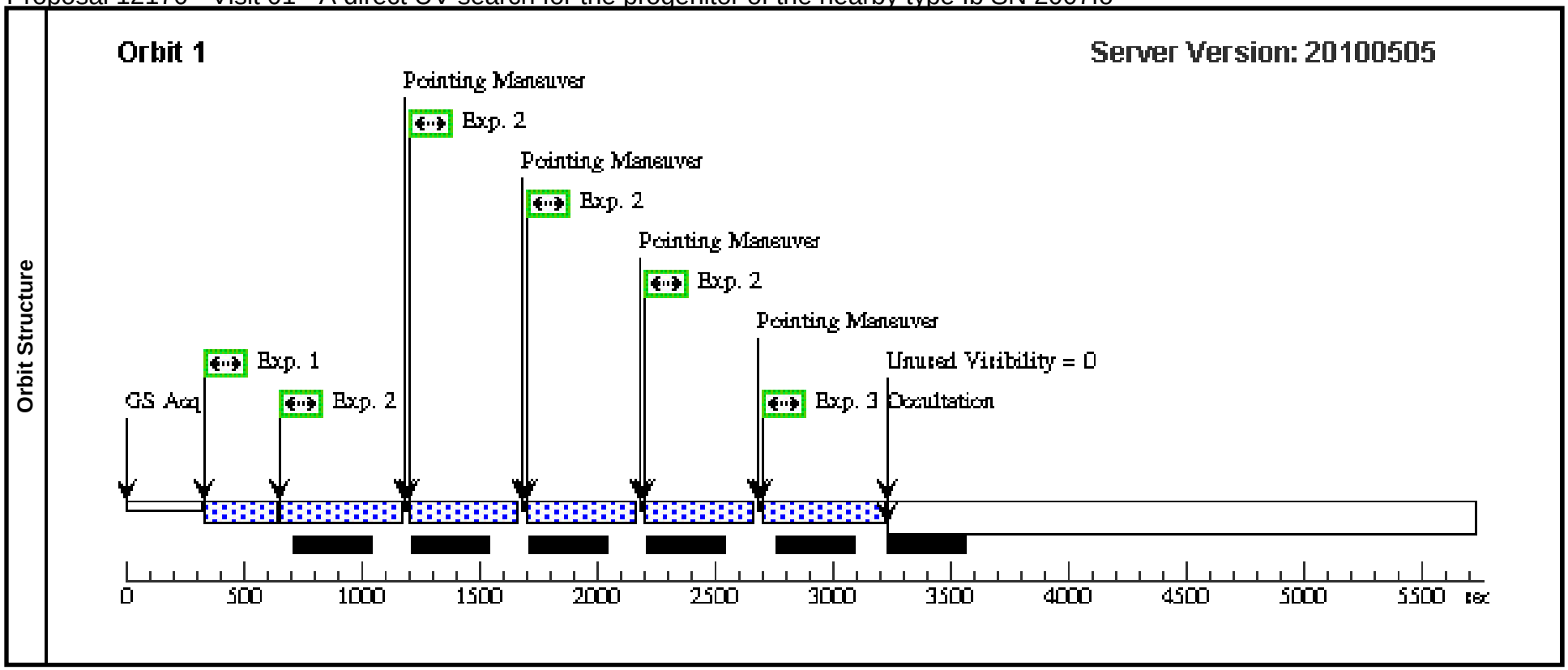
#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false		(2)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2007FO	RA: 23 36 14.0000 (354.0583333d) Dec: +02 09 30.00 (2.15833d) Equinox: J2000		V=25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SN2007FO	ACS/WFC, ACCUM, WFC1	F814W				97 Secs	
								[==>]	***[1]***
2		(1) SN2007FO	ACS/WFC, ACCUM, WFC1	F606W			Pattern 1, Exps 2-2 (1)	340 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
3		(1) SN2007FO	ACS/WFC, ACCUM, WFC1	F814W				340 Secs	
								[==>]	***[1]***


Orbit Structure
Orbit 1
Server Version: 20100505
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 2
Pointing Maneuver
Exp. 1
Exp. 2
Exp. 3
Unused Vitibility = 0
GS Acq
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12170, Visit 02 Wed Jul 07 01:51:24 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

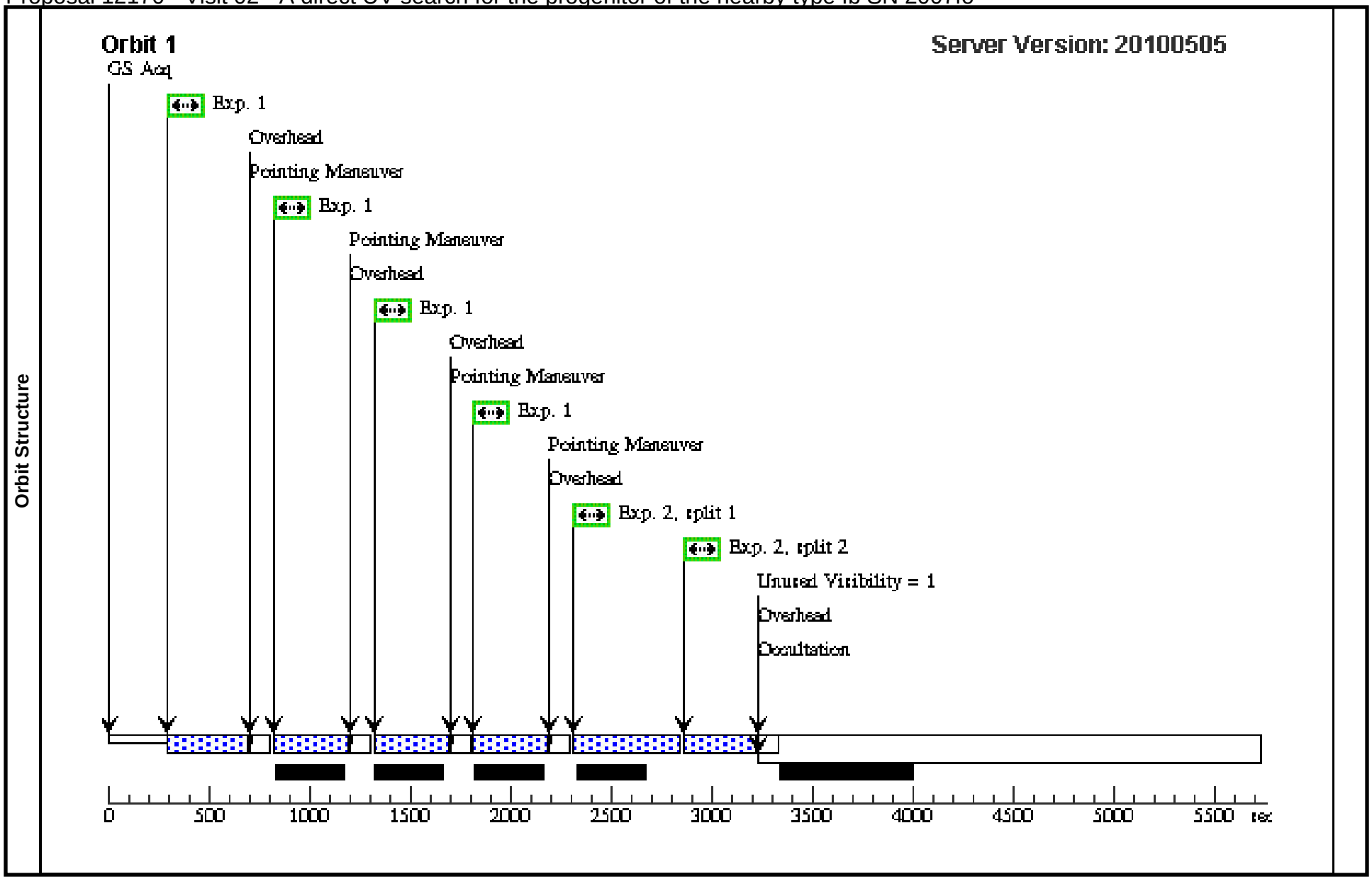
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.173 Line Spacing=0.112	Coordinate Frame=POS-TARG Pattern Orientation=23.884 Angle Between Sides=81.785 Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2007FO	RA: 23 36 14.0000 (354.0583333d) Dec: +02 09 30.00 (2.15833d) Equinox: J2000		V=25	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SN2007FO	WFC3/UVIS, ACCUM, UVIS1	F390W			Pattern 2, Exps 1-1 (2)	370 Secs	
								[==>368.0 Secs (Pattern 1)] *[==>368.0 Secs (Pattern 2)]* *[==>368.0 Secs (Pattern 3)]* *[==>368.0 Secs (Pattern 4)]*	***[1]***
2		(1) SN2007FO	WFC3/UVIS, ACCUM, UVIS1	F300X	CR-SPLIT=2			399 Secs	
								[==>400.0 Secs (Split 1)] *[==>360.0 Secs (Split 2)]*	***[1]***


Orbit 1
Server Version: 20100505
Orbit Structure
GS Acq
Exp. 1
Overhead
Pointing Maneuver
Exp. 1
Pointing Maneuver
Overhead
Exp. 1
Overhead
Pointing Maneuver
Exp. 1
Pointing Maneuver
Overhead
Exp. 2, split 1
Exp. 2, split 2
Unused Visibility = 1
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec