13799 - Constraining Type Ia Supernova Nucleosynthesis and Explosion Models Using Late-Time Photometry of SN2012cg

Cycle: 22, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Or Graur (PI) (Contact)	**New York University**	**orgraur@nyu.edu**
Dr. Michael Shara (CoI)	American Museum of Natural History	mshara@amnh.org
Dr. David R. Zurek (CoI)	American Museum of Natural History	dzurek@amnh.org

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SN2012CG	WFC3/UVIS	2	20-Jan-2015 15:52:56.0	yes
02	(1) SN2012CG	WFC3/UVIS	1	20-Jan-2015 15:52:58.0	yes
03	(1) SN2012CG	WFC3/UVIS	1	20-Jan-2015 15:52:58.0	yes

4 Total Orbits Used

ABSTRACT

We propose to use WFC3 photometry from the near UV to the near IR to sample the bolometric light curve of the nearby Type Ia supernova (SN Ia) SN2012cg at late times (>900 days after maximum light). This light curve will allow us to conduct a fundamental test of the theoretically predicted behavior of SN Ia light curves at late times. We will observationally determine, for the first time, whether the nuclear physics of SN Ia ejecta is solely determined by the radioactive decay of 56Co to 56Fe, or whether (and by how much) other nuclear heating mechanisms (such as the leptonic decays of 57Co and 55Fe) become discernible, as predicted.

OBSERVING DESCRIPTION

Due to the high background of the galaxy at the location of the supernova, we will split our orbits between two epochs, the first when the supernova is ~925 days after maximum light, during December 13-19 2014, and the second when it is ~975 days after maximum light, during February 4-7 2015. In each epoch, both orbits will use the WFC3/UVIS F350LP filter, which covers the main UV-optical range of 300-1000 nm in which SNe Ia are usually observed. In each orbit, we will perform three exposures using the default WFC3-UVIS-LINE-3PT dither. To maximize the UVIS orbits, we will use the 1024x1024 UVIS subarray, centered on the location of the supernova.

Based on similar images of the supernova in F350LP taken by GO-12880 (PI: A. Riess) and extrapolating the decaying light curve of the supernova out to our epochs, we expect the supernova to be at least as bright as 26-26.5 mag in F350LP. Furthermore, we have determined that two orbits per visit in F350LP are sufficient to obtain a signal-to-noise ratio ~20 in this filter, at our chosen epochs, which is high enough to distinguish between the various predictions tested here.

UPDATE: Following our first epoch of observations, we have determined that our images are limited by the noise from the galaxy background. Thus, we cannot improve the signal-to-noise ratio of our target by observing it for more than one orbit. It is better, then, to split our remaining two orbits into two separate epochs.

Visit

Proposal 13799, SN2012cg +925 (01), completed Tue Jan 20 20:52:59 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 13-DEC-2014:00:00:00 AND 19-DEC-2014:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1), (2)

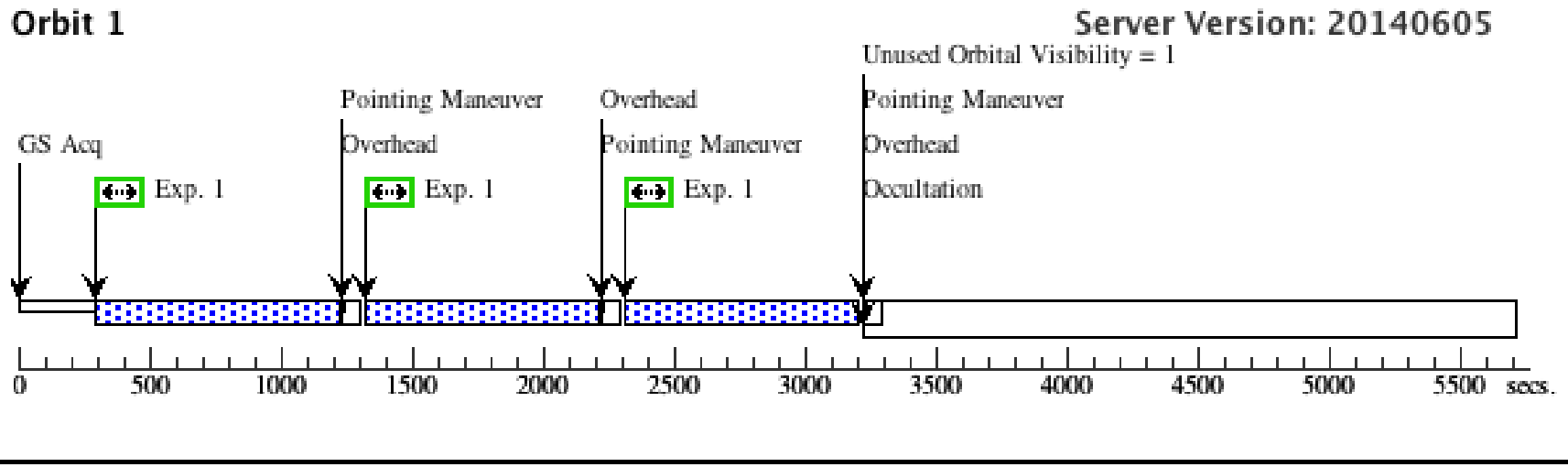
Fixed Targets

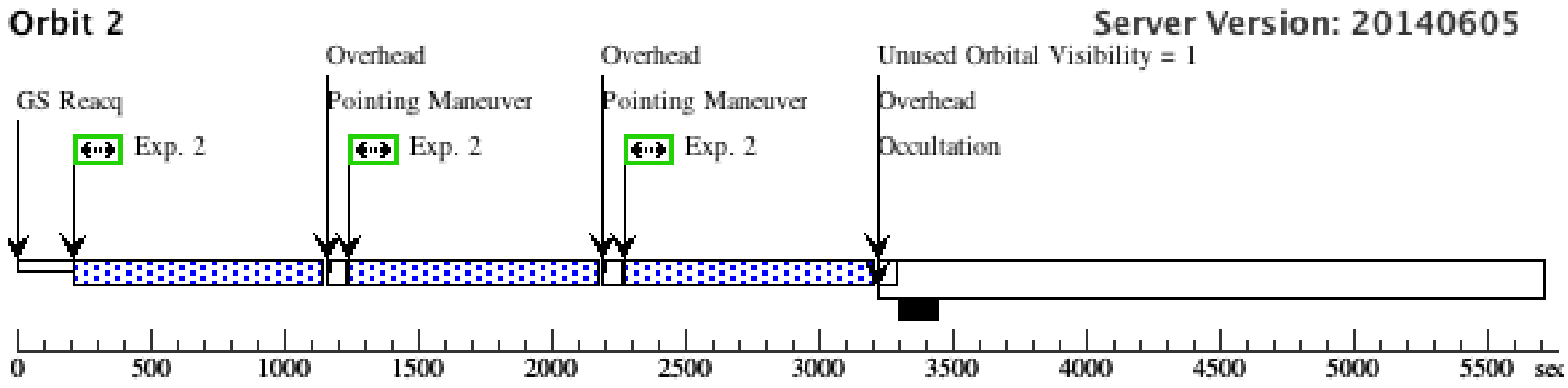
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2012CG	RA: 12 27 12.8300 (186.8034583d) Dec: +09 25 13.10 (9.42031d) Equinox: J2000		V=24.0+/-0.3	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F350LP	(1) SN2012CG	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F350LP	FLASH=12	GS ACQ SCENARIO BASE1B3	Pattern 2, Exps 1-1 in SN2012cg +925 (01) (2)	896 Secs (2688 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2	F350LP	(1) SN2012CG	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F350LP	FLASH=12		Pattern 2, Exps 2-2 in SN2012cg +925 (01) (2)	933 Secs (2799 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 13799, SN2012cg +975 (02), scheduling Tue Jan 20 20:53:00 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 04-FEB-2015:00:00:00 AND 07-FEB-2015:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

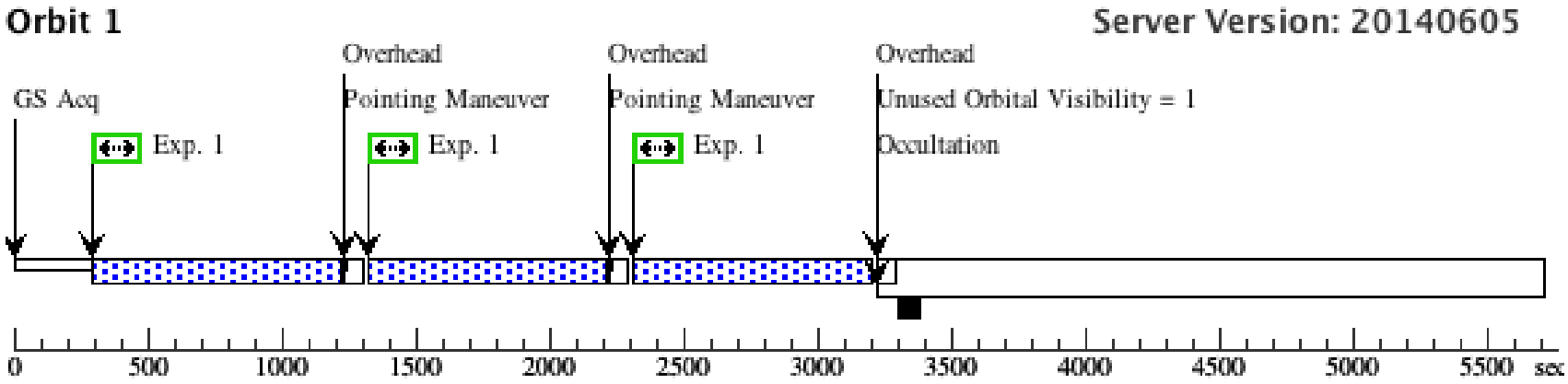
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2012CG	RA: 12 27 12.8300 (186.8034583d) Dec: +09 25 13.10 (9.42031d) Equinox: J2000		V=24.0+/-0.3	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F350LP	(1) SN2012CG	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F350LP	FLASH=12	GS ACQ SCENARIO BASE1B3	Pattern 2, Exps 1-1 in SN2012cg +975 (02) (2)	896 Secs (2688 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure



Visit

Proposal 13799, SN2012cg +1060 (03) Tue Jan 20 20:53:00 GMT 2015

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 26-APR-2015:00:00:00 AND 29-APR-2015:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-UVIS-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.135 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2012CG	RA: 12 27 12.8300 (186.8034583d) Dec: +09 25 13.10 (9.42031d) Equinox: J2000		V=24.0+/-0.3	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F350LP	(1) SN2012CG	WFC3/UVIS, ACCUM, UVIS2-M1K1C-SUB	F350LP	FLASH=12	GS ACQ SCENARIO BASE1B3	Pattern 2, Exps 1-1 in SN2012cg +1060 (03) (2)	896 Secs (2688 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure