



14146 - Light Echoes and Environment of SN 2014J in M82

Cycle: 23, 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) SN2014J	WFC3/UVIS	1	08-Jul-2015 21:08:06.0	yes
02	(1) SN2014J	WFC3/UVIS	1	08-Jul-2015 21:08:12.0	yes
03	(1) SN2014J	WFC3/UVIS	3	08-Jul-2015 21:08:23.0	yes

5 Total Orbits Used

ABSTRACT

Type Ia SN 2014J exploded in the nearby M82 = NGC 3032, reaching V maximum light around 2014 February 5, the closest SN since 1987 and likely the closest SN Ia since 1885. Recent HST/WFC3 imaging (2014 September 5 and 2015 February 2) of M82 in the vicinity of SN 2014J reveals a light echo at radius 0.6 arcsec from SN 2014J (or 13 pc in M82), meaning a z distance of 330 pc closer to Earth than the SN. Additional echoes reside at a smaller radii of about 0.3-0.4 arcsec (or z = 80-160 pc). HST observations of SN 2014J's echoes over the next few years will allow us to map and explore further star formation in M82, and the 3-D structure of gas and dust. Echoes in the near future might also reveal circumstellar structure around SN 2014J's progenitor star. This offers us a unique opportunity to study the environment of SNe Ia, here at a level of detail several

times better than any other, farther SN Ia observed by HST. M82 is a special galaxy in terms of star formation activity, and SN 2014J offers a special probe of this galaxy since it is a Ia, not core collapse SN, so more likely to sample the structure of M82 more typically, rather than centered on a region recently producing massive stars, such as a core-collapse progenitor. We describe how the light echo mapping that will be provided by the proposed observations will produce a high-resolution, three-dimensional view of a large part of M82, and how this can be directly compared to models of the interstellar medium to learn how star formation feeds back into the gaseous structure of galaxies. This comparison is arguably only possible with SN light echoes, with SN 2014J providing the most useful Ia example.

OBSERVING DESCRIPTION

The prime purpose of these observations is to obtain unsaturated or only mildly saturated images primarily in broad bands in which the field containing SN 2014J was imaged prior to the SN outburst. These bands are F438W, F555W and F814W. Exposure times will need to be adjusted to provide these, given the somewhat unpredictable variable nature of the source. In addition there are several narrow bands observed before outburst that can be compared to look at new extended sources in atomic line transitions (F487N, F502N, F658N, F673N). For these we need if possible to achieve satisfactory S/N ratio in the background galaxy surface brightness. Finally, we will use some small fraction of exposure time to extend the UV light curve past maximum light and look for extended UV reflection for this unique object (F218W, F225W, F275W, F336W).

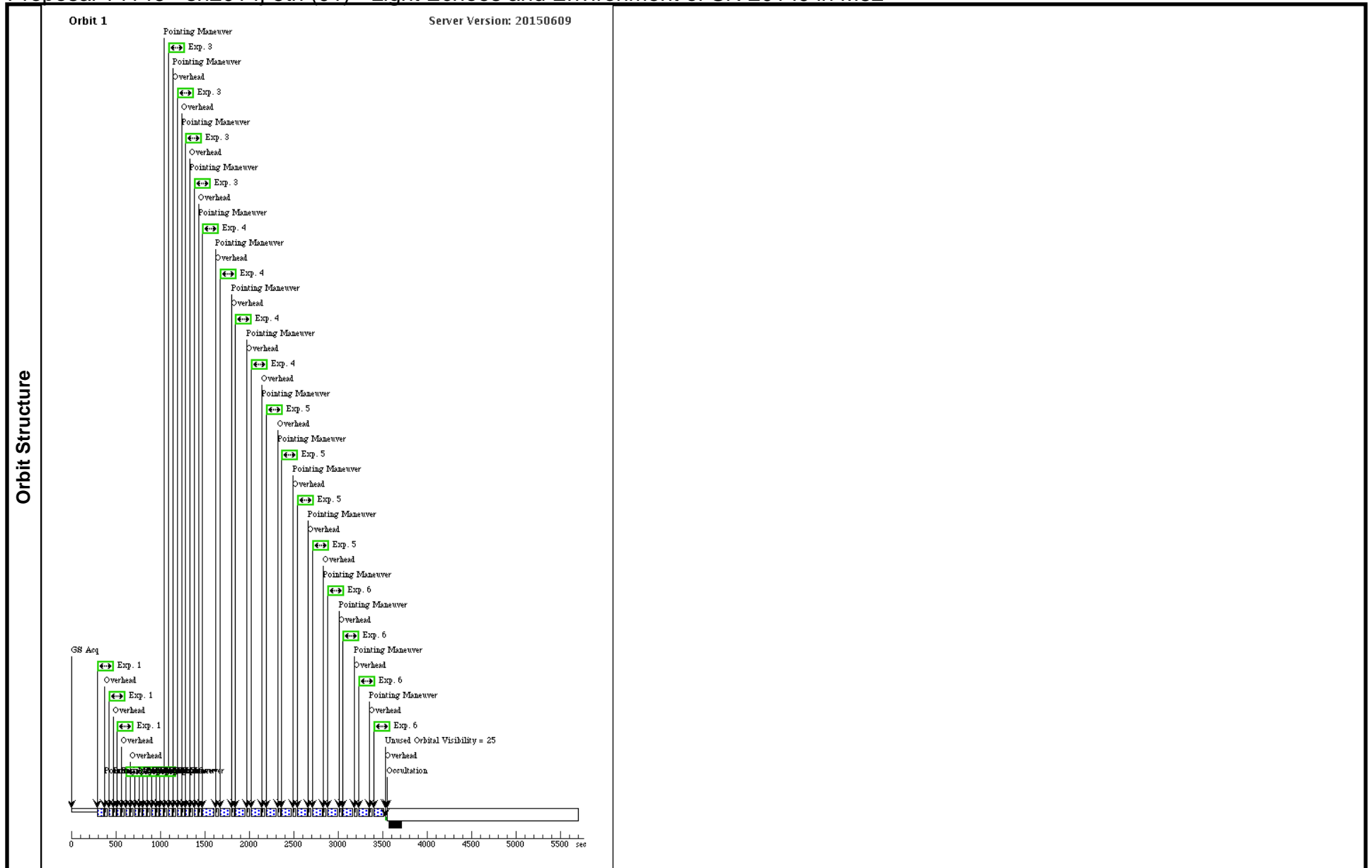
Proposal 14146 - sn2014j-5th (01) - Light Echoes and Environment of SN 2014J in M82

Thu Jul 09 01:08:27 GMT 2015

Visit	Proposal 14146, sn2014j-5th (01) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: BEFORE 01-AUG-2015:00:00:00 <i>Comments: This Visit 01 defines the data for the fifth epoch of observations of the light echoes of SN2014J in M82. Epochs 1--4 were taken during GO 13626.</i>					
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
(3)		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), (2), (3), (4), (5), (6)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SN2014J	RA: 09 55 42.1400 (148.9255833d) Dec: +69 40 26.00 (69.67389d) Equinox: J2000		V=10+/-1	Reference Frame: ICRS

Proposal 14146 - sn2014j-5th (01) - Light Echoes and Environment of SN 2014J in M82

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
Exposures	1	f555w-36-1	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10	GS ACQ SCENARIO BASE1B3	Pattern 3, Exps 1-1 in sn2014j-5th (01) (3)	36 Secs (144 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	2	f555w-36-2	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10		Pattern 3, Exps 2-2 in sn2014j-5th (01) (3)	36 Secs (144 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	3	f555w-36-3	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10		Pattern 3, Exps 3-3 in sn2014j-5th (01) (3)	36 Secs (144 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	4	f438w-112-1	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 4-4 in sn2014j-5th (01) (3)	112 Secs (448 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	5	f438w-112-2	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 5-5 in sn2014j-5th (01) (3)	112 Secs (448 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]
	6	f438w-112-3	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 6-6 in sn2014j-5th (01) (3)	112 Secs (448 Secs) [=>(Pattern 1)] [=>(Pattern 2)] [=>(Pattern 3)] [=>(Pattern 4)]	[1]



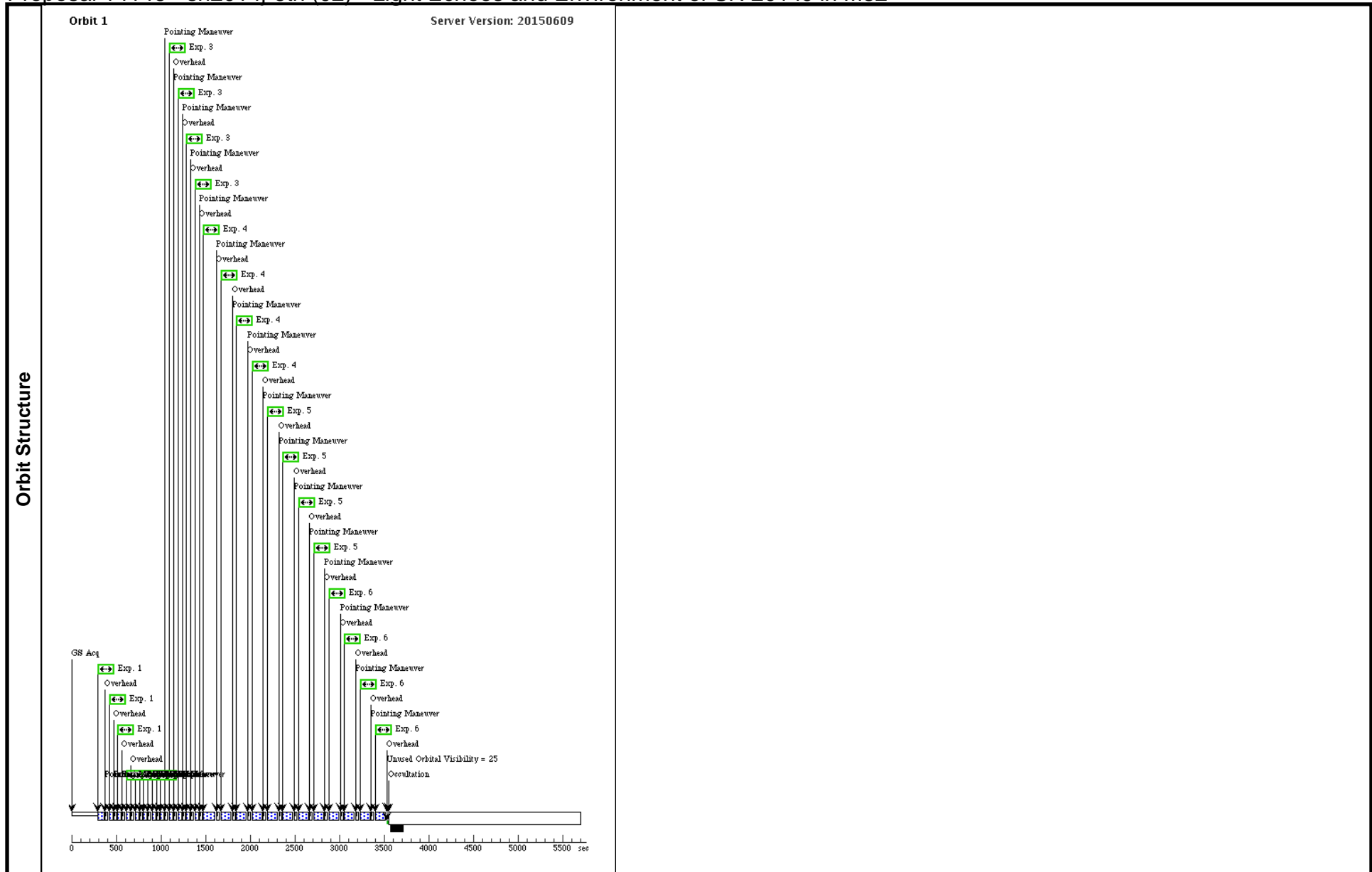
Proposal 14146 - sn2014j-6th (02) - Light Echoes and Environment of SN 2014J in M82

Thu Jul 09 01:08:28 GMT 2015

Visit	Proposal 14146, sn2014j-6th (02) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: BETWEEN 01-JAN-2016 AND 31-MAR-2016 <i>Comments: This Visit 02 defines the data for the sixth epoch of observations of the light echoes of SN2014J in M82. Epochs 1--4 were taken during GO 13626, Epoch 5 was taken during Visit 01.</i>					
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
	(3)	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), (2), (3), (4), (5), (6)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SN2014J	RA: 09 55 42.1400 (148.9255833d) Dec: +69 40 26.00 (69.67389d) Equinox: J2000		V=10+/-1	Reference Frame: ICRS

Proposal 14146 - sn2014j-6th (02) - Light Echoes and Environment of SN 2014J in M82

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
Exposures	1	f555w-36-1 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10	GS ACQ SCENARIO BASE1B3	Pattern 3, Exps 1-1 in sn2014j-6th (02) (3)	36 Secs (144 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	2	f555w-36-2 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10		Pattern 3, Exps 2-2 in sn2014j-6th (02) (3)	36 Secs (144 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	3	f555w-36-3 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10		Pattern 3, Exps 3-3 in sn2014j-6th (02) (3)	36 Secs (144 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	4	f438w-112-1 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 4-4 in sn2014j-6th (02) (3)	112 Secs (448 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	5	f438w-112-2 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 5-5 in sn2014j-6th (02) (3)	112 Secs (448 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	6	f438w-112-3 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 6-6 in sn2014j-6th (02) (3)	112 Secs (448 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



Proposal 14146 - sn2014j-7th (03) - Light Echoes and Environment of SN 2014J in M82

Thu Jul 09 01:08:28 GMT 2015

Visit	Proposal 14146, sn2014j-7th (03) Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: BETWEEN 01-JUL-2016 AND 30-SEP-2016 <i>Comments: This Visit 03 defines the data for the seventh epoch of observations of the light echoes of SN2014J in M82. Epochs 1--4 were taken during GO 13626, Epochs 5 and 6 were taken during Visits 01 and 02, respectively.</i>					
	Patterns	#	Primary Pattern	Secondary Pattern	Exposures	
(3)		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), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SN2014J	RA: 09 55 42.1400 (148.9255833d) Dec: +69 40 26.00 (69.67389d) Equinox: J2000		V=10+/-1	Reference Frame: ICRS

Proposal 14146 - sn2014j-7th (03) - Light Echoes and Environment of SN 2014J in M82

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
Exposures	1	f555w-36-1	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10	GS ACQ SCENARI O BASE1B3	Pattern 3, Exps 1-1 i n sn2014j-7th (03) (3)	36 Secs (144 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	2	f555w-36-2	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10		Pattern 3, Exps 2-2 i n sn2014j-7th (03) (3)	36 Secs (144 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	3	f555w-36-3	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F555W	FLASH=10		Pattern 3, Exps 3-3 i n sn2014j-7th (03) (3)	36 Secs (144 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	4	f438w-112- 1	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 4-4 i n sn2014j-7th (03) (3)	112 Secs (448 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	5	f438w-112- 2	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 5-5 i n sn2014j-7th (03) (3)	112 Secs (448 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	6	f438w-112- 3	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F438W	FLASH=11		Pattern 3, Exps 6-6 i n sn2014j-7th (03) (3)	112 Secs (448 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]
	7	f502n-224-1	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F502N	FLASH=11		Pattern 3, Exps 7-7 i n sn2014j-7th (03) (3)	224 Secs (896 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
	8	f502n-224-2	(1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F502N	FLASH=11		Pattern 3, Exps 8-8 i n sn2014j-7th (03) (3)	224 Secs (896 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]

Proposal 14146 - sn2014j-7th (03) - Light Echoes and Environment of SN 2014J in M82

9	f502n-224-3 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F502N	FLASH=11	Pattern 3, Exps 9-9 in sn2014j-7th (03) (3)	224 Secs (896 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[2]
10	f658n-224-1 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F658N	FLASH=11	Pattern 3, Exps 10-10 in sn2014j-7th (03) (3)	224 Secs (896 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]
11	f658n-224-2 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F658N	FLASH=11	Pattern 3, Exps 11-11 in sn2014j-7th (03) (3)	224 Secs (896 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]
12	f658n-224-3 (1) SN2014J	WFC3/UVIS, ACCUM, UVIS2-C512C-SUB	F658N	FLASH=11	Pattern 3, Exps 12-12 in sn2014j-7th (03) (3)	224 Secs (896 Secs) [==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[3]

