16078 - Late Time Photometry of a Type Ia Supernova with an Early, Red Light Curve Excess

Cycle: 27, 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) SN2018AOZ	WFC3/UVIS	2	20-Mar-2020 18:00:17.0	yes
02	(1) SN2018AOZ	WFC3/IR	1	20-Mar-2020 18:00:18.0	yes
03	(1) SN2018AOZ	WFC3/UVIS	1	20-Mar-2020 18:00:19.0	yes

4 Total Orbits Used

ABSTRACT

Type Ia supernovae (SNe) are essential cosmological distance indicators, but despite their intense study we still do not definitively know their progenitor systems or how exactly the carbon oxygen white dwarf ultimately explodes. We propose to observe the fading optical+NIR light of the nearby SN 2018aoz, which displayed an early, red light curve excess or `bump', but was an otherwise normal SN Ia. This excess may point to a so-

called double detonation explosion, shocking of a companion star by the SN ejecta, or an unusual nickel distribution -- or a combination of several of these possibilities. Very late time SN Ia light curves -- only possible with HST -- can distinguish between progenitor and explosion scenarios by constraining the abundance of 57Co and thus can corroborate (or reject) the light curve signatures seen at early times. These observations are essential for building up a clear and comprehensive picture of this otherwise normal SN Ia; similar early time light curve features have only been observable within the last few years, and none with the dramatic early red feature that we witness in SN 2018aoz.

OBSERVING DESCRIPTION

We propose to observe the late-time light curve of the Type Ia supernova (SN Ia) SN 2018aoz in one visit with WFC3. In four orbits, we will use F438W, F555W, F600LP, and F110W. For the UVIS filters, a WFC3-UVIS-DITHER-LINE-3PT dithering pattern is used, and for the F110W filter, we use the WFC3-IR-DITHER-LINE pattern.

Visit

Proposal 16078, visit1 (01), implementation Fri Mar 20 22:00:19 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: BETWEEN 01-JUN-2020:00:00:00 AND 30-AUG-2020:00:00:00; GROUP 01,02,03 WITHIN 7D

Comments: Observations of SN2018aoz. We'll take images in the F438W, F555W, F600LP, and F110W filters.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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), (3)

Fixed Targets

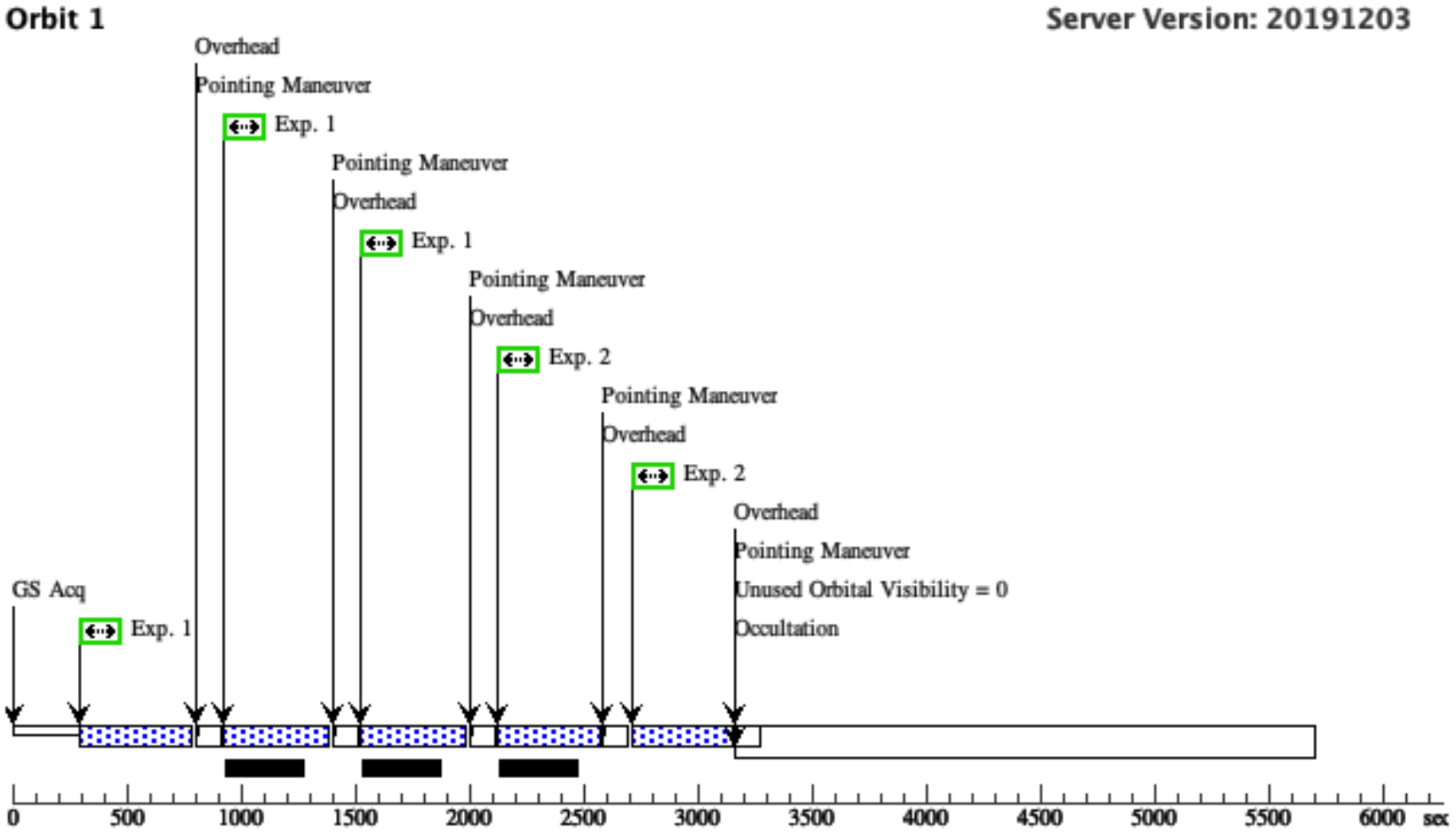
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2018AOZ	RA: 11 51 1.7900 (177.7574583d) Dec: -28 44 38.40 (-28.74400d) Equinox: J2000		V=26.5+/-0.5	Reference Frame: ICRS

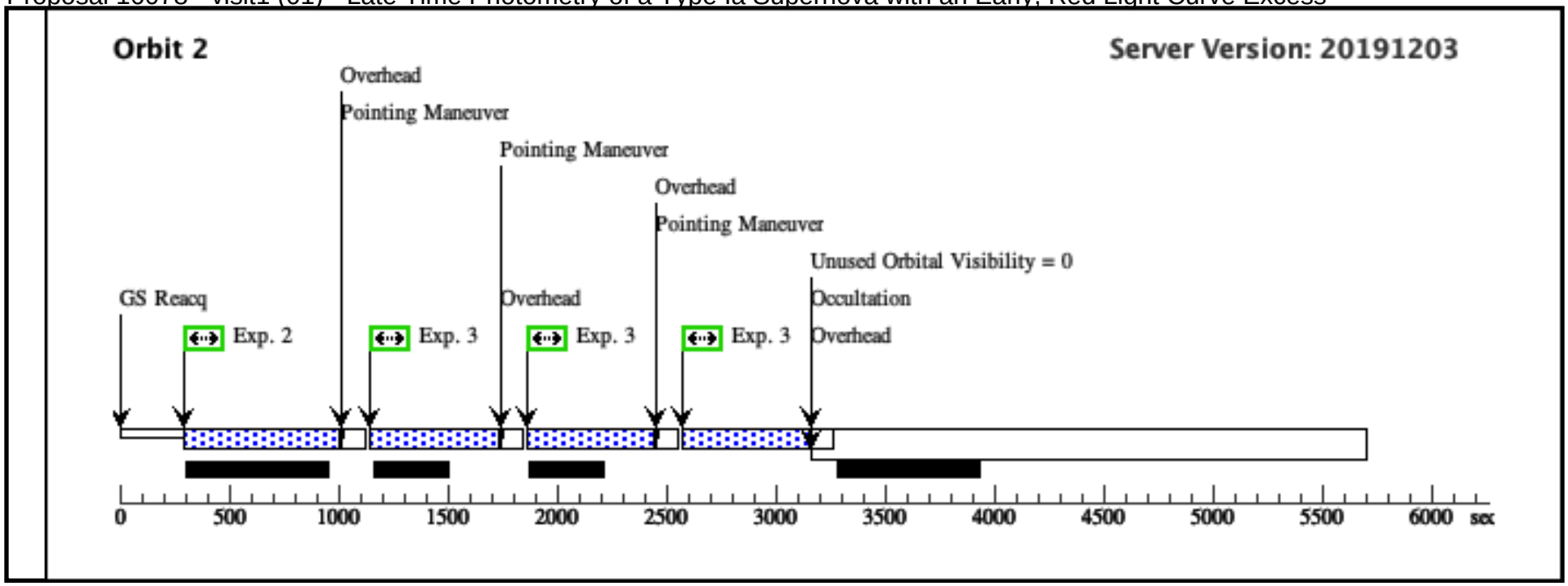
Comments:
Category=STAR
Description=[SUPERNOVA TYPE IA]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F438W	(1) SN2018AOZ	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=9		Pattern 1, Exps 1-1 in visit1 (01) (1)	465 Secs (1395 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[1]***
								[==>(Pattern 3)]	
2	F438W	(1) SN2018AOZ	WFC3/UVIS, ACCUM, UVIS2	F438W	FLASH=9		Pattern 1, Exps 2-2 in visit1 (01) (1)	500 Secs (1601 Secs)	
								[==>450.0 Secs (Pattern 1)]	***[1]***
								[==>443.0 Secs (Pattern 2)]	
								[==>708.0 Secs (Pattern 3)]	***[2]***
3	F600LPW	(1) SN2018AOZ	WFC3/UVIS, ACCUM, UVIS2	F600LP			Pattern 1, Exps 3-3 in visit1 (01) (1)	580 Secs (1740 Secs)	
								[==>(Pattern 1)]	
								[==>(Pattern 2)]	***[2]***
								[==>(Pattern 3)]	

Orbit Structure




Orbit 2
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Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Pointing Maneuver
Unused Orbital Visibility = 0
GS Reacq
Exp. 2
Exp. 3
Overhead
Exp. 3
Exp. 3
Occultation
Overhead
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 16078, visit2 (02) Fri Mar 20 22:00:19 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: GROUP 02,01,03 WITHIN 7D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFC3-IR-DITHER-LINE-3PT Purpose=DITHER Number Of Points=3 Point Spacing=0.605 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=41.788 Angle Between Sides= Center Pattern=false		(1), (2)

Fixed Targets

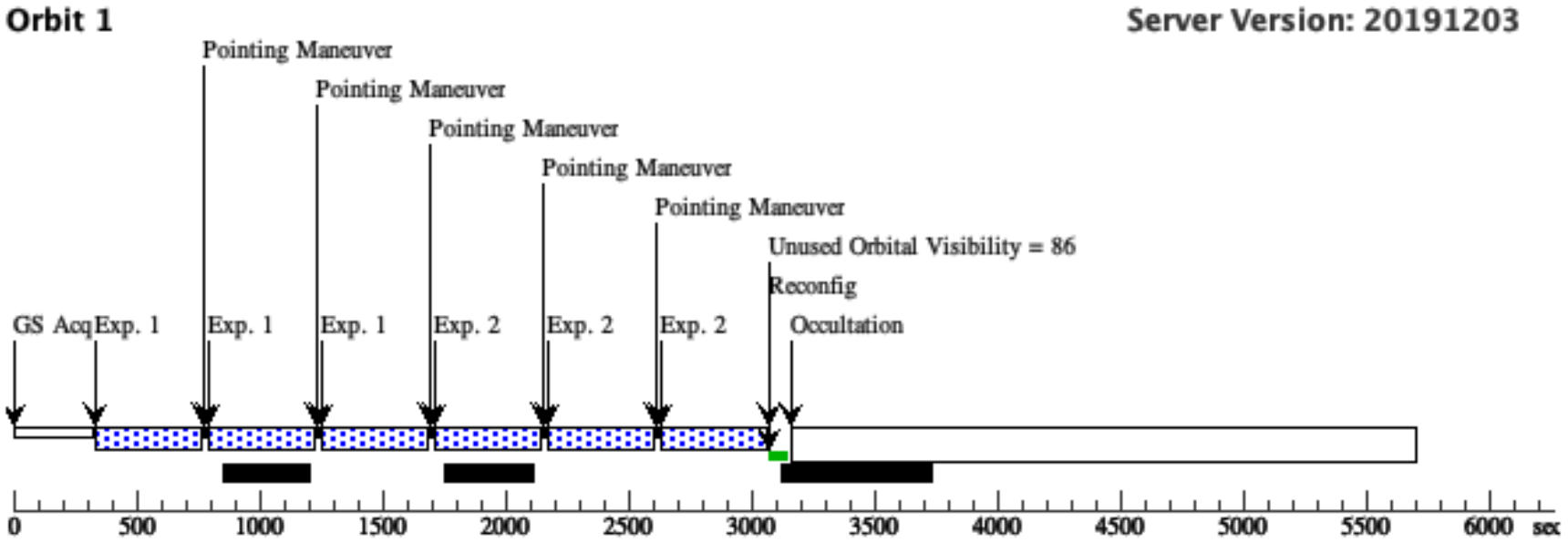
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2018AOZ	RA: 11 51 1.7900 (177.7574583d) Dec: -28 44 38.40 (-28.74400d) Equinox: J2000		V=26.5+/-0.5	Reference Frame: ICRS

Comments:
Category=STAR
Description=[SUPERNOVA TYPE IA]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F110W	(1) SN2018AOZ	WFC3/IR, MULTIACCUM, IR-UVIS	F110W	NSAMP=10; SAMP-SEQ=STEP100		Pattern 2, Exps 1-1 in visit2 (02) (2)	399.231646 Secs (1197.695 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2	F110W	(1) SN2018AOZ	WFC3/IR, MULTIACCUM, IR-UVIS	F110W	NSAMP=10; SAMP-SEQ=STEP100		Pattern 2, Exps 2-2 in visit2 (02) (2)	399.231646 Secs (1197.695 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***

Orbit Structure



Visit

Proposal 16078, visit3 (03) Fri Mar 20 22:00:20 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: GROUP 03,01,02 WITHIN 7D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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)	SN2018AOZ	RA: 11 51 1.7900 (177.7574583d) Dec: -28 44 38.40 (-28.74400d) Equinox: J2000		V=26.5+/-0.5	Reference Frame: ICRS

Comments:
Category=STAR
Description=[SUPERNOVA TYPE IA]
Extended=NO

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F555W	(1) SN2018AOZ	WFC3/UVIS, ACCUM, UVIS2	F555W			Pattern 1, Exps 1-1 in visit3 (03) (1)	856 Secs (2568 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	*[1]*

Orbit Structure