16683 - Radioactive Stars: Bound Remnants from White Dwarf Supernovae

Cycle: 29, 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) SN2019GSC	WFC3/IR WFC3/UVIS	3	23-Jun-2022 15:00:19.0	yes
02	(2) SN2019MUJ	WFC3/IR WFC3/UVIS	3	23-Jun-2022 15:00:21.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(3) SN2020KYG	WFC3/IR WFC3/UVIS	3	23-Jun-2022 15:00:23.0	yes
53	(3) SN2020KYG	WFC3/UVIS	1	23-Jun-2022 15:00:24.0	yes

10 Total Orbits Used

ABSTRACT

Type Ia supernovae (SN Ia) have enormous importance to cosmology and astrophysics, but their progenitors and explosion mechanisms are not understood in detail. Recently, observations and theoretical models have suggested that not all thermonuclear white-dwarf supernova explosions are normal SN Ia. In particular, type Iax supernovae (SN Iax, peculiar cousins to SN Ia), are thought to be exploding white dwarfs that are not completely disrupted, leaving behind a bound remnant. We propose late-time HST WFC3 observations of three recent SN Iax to directly observe if they each harbor a bound remnant, with a radiation-driven wind. Our program is designed to discover a new category of stars, powered by radioactivity, and to show that some thermonuclear supernovae are not terminal events in the life of their progenitor white dwarfs (unlike the complete disruption thought to occur in normal SN Ia).

OBSERVING DESCRIPTION

We will obtain late-time HST photometry of three nearby type Iax supernovae (SN Iax): SN 2019gsc, 2019muj, and 2020kyg. Each object will be observed in one three-orbit visit, with WFC3/UVIS F555W, F814W, and WFC3/IR F125W using one orbit per filter.

We will use a 4 point dither in each orbit. For the WFC3/UVIS data, we will mitigate CTE losses by placing the target near the readout amplifier using one of the CTE apertures. The exposure times (about 600 seconds per dither position) give a sky background count level approaching or exceeding the recommended 20 e- and the fields also contain light from the supernova host galaxies, so we do not think post-flash illumination will be necessary.

For SN 2019muj, we include a timing constraint to observe late in the cycle to allow for more contrast between the expectations of SN ejecta flux and the bound remant flux we are searching for.

Visit

Proposal 16683, Visit 01, scheduling Thu Jun 23 19:00:24 GMT 2022

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 1, Exps 1-1 in Visit 01)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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)

Fixed Targets

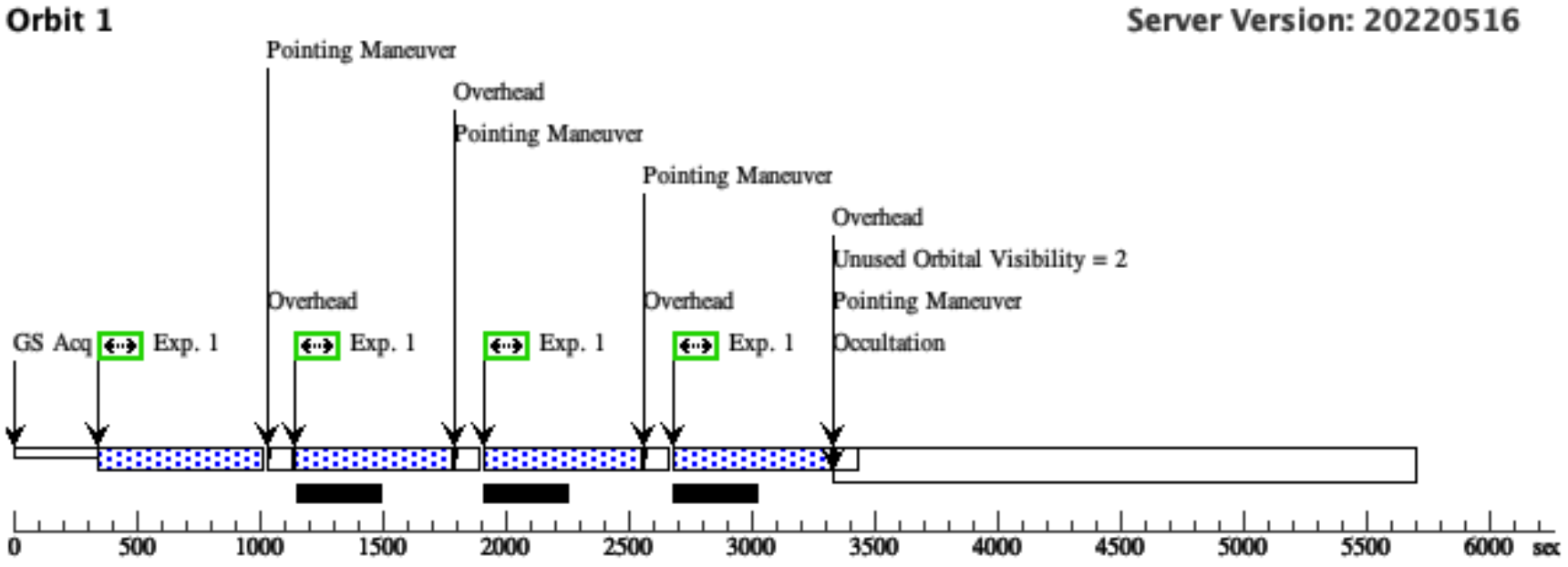
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2019GSC	RA: 14 37 45.2490 (219.4385375d) Dec: +52 43 36.28 (52.72674d) Equinox: J2000		V=25.4+/-0.5	Reference Frame: ICRS

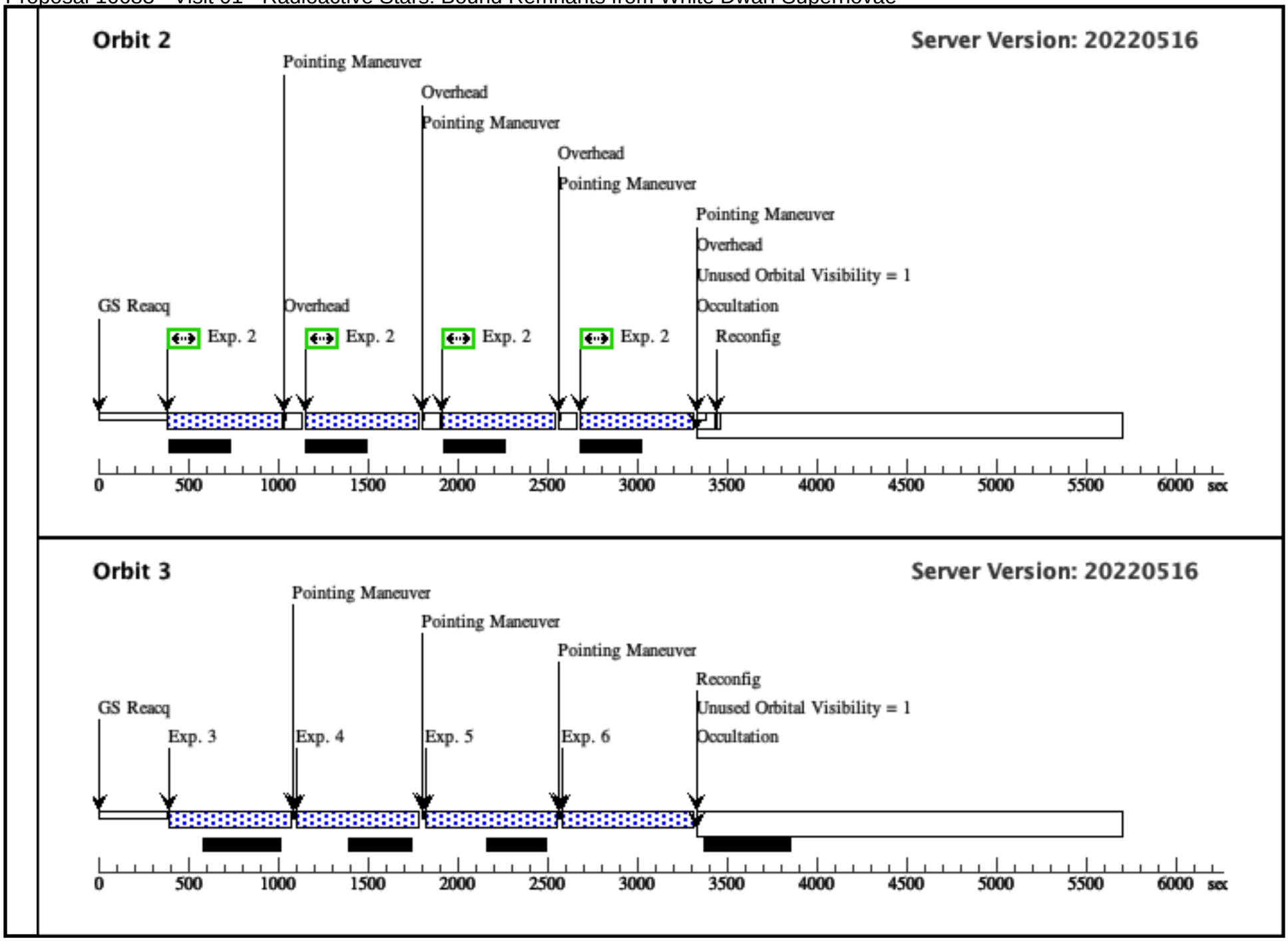
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) SN2019GSC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W			Pattern 1, Exps 1-1 in Visit 01 (1)	639 Secs (2556 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(1) SN2019GSC	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F555W			Pattern 1, Exps 2-2 in Visit 01 (1)	637 Secs (2548 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
3		(1) SN2019GSC	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 0.000,0.000		652.938154 Secs (652.938 Secs) *[==>]*	***[3]***
4		(1) SN2019GSC	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 0.542,0.182		652.938154 Secs (652.938 Secs) *[==>]*	***[3]***
5		(1) SN2019GSC	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG 0.339,0.485		702.938605 Secs (702.939 Secs) *[==>]*	***[3]***
6		(1) SN2019GSC	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=15	POS TARG -0.203,0.303		702.938605 Secs (702.939 Secs) *[==>]*	***[3]***

Orbit Structure

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Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Overhead
Unused Orbital Visibility = 1
Occultation
Reconfig
GS Reacq
Overhead
Exp. 2
Exp. 2
Exp. 2
Exp. 2
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2000
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3500
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4500
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5500
6000
sec
Orbit 3
Server Version: 20220516
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 1
Occultation
GS Reacq
Exp. 3
Exp. 4
Exp. 5
Exp. 6
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2500
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Visit

Proposal 16683, Visit 02, scheduling Thu Jun 23 19:00:24 GMT 2022

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: AFTER 18-JUN-2022:00:00:00

Diagnostics

(Exposure 1 (Pattern 1, Exps 1-1 in Visit 02)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

(Exposure 2 (Pattern 1, Exps 2-2 in Visit 02)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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)

Fixed Targets

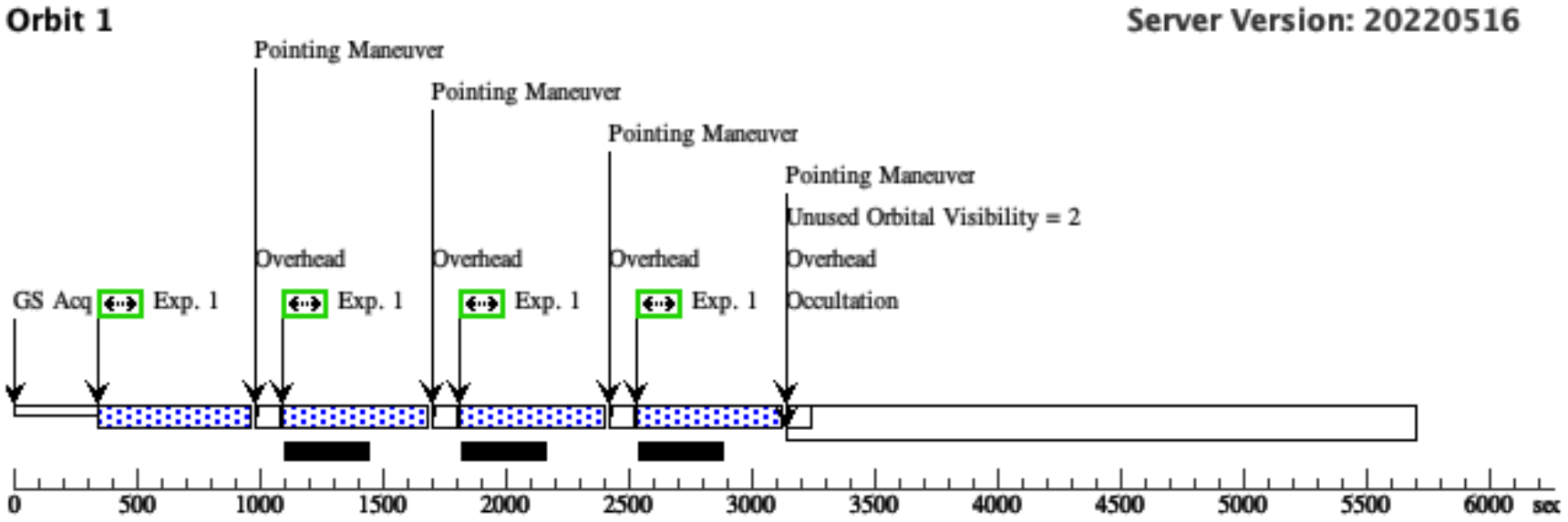
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SN2019MUJ	RA: 02 26 18.5200 (36.5771667d) Dec: -09 50 9.39 (-9.83594d) Equinox: J2000		V=26.6+/-0.5	Reference Frame: ICRS

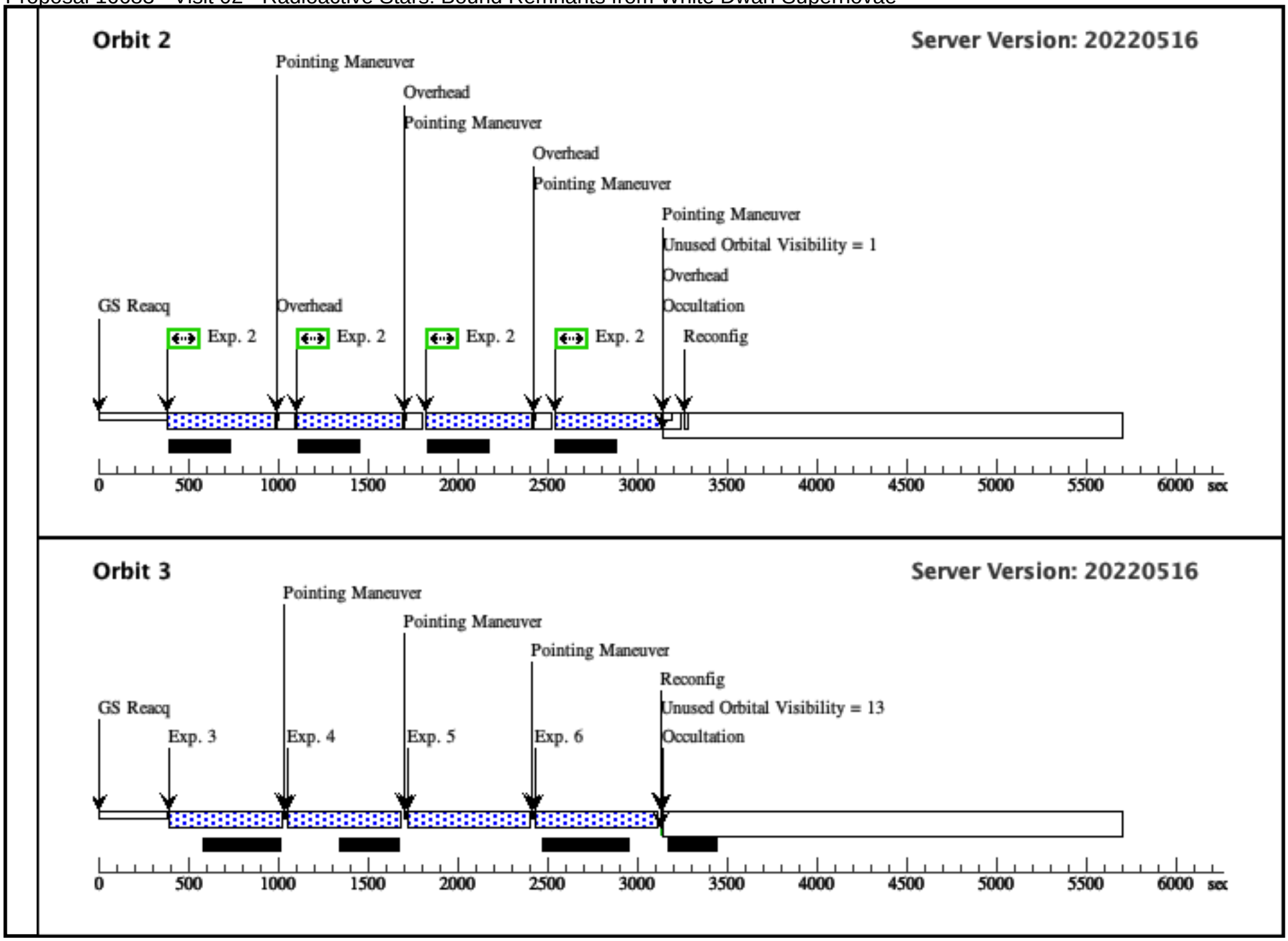
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(2) SN2019MUJ	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W			Pattern 1, Exps 1-1 in Visit 02 (1)	592 Secs (2368 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(2) SN2019MUJ	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F555W			Pattern 1, Exps 2-2 in Visit 02 (1)	590 Secs (2360 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
3		(2) SN2019MUJ	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=13	POS TARG 0.000,0.000		602.937703 Secs (602.938 Secs) *[==>]*	***[3]***
4		(2) SN2019MUJ	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=13	POS TARG 0.542,0.182		602.937703 Secs (602.938 Secs) *[==>]*	***[3]***
5		(2) SN2019MUJ	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 0.339,0.485		652.938154 Secs (652.938 Secs) *[==>]*	***[3]***
6		(2) SN2019MUJ	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -0.203,0.303		652.938154 Secs (652.938 Secs) *[==>]*	***[3]***

Orbit Structure




Orbit 2
Server Version: 20220516
Pointing Maneuver
Overhead
Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 1
Overhead
Occultation
GS Reacq
Overhead
Exp. 2
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Exp. 2
Reconfig
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Orbit 3
Server Version: 20220516
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 13
Occultation
GS Reacq
Exp. 3
Exp. 4
Exp. 5
Exp. 6
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Visit

Proposal 16683, Visit 03, failed Thu Jun 23 19:00:24 GMT 2022

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 1, Exps 1-1 in Visit 03)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

(Exposure 2 (Pattern 1, Exps 2-2 in Visit 03)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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)

Fixed Targets

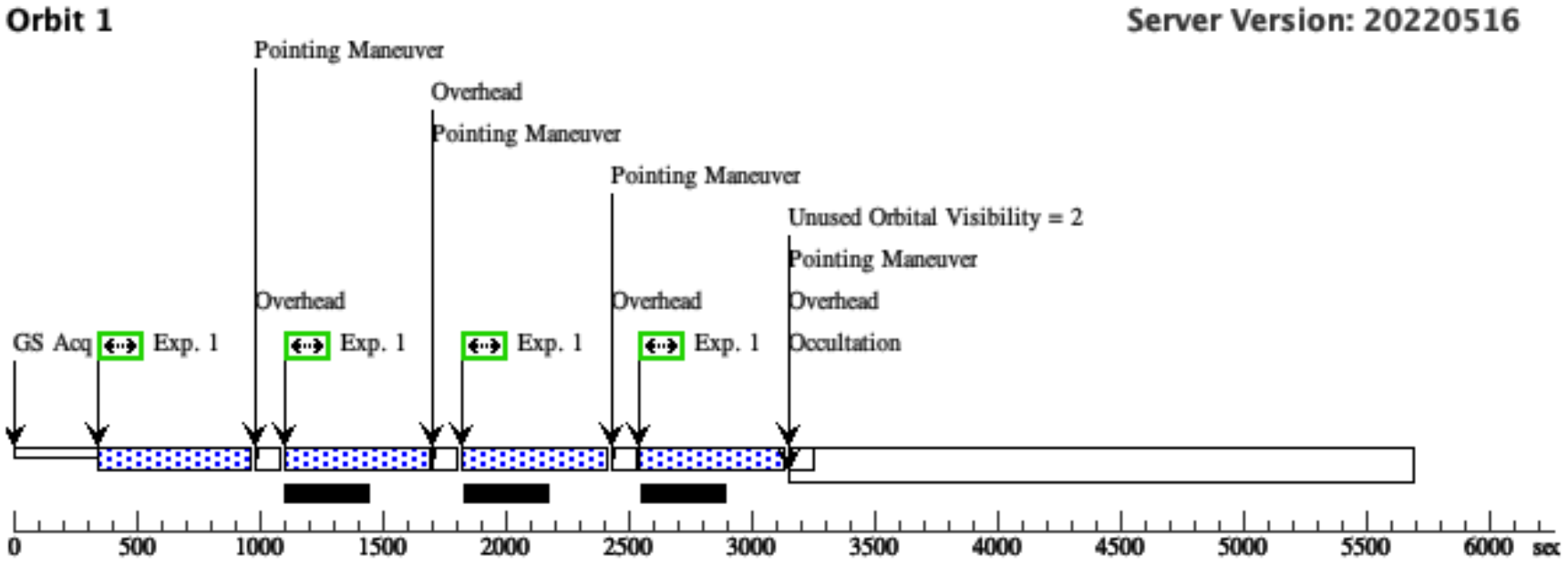
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SN2020KYG	RA: 13 11 39.6030 (197.9150125d) Dec: +22 54 55.85 (22.91551d) Equinox: J2000		V=26.0+/-0.5	Reference Frame: ICRS

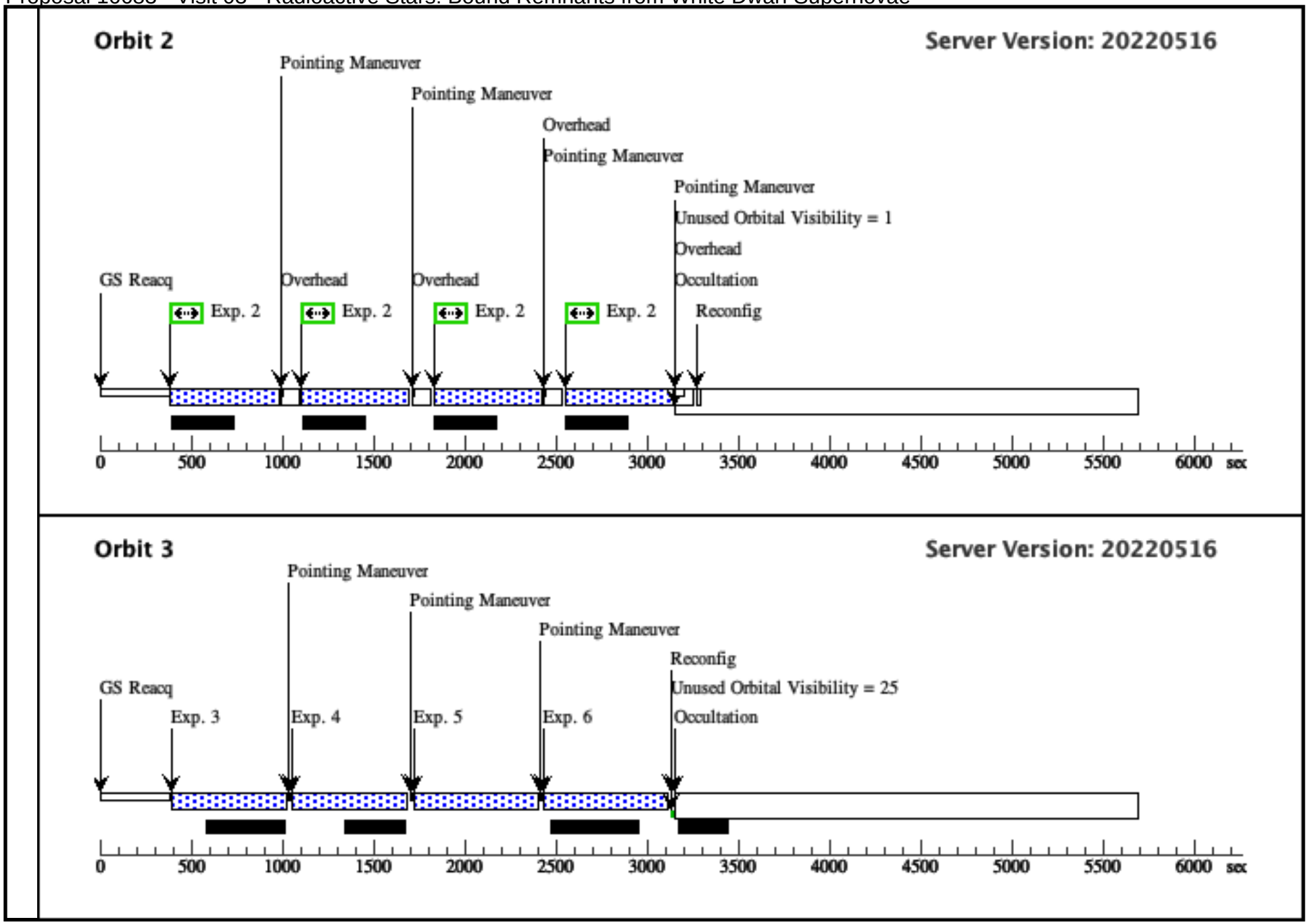
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SN2020KYG	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W			Pattern 1, Exps 1-1 in Visit 03 (1)	595 Secs (2380 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***
2		(3) SN2020KYG	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F555W			Pattern 1, Exps 2-2 in Visit 03 (1)	593 Secs (2372 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
3		(3) SN2020KYG	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=13	POS TARG 0.000,0.000		602.937703 Secs (602.938 Secs) *[==>]*	***[3]***
4		(3) SN2020KYG	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=13	POS TARG 0.542,0.182		602.937703 Secs (602.938 Secs) *[==>]*	***[3]***
5		(3) SN2020KYG	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG 0.339,0.485		652.938154 Secs (652.938 Secs) *[==>]*	***[3]***
6		(3) SN2020KYG	WFC3/IR, MULTIACCUM, IR	F125W	SAMP-SEQ=SPARS50; NSAMP=14	POS TARG -0.203,0.303		652.938154 Secs (652.938 Secs) *[==>]*	***[3]***

Orbit Structure




Orbit 2
Server Version: 20220516
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Pointing Maneuver
Overhead
Pointing Maneuver
Pointing Maneuver
Unused Orbital Visibility = 1
Overhead
Occultation
GS Reacq
Overhead
Overhead
Exp. 2
Exp. 2
Exp. 2
Exp. 2
Reconfig
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Orbit 3
Server Version: 20220516
Pointing Maneuver
Pointing Maneuver
Pointing Maneuver
Reconfig
Unused Orbital Visibility = 25
GS Reacq
Exp. 3
Exp. 4
Exp. 5
Exp. 6
Occultation
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sec

Visit

Proposal 16683, Visit 53 Thu Jun 23 19:00:25 GMT 2022

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Diagnostics

(Exposure 1 (Pattern 1, Exps 1-1 in Visit 53)) Warning (Form): FLASH level may be too low for this exposure or a short subexposure. See extended explanation in the diagnostic browser

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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
(3)	SN2020KYG	RA: 13 11 39.6030 (197.9150125d) Dec: +22 54 55.85 (22.91551d) Equinox: J2000		V=26.0+/-0.5	Reference Frame: ICRS

Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SN2020KYG	WFC3/UVIS, ACCUM, UVIS2-C1K1C-CTE	F814W			Pattern 1, Exps 1-1 in Visit 53 (1)	595 Secs (2380 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[1]***

Orbit Structure