18069 - Requiem's Return: Precision cosmology from a decade-delayed, strongly-lensed supernova and its new sibling

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

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Prof. Brenda Louise Frye (CoI)	University of Arizona
Aadya Agrawal (CoI)	University of Illinois at Urbana - Champaign

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SN-R4	WFC3/IR	2	01-Dec-2025 11:00:29.0	yes
02	(1) SN-R4	WFC3/IR	2	01-Dec-2025 11:00:30.0	yes
03	(1) SN-R4	WFC3/IR	2	01-Dec-2025 11:00:30.0	yes
04	(1) SN-R4	WFC3/IR	2	01-Dec-2025 11:00:31.0	yes
05	(1) SN-R4	WFC3/IR	2	01-Dec-2025 11:00:32.0	yes
06	(1) SN-R4	WFC3/IR	2	01-Dec-2025 11:00:32.0	yes
07	(1) SN-R4	WFC3/IR	2	01-Dec-2025 11:00:33.0	yes

14 Total Orbits Used

ABSTRACT

This program will capture the reappearance of a strongly lensed Type Ia supernova (SN Ia), SN Requiem, a decade after its initial discovery. Lensed by the galaxy cluster MACS J0138-2155, the first three images of SN Requiem at z=1.95 were seen in a 2016 HST visit; the fourth is predicted to appear a decade later. In 2023, this system became even more remarkable with JWST's discovery of a second lensed SN Ia in the same host galaxy,

named SN Encore. Detecting SN Requiem's fourth image enables the first joint Hubble constant (H0) measurement from two lensed SNe in one system. Using archival JWST, HST, and MUSE data, we built seven lens mass models of the cluster, incorporating both statistical and systematic uncertainties, to predict SN Requiem's reappearance. If H0 = 73 km/s/Mpc, the fourth image is expected in June-Nov 2026; if H0 = 67.4 km/s/Mpc, then Apr-Sept 2027. We propose two HST cycles to monitor the cluster and catch the reappearance, triggering JWST ToO imaging and spectroscopy upon detection to measure the longest-ever lensing time delay (~10 years). This allows a Requiem+Encore H0 measurement with <3% uncertainty -- the most precise from lensed SNe to date -- and directly addresses the Hubble tension between early- and late-Universe values. Our program leverages HST WFC3/IR as the most efficient tool to monitor the system and detect SN Requiem, and JWST to capture the full UV-NIR photometric and spectroscopic evolution of this rare event.

OBSERVING DESCRIPTION

We have used the existing HST detections of SN Requiem, in conjunction with our mass models and microlensing simulations, to predict the SN-R4 reappearance brightness range in HST F110W/F160W filters. These filters are the optimal choice as they are the most efficient means of sampling the rest-frame UV+optical SED of a z = 2 SN with HST, providing roughly rest-frame u + B and V band, respectively. These filters were used to detect SN Requiem in 2016, enabling immediate difference imaging at SN-R4 and a direct comparison to SN-R1,2,3. We choose 3sigma limiting magnitudes for both filters that enable a 2-filter detection for ~90% of the detection range. Reaching these depths requires 2 orbits (1.5 F160W, 0.5 F110W) per visit. If the SN is only detected in F160W, we will require detections in all (6) exposures across both orbits. We will monitor with ~monthly cadence during the HST visibility windows, corresponding to a ~10 rest-frame day cadence. This is designed such that during the monitoring windows we guarantee a pre-peak detection and near-peak JWST follow-up, as the rise time for SNe Ia is generally 15-20 rest-frame days. We require 7 visits in Cycle 33 and 6 in Cycle 34 considering a ~5 month gap when SN Requiem is behind the sun. The total HST request is therefore 2x7 + 2x6 = 26 orbits. Only one observing gap is filled with a JWST visit.

Visit

Proposal 18069, Visit 01, completed Mon Dec 01 16:00:33 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: BETWEEN 07-NOV-2025:00:00:00 AND 11-NOV-2025:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(7)

Fixed Targets

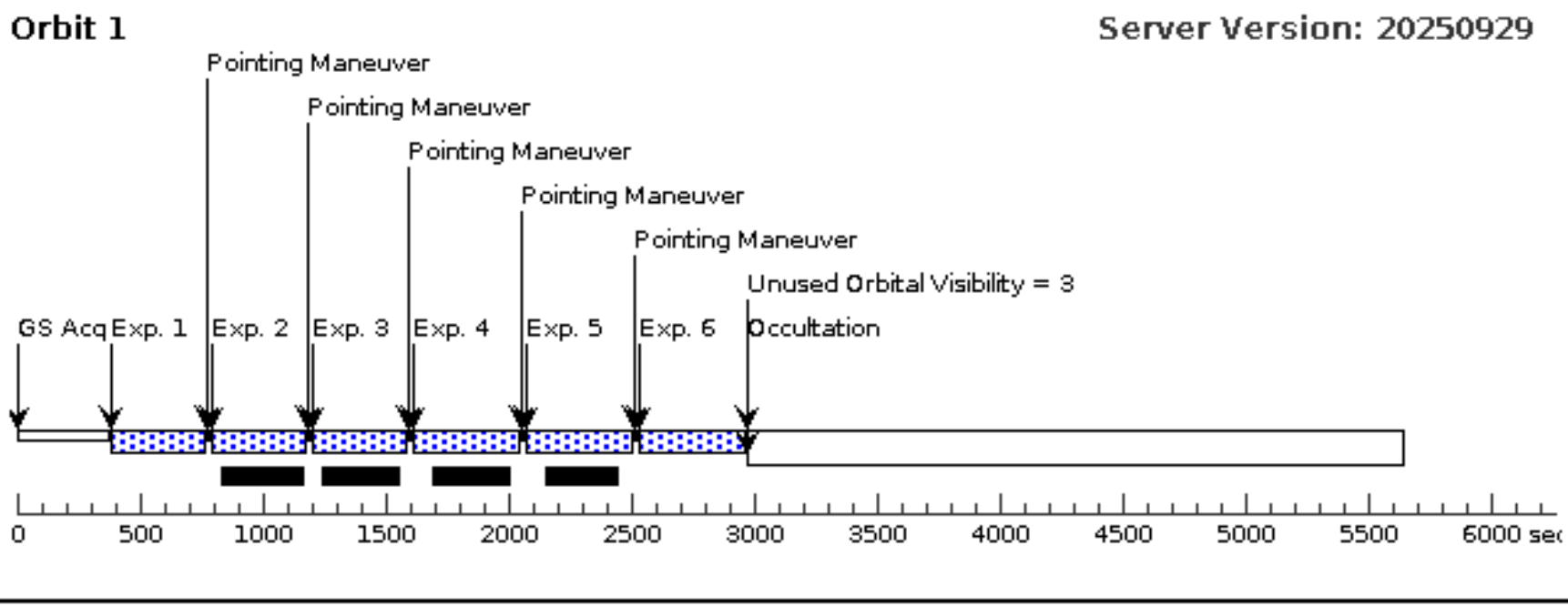
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-R4	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		V=26+/-1	Reference Frame: ICRS

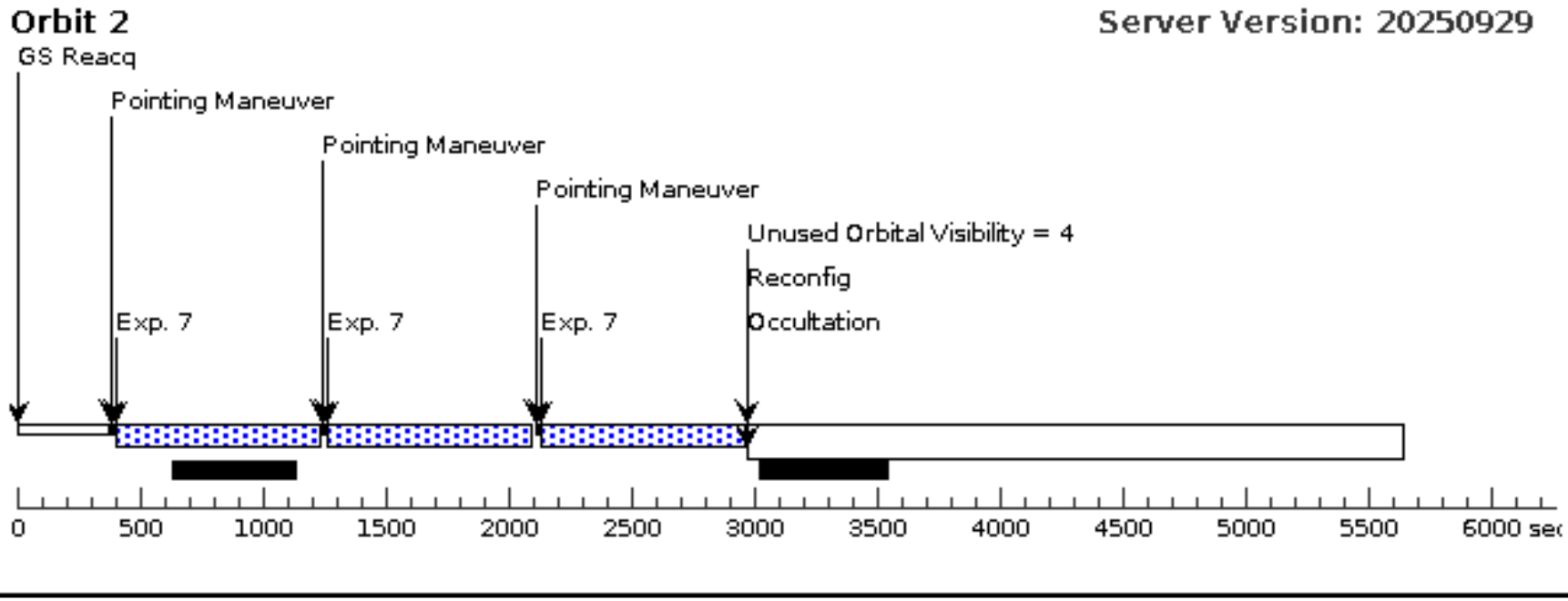
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0,0	Sequence 1-6 Non-Int in Visit 01	349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
2	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0.451,0.403	Sequence 1-6 Non-Int in Visit 01	349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
3	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG .474,.424	Sequence 1-6 Non-Int in Visit 01	349.232932 Secs (349.233 Secs) *[==>]*	*[1]*
4	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG .925,.827	Sequence 1-6 Non-Int in Visit 01	399.233383 Secs (399.233 Secs) *[==>]*	*[1]*
5	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 1.376,1.230	Sequence 1-6 Non-Int in Visit 01	399.233383 Secs (399.233 Secs) *[==>]*	*[1]*
6	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 0.902,0.806	Sequence 1-6 Non-Int in Visit 01	399.233383 Secs (399.233 Secs) *[==>]*	*[1]*
7		(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPARS100		Pattern 1, Exps 7-7 in Visit 01 (1)	802.934875 Secs (2408.805 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	*[2]*

Orbit Structure





Visit

Proposal 18069, Visit 02, implementation Mon Dec 01 16:00:34 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: BETWEEN 20-DEC-2025:00:00:00 AND 24-DEC-2025:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(7)

Fixed Targets

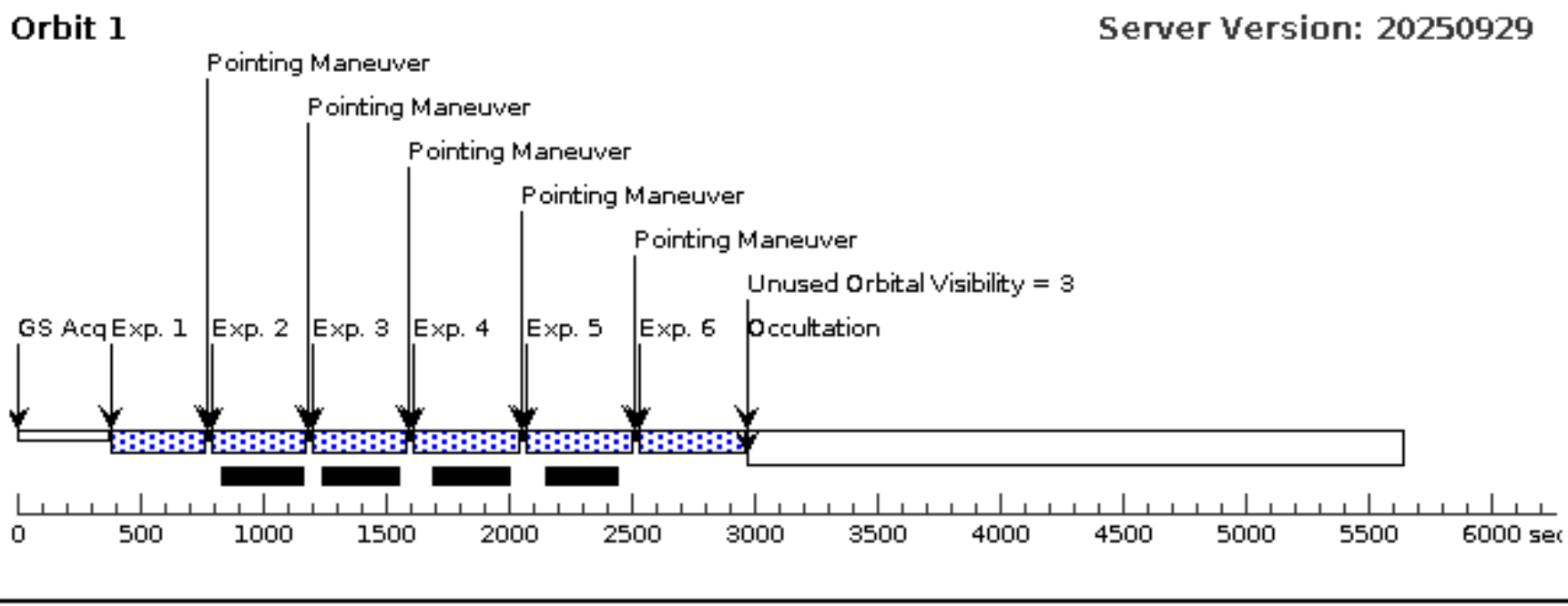
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-R4	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		V=26+/-1	Reference Frame: ICRS

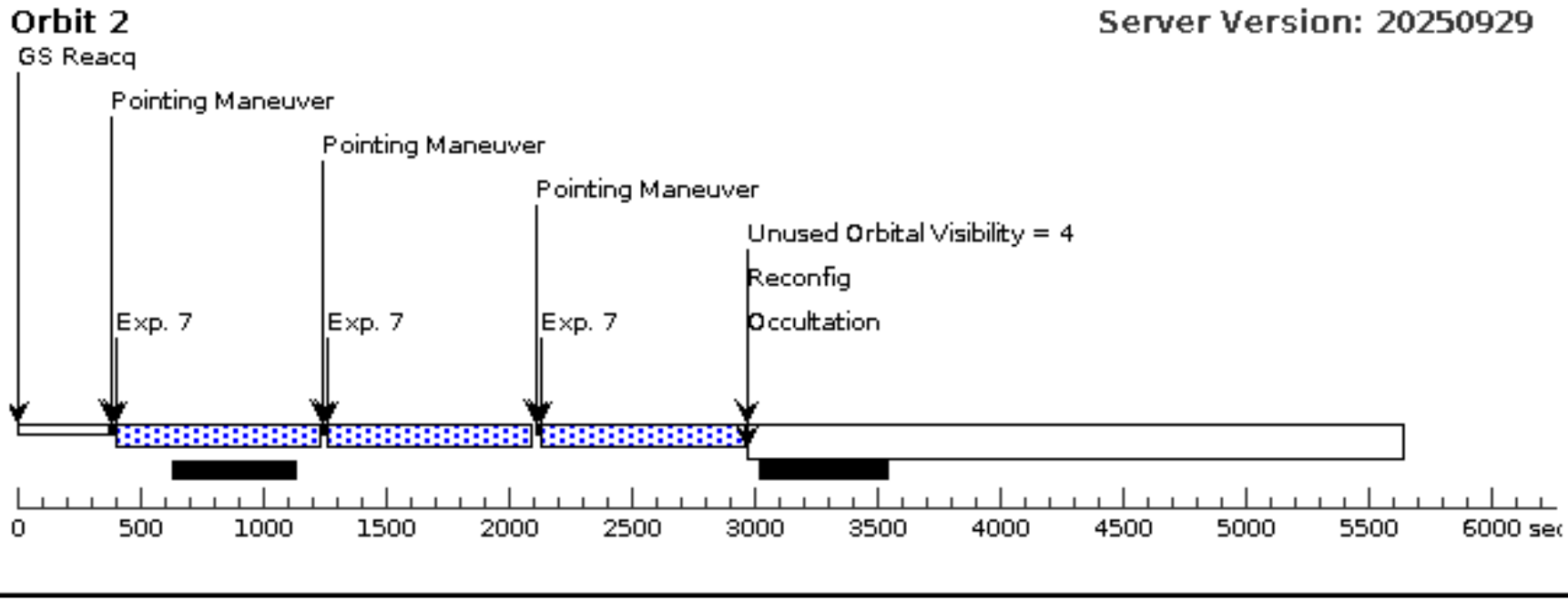
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0,0	Sequence 1-6 Non-Int in Visit 02	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
2	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0.451,0.403	Sequence 1-6 Non-Int in Visit 02	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
3	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG .474,.424	Sequence 1-6 Non-Int in Visit 02	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
4	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG .925,.827	Sequence 1-6 Non-Int in Visit 02	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
5	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 1.376,1.230	Sequence 1-6 Non-Int in Visit 02	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 0.902,0.806	Sequence 1-6 Non-Int in Visit 02	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7		(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPARS100		Pattern 1, Exps 7-7 in Visit 02 (1)	802.934875 Secs (2408.805 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 18069, Visit 03, implementation Mon Dec 01 16:00:34 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: BETWEEN 03-JUN-2026:00:00:00 AND 07-JUN-2026:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(7)

Fixed Targets

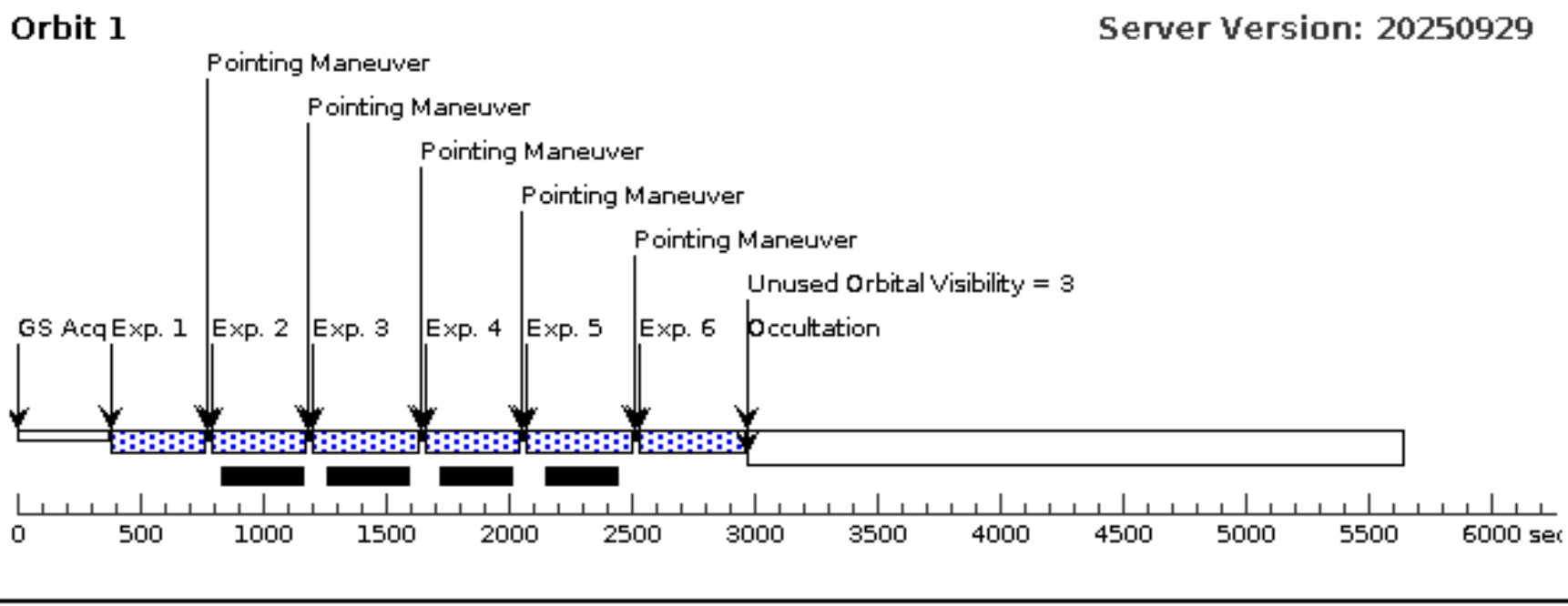
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-R4	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		V=26+/-1	Reference Frame: ICRS

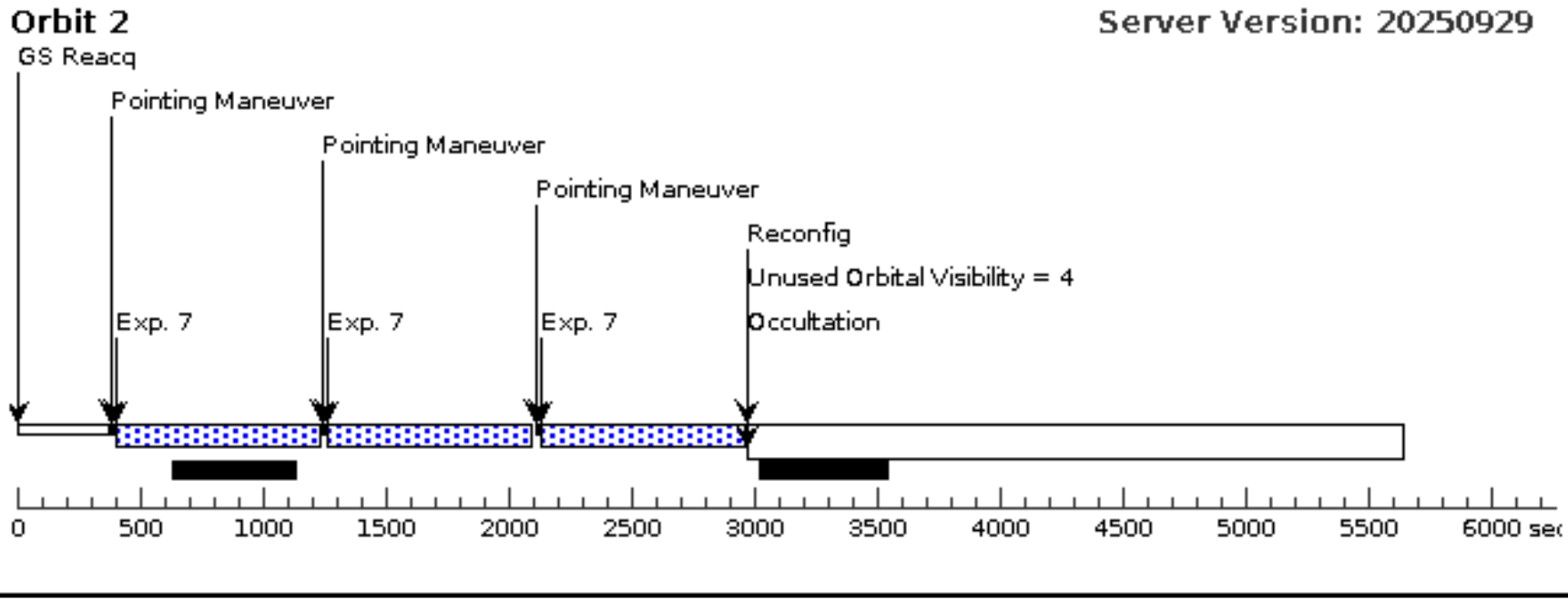
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0,0	Sequence 1-6 Non-Int in Visit 03	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
2	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0.451,0.403	Sequence 1-6 Non-Int in Visit 03	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
3	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG .474,.424	Sequence 1-6 Non-Int in Visit 03	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
4	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG .925,.827	Sequence 1-6 Non-Int in Visit 03	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
5	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 1.376,1.230	Sequence 1-6 Non-Int in Visit 03	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 0.902,0.806	Sequence 1-6 Non-Int in Visit 03	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7		(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPARS100		Pattern 1, Exps 7-7 in Visit 03 (1)	802.934875 Secs (2408.805 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 18069, Visit 04, implementation Mon Dec 01 16:00:34 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: AFTER 03 BY 27 D TO 33 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(7)

Fixed Targets

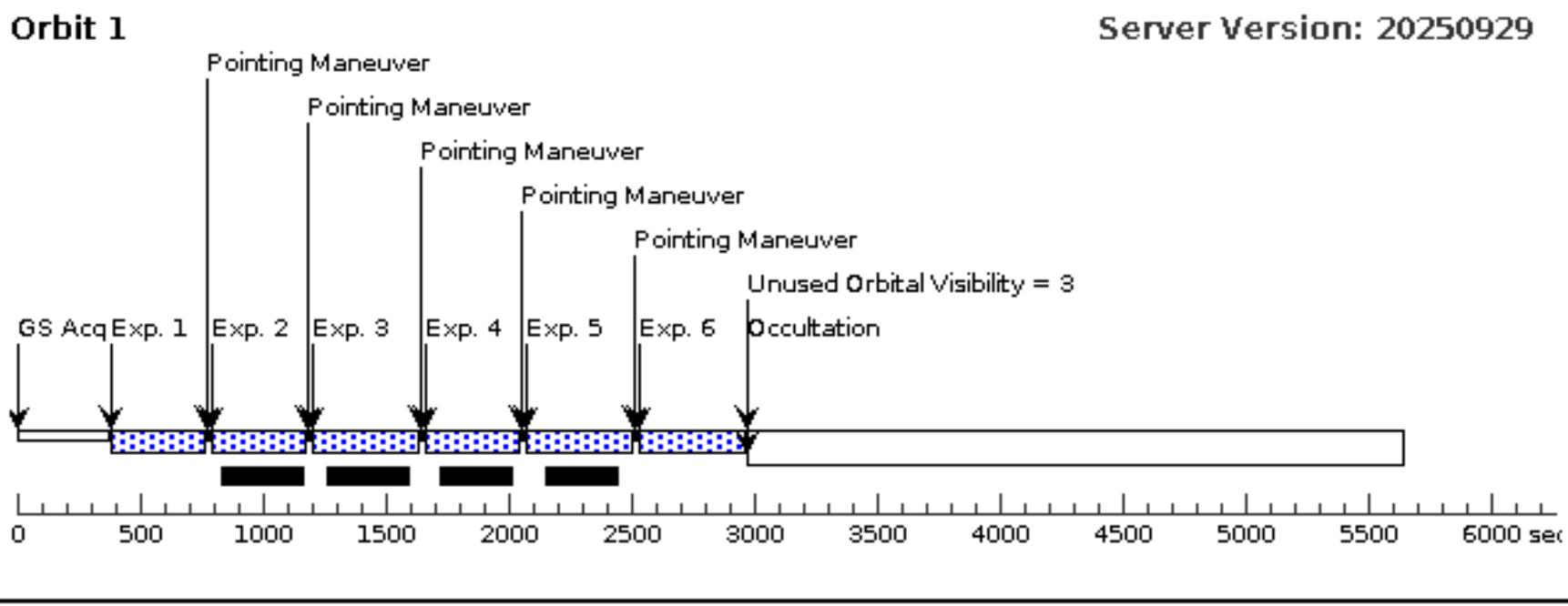
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-R4	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		V=26+/-1	Reference Frame: ICRS

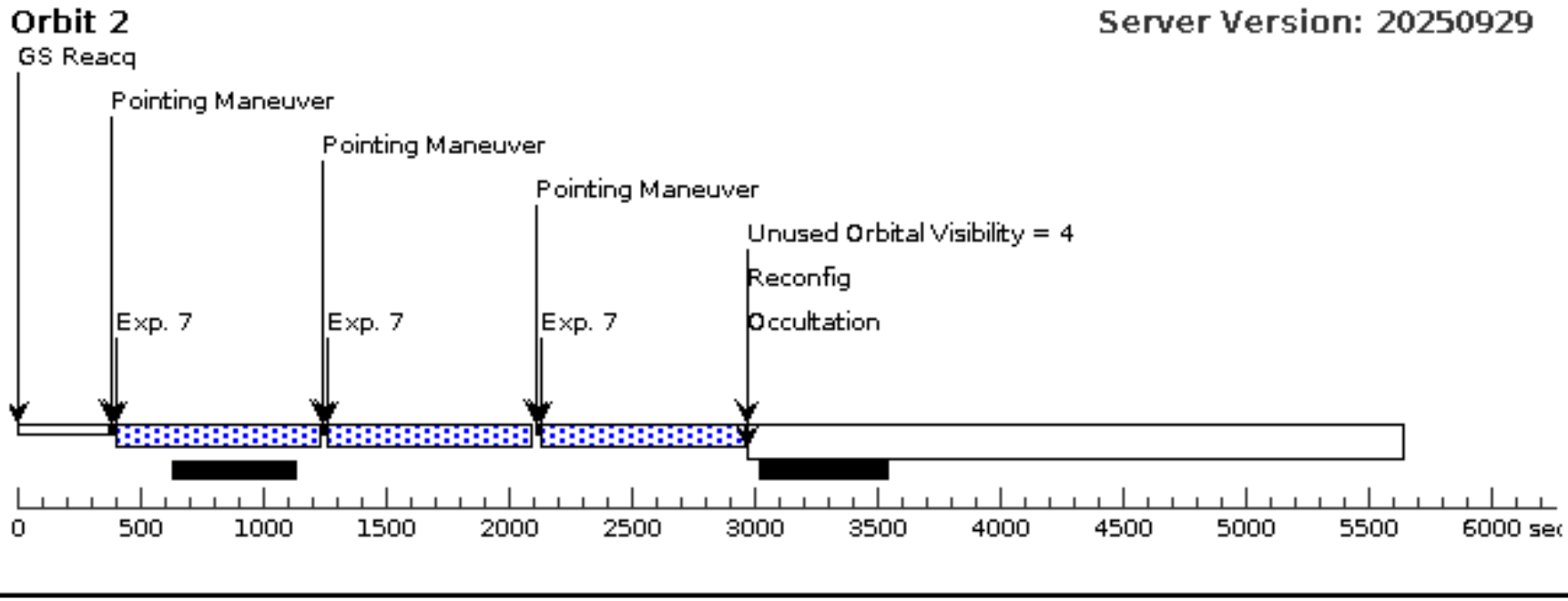
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0,0	Sequence 1-6 Non-Int in Visit 04	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
2	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0.451,0.403	Sequence 1-6 Non-Int in Visit 04	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
3	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG .474,.424	Sequence 1-6 Non-Int in Visit 04	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
4	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG .925,.827	Sequence 1-6 Non-Int in Visit 04	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
5	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 1.376,1.230	Sequence 1-6 Non-Int in Visit 04	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 0.902,0.806	Sequence 1-6 Non-Int in Visit 04	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7		(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPARS100		Pattern 1, Exps 7-7 in Visit 04 (1)	802.934875 Secs (2408.805 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 18069, Visit 05, implementation Mon Dec 01 16:00:34 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: AFTER 04 BY 27 D TO 33 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(7)

Fixed Targets

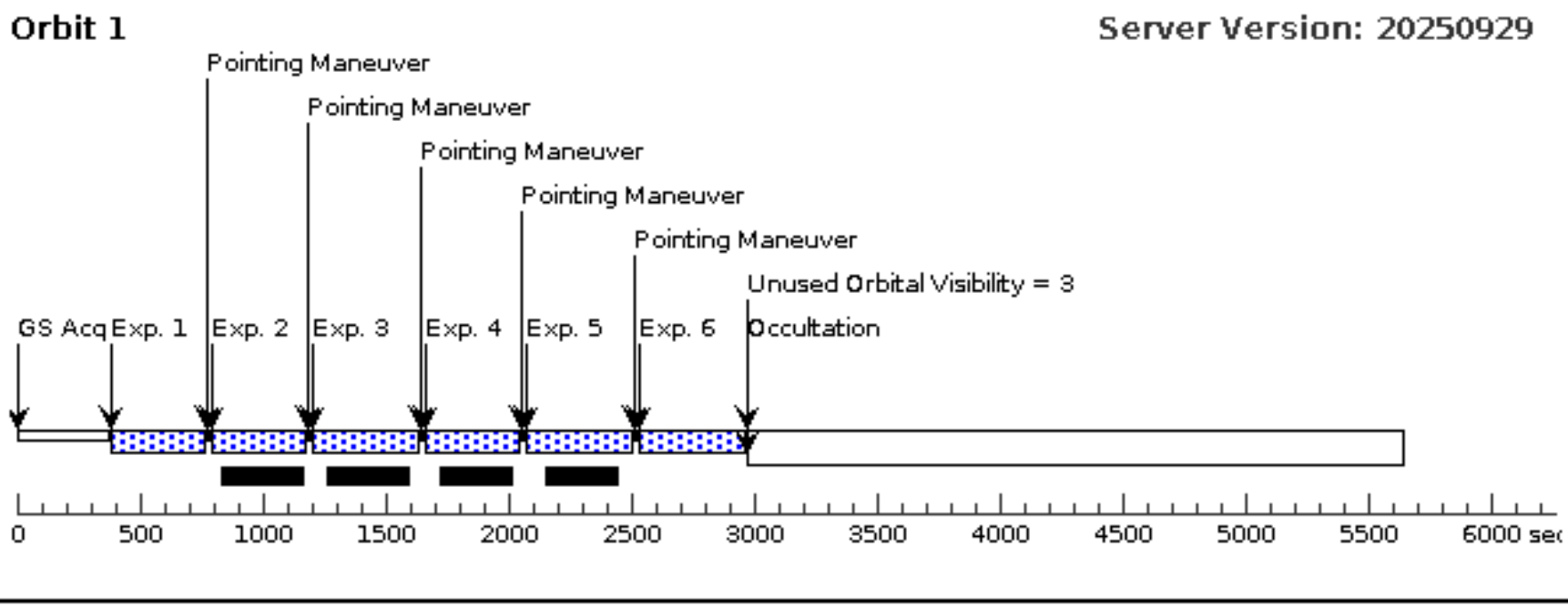
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-R4	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		V=26+/-1	Reference Frame: ICRS

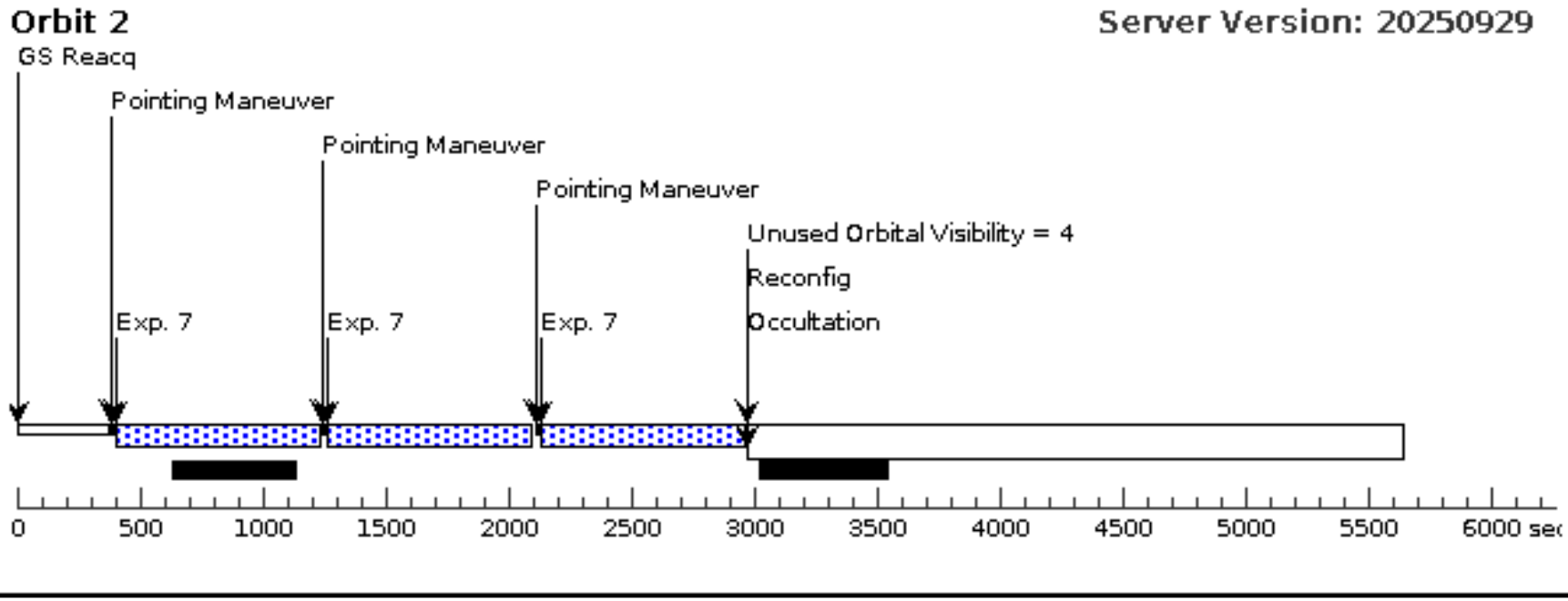
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0,0	Sequence 1-6 Non-Int in Visit 05	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
2	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0.451,0.403	Sequence 1-6 Non-Int in Visit 05	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
3	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG .474,.424	Sequence 1-6 Non-Int in Visit 05	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
4	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG .925,.827	Sequence 1-6 Non-Int in Visit 05	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
5	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 1.376,1.230	Sequence 1-6 Non-Int in Visit 05	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 0.902,0.806	Sequence 1-6 Non-Int in Visit 05	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7		(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPARS100		Pattern 1, Exps 7-7 in Visit 05 (1)	802.934875 Secs (2408.805 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 18069, Visit 06, implementation Mon Dec 01 16:00:34 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: BETWEEN 27-AUG-2026:00:00:00 AND 03-SEP-2026:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(7)

Fixed Targets

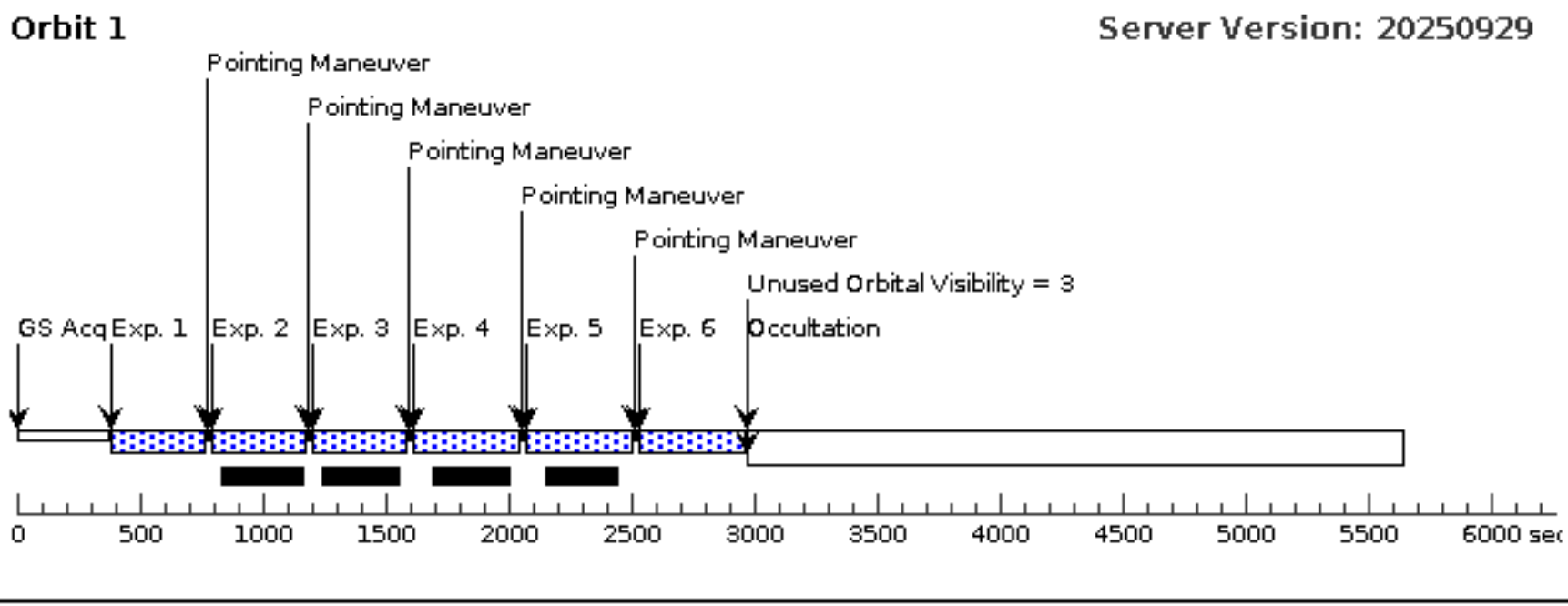
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-R4	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		V=26+/-1	Reference Frame: ICRS

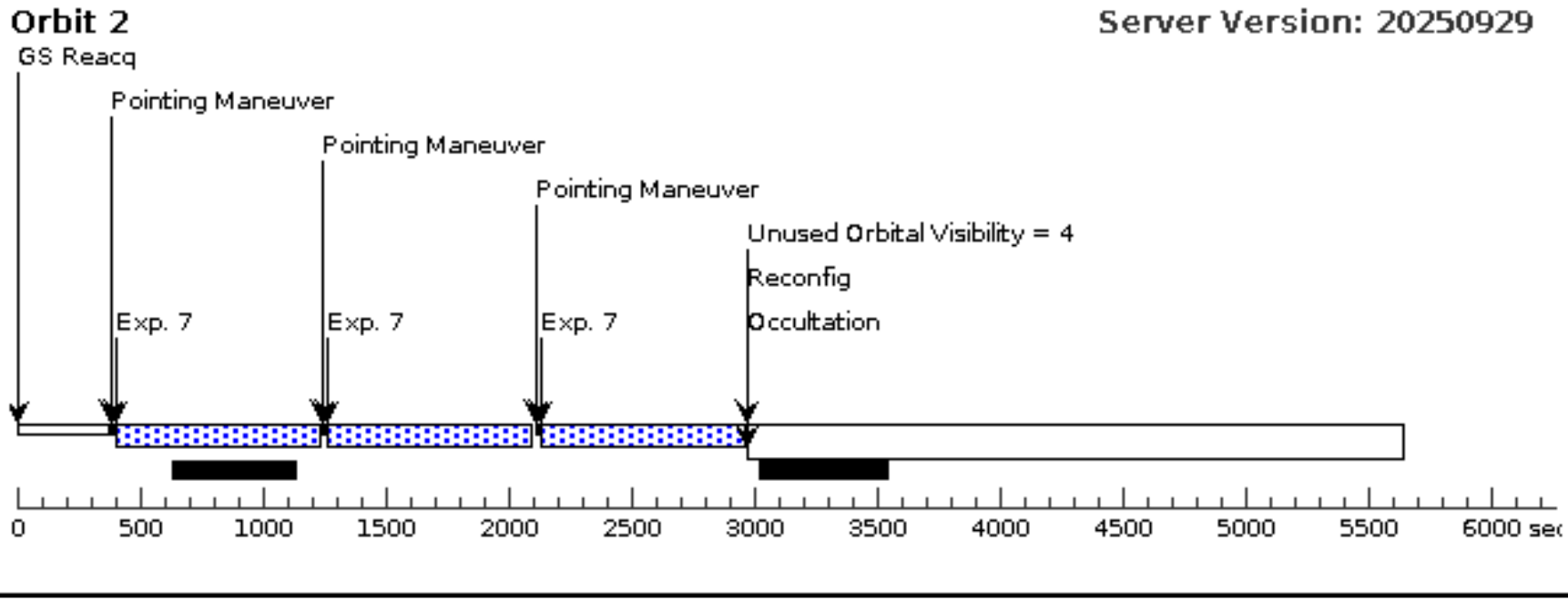
Comments:
Category=EXT-STAR
Description=[SUPERNOVA TYPE IA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0,0	Sequence 1-6 Non-Int in Visit 06	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
2	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0.451,0.403	Sequence 1-6 Non-Int in Visit 06	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
3	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG .474,.424	Sequence 1-6 Non-Int in Visit 06	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
4	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG .925,.827	Sequence 1-6 Non-Int in Visit 06	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
5	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 1.376,1.230	Sequence 1-6 Non-Int in Visit 06	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 0.902,0.806	Sequence 1-6 Non-Int in Visit 06	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7		(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPARS100		Pattern 1, Exps 7-7 in Visit 06 (1)	802.934875 Secs (2408.805 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 18069, Visit 07, implementation Mon Dec 01 16:00:34 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: BETWEEN 27-SEP-2026:00:00:00 AND 01-OCT-2026:00:00:00

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	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		(7)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN-R4	RA: 01 38 2.1602 (24.5090008d) Dec: -21 55 22.41 (-21.92289d) Equinox: J2000		V=26+/-1	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	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0,0	Sequence 1-6 Non-Int in Visit 07	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
2	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG 0.451,0.403	Sequence 1-6 Non-Int in Visit 07	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
3	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG .474,.424	Sequence 1-6 Non-Int in Visit 07	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
4	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=12; SAMP-SEQ=STEP50	POS TARG .925,.827	Sequence 1-6 Non-Int in Visit 07	349.232932 Secs (349.233 Secs) *[==>]*	***[1]***
5	F110W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 1.376,1.230	Sequence 1-6 Non-Int in Visit 07	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
6	F160W	(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=STEP50	POS TARG 0.902,0.806	Sequence 1-6 Non-Int in Visit 07	399.233383 Secs (399.233 Secs) *[==>]*	***[1]***
7		(1) SN-R4	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=9; SAMP-SEQ=SPARS100		Pattern 1, Exps 7-7 in Visit 07 (1)	802.934875 Secs (2408.805 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure