17706 - Finding Supernova Progenitor Stars in HST and JWST Imaging

Cycle: 32, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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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	(3) SN2025PHT	WFC3/UVIS	1	16-Sep-2025 16:00:20.0	yes
02	(4) SN2025QGD	WFC3/UVIS	1	16-Sep-2025 16:00:21.0	yes

2 Total Orbits Used

ABSTRACT

Many open questions in supernova (SN) physics rely on the connection between SNe and their progenitor stars. HST and now JWST provide a vast imaging archive of galaxies in the local Universe in which individual supernova progenitor stars can be isolated soon after they explode. Each new such event is a rare and unique opportunity in which we can compare a supernova explosion to the mass, metallicity, and local environments of the star that exploded. In many cases however, it is only possible to isolate the supernova progenitor star with high-resolution imaging follow up where local astrometric calibrators can be used to precisely align the supernova position with <0.1 arcsec precision. When adaptive optics imaging is not

possible due to a lack of available guide stars, HST is the best available resource to obtain such follow-up imaging of the supernova. We propose a target-of-opportunity program to obtain such imaging with HST for 2 nearby (<40 Mpc) supernova targets during Cycle 32 that have pre-explosion HST or JWST imaging and precisely isolate the progenitor systems of these stellar explosions.

OBSERVING DESCRIPTION

This is a target-of-opportunity proposal to observe up to 2 supernovae at <40 Mpc with pre-explosion HST and/or JWST imaging. The goal of the proposal is to obtain imaging at the site of each supernova in order to precisely align to the pre-explosion imaging and identify or rule out the presence of a counterpart in the pre-explosion data. We are requesting a 3 week minimum response time from the time of trigger in order to guarantee that we can calibrate our exposures to the expected brightness of the supernova at the time of observation and avoid either saturating or failing to detect the primary supernova target.

Our fiducial observation setup assumes that we will observe the supernova around or slightly after maximum light, with a required brightness of >16.5 mag to avoid saturating this source, which would limit the astrometric precision in centroiding on the supernova. We therefore use 68s exposures in F555W and use the UVIS2-C1K1C-SUB readout mode to reduce overheads between individual exposures. As we are targeting sources in galaxies at <40 Mpc, we expect the field around the supernova to be crowded with astrometric calibrators, and so the smaller readout region will not limit our science case. We have also adjusted FLASH=15 to avoid CTE losses. To improve PSF sampling, we use 4 iterations of a WFC3-UVIS-DITHER-BOX pattern for a total of 16 individual exposures.

Visit

Proposal 17706, Visit 01, completed Tue Sep 16 20:00:22 GMT 2025

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: ON HOLD ; TOO RESPONSE TIME 21.0D

On Hold Comments: Target of Opportunity
Requirement is 21-60 days from initial trigger

Diagnostics

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

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

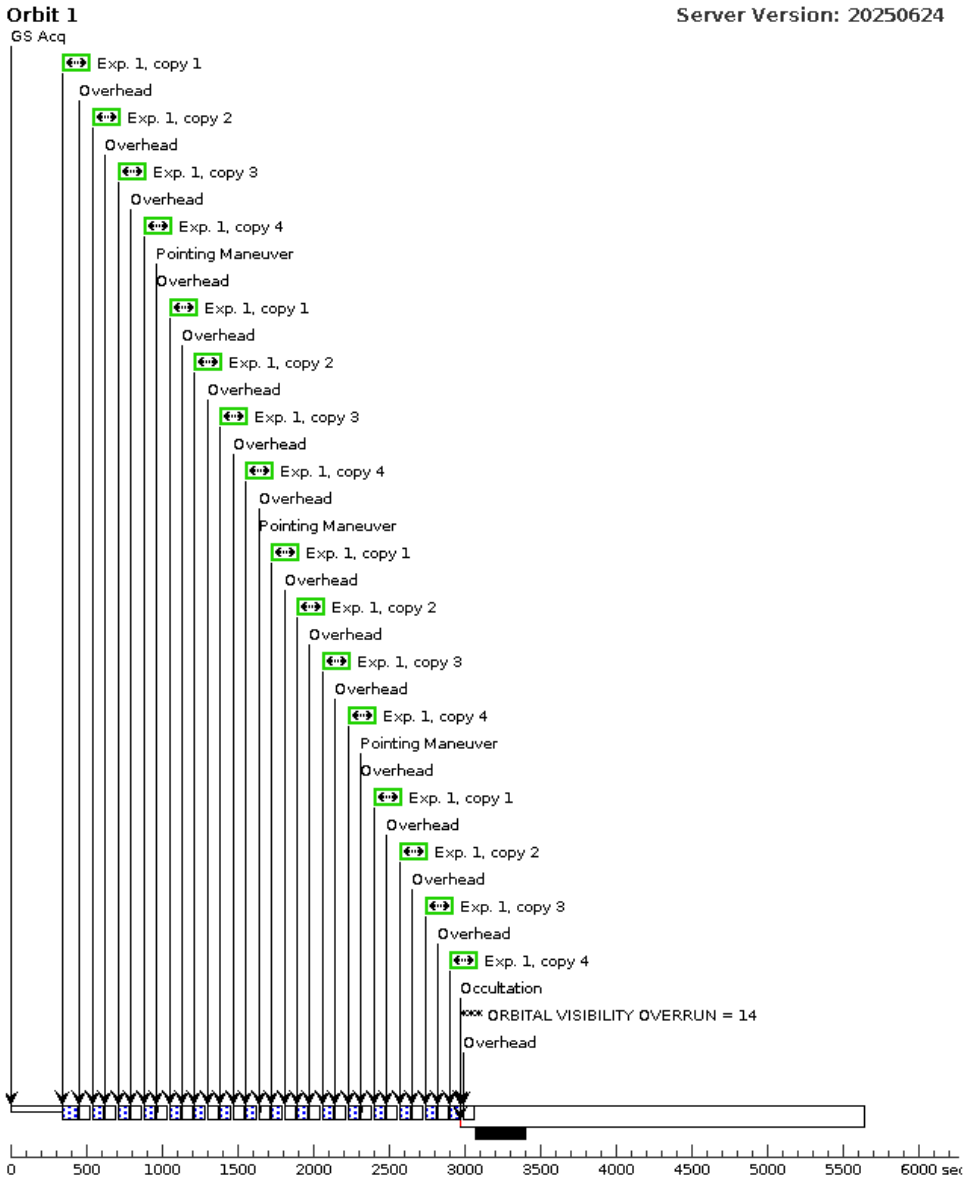
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SN2025PHT	RA: 04 41 28.8340 (70.3701417d) Dec: -02 51 55.87 (-2.86552d) Equinox: J2000		V=14	Reference Frame: ICRS

Comments:
Category=STAR
Description=[SUPERNOVA]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) SN2025PHT	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F336W	FLASH=16		Pattern 1, Exps 1-1 in Visit 01 (1)	68 Secs X 4 (1120 Secs)	
								[==>70.0 Secs (Pattern 1, Copy 1)]	***[1]***
								[==>70.0 Secs (Pattern 1, Copy 2)]	
								[==>70.0 Secs (Pattern 1, Copy 3)]	
								[==>70.0 Secs (Pattern 1, Copy 4)]	
								[==>70.0 Secs (Pattern 2, Copy 1)]	
								[==>70.0 Secs (Pattern 2, Copy 2)]	
								[==>70.0 Secs (Pattern 2, Copy 3)]	
								[==>70.0 Secs (Pattern 2, Copy 4)]	
								[==>70.0 Secs (Pattern 3, Copy 1)]	
								[==>70.0 Secs (Pattern 3, Copy 2)]	
								[==>70.0 Secs (Pattern 3, Copy 3)]	
								[==>70.0 Secs (Pattern 3, Copy 4)]	
								[==>70.0 Secs (Pattern 4, Copy 1)]	
								[==>70.0 Secs (Pattern 4, Copy 2)]	
								[==>70.0 Secs (Pattern 4, Copy 3)]	
								[==>70.0 Secs (Pattern 4, Copy 4)]	

Orbit Structure



Visit

Proposal 17706, Visit 02, implementation Tue Sep 16 20:00:22 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: ON HOLD ; TOO RESPONSE TIME 21.0D

On Hold Comments: Target of Opportunity
Requirement is 21-60 days from initial trigger

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
(4)	SN2025QGD	RA: 10 27 51.0660 (156.9627750d) Dec: -43 54 20.96 (-43.90582d) Equinox: J2000		V=20	Reference Frame: ICRS

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

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) SN2025QGD	WFC3/UVIS, ACCUM, UVIS2-C1K1C-SUB	F555W	FLASH=15		Pattern 1, Exps 1-1 in Visit 02 (1)	68 Secs X 4 (1120 Secs)	
								[==>70.0 Secs (Pattern 1, Copy 1)]	***[1]***
								[==>70.0 Secs (Pattern 1, Copy 2)]	
								[==>70.0 Secs (Pattern 1, Copy 3)]	
								[==>70.0 Secs (Pattern 1, Copy 4)]	
								[==>70.0 Secs (Pattern 2, Copy 1)]	
								[==>70.0 Secs (Pattern 2, Copy 2)]	
								[==>70.0 Secs (Pattern 2, Copy 3)]	
								[==>70.0 Secs (Pattern 2, Copy 4)]	
								[==>70.0 Secs (Pattern 3, Copy 1)]	
								[==>70.0 Secs (Pattern 3, Copy 2)]	
								[==>70.0 Secs (Pattern 3, Copy 3)]	
								[==>70.0 Secs (Pattern 3, Copy 4)]	
								[==>70.0 Secs (Pattern 4, Copy 1)]	
								[==>70.0 Secs (Pattern 4, Copy 2)]	
								[==>70.0 Secs (Pattern 4, Copy 3)]	
								[==>70.0 Secs (Pattern 4, Copy 4)]	

Orbit Structure