17300 - Probing the Post-genitor System of Calcium-rich Transient SN 2021gno

Cycle: 30, 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	(1) SN2021GNO	WFC3/IR WFC3/UVIS	2	28-Apr-2023 12:00:15.0	yes

2 Total Orbits Used

ABSTRACT

Supernova (SN) 2021gno in NGC 4165 (D=30.5 Mpc) is the second closest known Calcium-rich (Ca-rich) transient and only the second object in this class with an X-ray detection. Prompt, high-cadence follow-up of this transient across the EM spectrum indicated that the progenitor star was likely low mass (e.g., a white dwarf or a <10 Msun star) and surrounded by a dense shell of circumstellar material (CSM) whose geometry/density was capable of producing luminous X-ray emission as well as a double-peaked optical light curve. The close proximity of SN 2021gno provided only the second opportunity to obtain multi-color HST observations out to ~450 days post explosion, which indicate a pure radioactive decay power source. Ca-rich transients typically decrease in magnitude rapidly and therefore their extremely late-time decline rate and power source at t>700 days is completely unknown. Here we propose multi-color imaging of SN 2021gno in order to search for emission from a bound remnant white dwarf as predicted by a favored progenitor model for this explosion. Detection and characterization of such a remnant will be the most substantial proof of a WD origin for a Ca-rich transient to date and will provide a novel window into the explosion mechanism. Additionally, these observations will provide one of the best constraints to date on a potential non-degenerate companion star in any thermonuclear SN progenitor system, such as Ca-rich SNe.

OBSERVING DESCRIPTION

We propose to observe nearby supernova 2021gno with WFC3/UVIS in filters F555W and F814W in the first of our two allocated orbits. In the second orbit, we will observe SN 2021gno with WFC3/IR in filter F160W. Our optimal observing window is between 07-May-2023 and 18-June-2023, however, 22-June-2023 to 27-July-2023 is another acceptable scheduling window. We have requested that IR imaging be taken within 3 days of the UVIS imaging orbit. Below is our observing plan for each filter in each orbit:

Orbit 1:

F555W: Total Exposure time = 1500s; Split into two 750s exposures using WFC3-UVIS-DITHER-LINE pattern
F814W: Total Exposure time = 900s; Split into two 450s exposures using WFC3-UVIS-DITHER-LINE pattern

Orbit 2:

F160W: Eight ~300s individual exposures for each filter using the WFC3-IR-DILTER-BOX-MIN pattern.

Visit

Proposal 17300, UVIS/IR Orbits (01), implementation Fri Apr 28 16:00:16 GMT 2023

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR, WFC3/UVIS

Special Requirements: (none)

Comments: Orbit 1:
Filters: F555W, F814W

Orbit 2:
Filters: F160W

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFC3-UVIS-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.145 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=46.84 Angle Between Sides= Center Pattern=false		(1-2)
(2)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false		(3-4)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SN2021GNO	RA: 12 12 10.2900 (183.0428750d) Dec: +13 14 57.04 (13.24918d) Equinox: J2000		V=25 g ~ 26-27, r ~ 25, i/z ~ 24	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	F814W Obs.	(1) SN2021GNO	WFC3/UVIS, ACCUM, UVIS	F814W	FLASH=10		Pattern 1, Exps 1-2 in UVIS/IR Orbits (01) (1)	450 Secs (864 Secs) *[==>432.0 Secs (Pattern 1)]* *[==>432.0 Secs (Pattern 2)]*	***[1]***
2	F555W Obs.	(1) SN2021GNO	WFC3/UVIS, ACCUM, UVIS	F555W			Pattern 1, Exps 1-2 in UVIS/IR Orbits (01) (1)	750 Secs (1460 Secs) *[==>730.0 Secs (Pattern 1)]* *[==>730.0 Secs (Pattern 2)]*	***[1]***
3	F160W Obs.	(1) SN2021GNO	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=SPARS25		Pattern 2, Exps 3-4 in UVIS/IR Orbits (01) (2)	302.938471 Secs (1211.754 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***
4	F160W Obs.	(1) SN2021GNO	WFC3/IR, MULTIACCUM, IR	F160W	NSAMP=13; SAMP-SEQ=SPARS25		Pattern 2, Exps 3-4 in UVIS/IR Orbits (01) (2)	302.938471 Secs (1211.754 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]*	***[2]***

Orbit Structure