



16874 - The Progenitor System and Ongoing Circumstellar Interaction of SN 2021qvr

Cycle: 29, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) SN2021QVR	WFC3/UVIS	2	01-Dec-2021 13:01:57.0	yes

2 Total Orbits Used

ABSTRACT

Ultra-rapid or "flash" spectroscopy of young core-collapse supernovae enables the detection of narrow emission lines that arise from shock ionization of local circumstellar material (CSM). This CSM is a direct tracer of progenitor star surface abundance in the last years before explosion and mass-loss history. A completely independent method for establishing progenitor properties is through direct detection of a source in deep pre-explosion imaging. SN 2021qvr is an extremely rare type II-L supernova with both flash spectra and progenitor candidates in pre-explosion imaging.

However, to fully leverage these data, we need high-resolution follow up imaging to isolate the progenitor candidate in pre-explosion HST frames. In addition, ultraviolet follow-up imaging would enable us to understand its late-time bolometric behavior and to constrain the CSM mass ejected decades before core collapse, establishing how the progenitor star evolved and what its mass-loss rate was in the final years before explosion.

OBSERVING DESCRIPTION

We will observe the site of supernova (SN) 2021qvr during Cycle 29 with the Wide Field Camera 3 UV/visible detecting CCD in F275W, F336W, and F555W. We expect the SN to be 24-26 mag in the UV bands at the time it is observed and around 20-22 mag in F555W. Our goal is to obtain deep imaging of SN2021qvr and the surrounding field in the two UV filters while maximizing the signal-to-noise. We will therefore use 1 orbit in F275W and 2/3 orbit in F336W. We expect to achieve $S/N > 10$ on SN2021qvr in both frames given our setup and exposure times. The remaining 1/3 orbit in F555W is designed to overlap with pre-explosion UVIS imaging in the same filter in order to perform astrometric alignment between the two images. The technical goal is therefore to detect as many point sources as possible that overlap with the pre-explosion frames. We expect to observe sources down to $F555W = 25.5$ mag at $S/N > 10$, which should result in hundreds of astrometric calibrators to achieve our goal of ≤ 0.01 arcsec alignment precision.

Proposal 16874 - Visit 01 - The Progenitor System and Ongoing Circumstellar Interaction of SN 2021qvr

Wed Dec 01 18:01:57 GMT 2021

Visit	Proposal 16874, Visit 01 Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: (none)									
	#	Primary Pattern	Secondary Pattern	Exposures						
Patterns	(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		(2), (3)						
	(2)	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				
	(1)	SN2021QVR	RA: 23 28 26.6500 (352.1110417d) Dec: +22 25 12.00 (22.42000d) Equinox: J2000		V=25	Reference Frame: ICRS				
Comments: Category=STAR Description=[SUPERNOVA, SUPERNOVA TYPE II]										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) SN2021QVR	WFC3/UVIS, ACCUM, UVIS1-FIX	F275W	FLASH=15		Pattern 2, Exps 1-1 in Visit 01 (2)	600 Secs (2352 Secs) [==>588.0 Secs (Pattern 1)] [==>588.0 Secs (Pattern 2)] [==>588.0 Secs (Pattern 3)] [==>588.0 Secs (Pattern 4)]	[1]
	2		(1) SN2021QVR	WFC3/UVIS, ACCUM, UVIS1-FIX	F336W	FLASH=18		Pattern 1, Exps 2-2 in Visit 01 (1)	800 Secs (1560 Secs) [==>780.0 Secs (Pattern 1)] [==>780.0 Secs (Pattern 2)]	[2]
	3		(1) SN2021QVR	WFC3/UVIS, ACCUM, UVIS1-FIX	F555W	FLASH=10		Pattern 1, Exps 3-3 in Visit 01 (1)	400 Secs (760 Secs) [==>380.0 Secs (Pattern 1)] [==>380.0 Secs (Pattern 2)]	[2]

