



12503 - Constraining the Hubble Constant with Nebular-Phase Spectroscopy of a 20x Magnified, Multiply Imaged Supernova

Cycle: 4, Proposal Category: DD

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1		NIRSpec Fixed Slit Spectroscopy	(1) A370-SN

ABSTRACT

Recent observations of the Abell 370 galaxy cluster have revealed a supernova (SN) triply-imaged as a result of strong gravitational lensing. We dub this SN, SN Typhon. An archival search for Hubble (HST) and James Webb Space Telescope (JWST) imaging of Abell 370 paints a remarkable picture, with serendipitous light curve coverage from 1 to 500 observer-frame days after explosion. While multiply-imaged SNe can be powerful probes of the Hubble constant (H_0), such an analysis requires a spectroscopic redshift for the SN and a precise measurement of the time delay. For SN Typhon, our time-delay measurements vary by 20% depending on the SN type, effectively eliminating any constraint on H_0 , while a spectroscopic classification would reduce this uncertainty to 5-7%. A spectroscopic redshift is also required for both the time delay measurement and for converting the time-delay distance to an H_0 constraint. Therefore, leveraging the 2024 SN Typhon light curve for an H_0 measurement requires a spectrum of SN Typhon only possible through a DDT program. SN Typhon will be 27.3 AB mag at the time of the spectrum, and will likely fade to > 28 AB mag in the next available observing window (July 2026). We therefore request a NIRSpec fixed-slit spectrum, providing both the spectroscopic redshift and classification needed to infer a precise time delay from the archival light curve. SN Typhon is a critical JWST DDT target as only the second lensed SN with early light curve coverage (enabling a 7-10% H_0 measurement), and a 20 \times magnification that will produce the first high S/N nebular phase spectroscopy of a lensed SN. The total request for this program is 7.1 hours.

OBSERVING DESCRIPTION

This program obtains a single NIRSpec fixed-slit spectrum of a multiply-imaged supernova (SN) lensed by the Abell 370 cluster. We are targeting the brightest visible image, which is ~27.3 AB magnitude in F200W. We have set our exposure time to target S/N >10 in critical nebular phase emission lines used for classification. We also require the spectrum during this observing window, which ends February 1, in order to observe the SN while it is still sufficiently bright.

Proposal 12503 - Targets - Constraining the Hubble Constant with Nebular-Phase Spectroscopy of a 20x Magnified, Multiply Imaged ...

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	A370-SN	RA: 02 39 52.0766 (39.9669858d) Dec: -01 35 50.50 (-1.59736d) Equinox: J2000 <i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i>		
(2)	TA-STAR	RA: 02 39 52.7706 (39.9698775d) Dec: -01 35 49.73 (-1.59715d) Equinox: J2000 <i>Comments:</i> <i>Category=Star</i> <i>Description=[O stars]</i>			

Proposal 12503 - Observation 1 - Constraining the Hubble Constant with Nebular-Phase Spectroscopy of a 20x Magnified, Multiply Im...

Tue Jan 20 06:00:15 GMT 2026

Observation	Proposal 12503, Observation 1 Diagnostic Status: Warning Observing Template: NIRSpec Fixed Slit Spectroscopy <i>Comments: Comment.</i>										
	(Observation 1) Warning (Form): Observers are responsible for checking that target acquisition is feasible. (Visit 1:1) Warning (Form): Data Excess over lower threshold (Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Diagnostics											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
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<i>Comments: Category=Star Description=[Supernovae]</i>											
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
	1	2 TA-STAR	WATA	SUB2048	F110W	NRSRAPID	3	1	1	3.628	
Template	HFF Readout Mode				Slit			Subarray			
	false				S200A1			FULL			
Dithers	#	Primary Dither Positions						Sub-Pixel Pattern			
	1	5						NONE			
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	PRISM/CLEAR	S200A1	NRSIRS2RAPID	62	4	1	NONE	5	20	18382.001

Proposal 12503 - Observation 1 - Constraining the Hubble Constant with Nebular-Phase Spectroscopy of a 20x Magnified, Multiply Im...

Special Requirements

Before Date 02-FEB-2026:00:00:00
Aperture PA Range 211.84190369 to 215.84190369 Degrees (V3 73.0 to 77.0)