



9478 - SN Ares: A Strongly Lensed, High-z CCSN with Remarkable Time Delays

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	NIRSpec Fixed Slit Spectroscopy	(1) Ares
	2	NIRCam	NIRCam Imaging	(15) MACSJ0308+2645

ABSTRACT

A bright and red strongly lensed core-collapse supernova (CCSN) candidate at $z = 1.275$ was discovered in JWST/NIRCam imaging acquired on 2025 August 25 by the Vast Exploration for Nascent, Unexplored Sources collaboration (VENUS, Cycle 4 GO: PID 6882), dubbed "SN Ares". CCSNe at $z > 1$ provide critical probes of the properties of massive stars and the environments in the early Universe, but due to a combination of selection effects and the falling rate of SNe at higher-redshifts there have only been a handful of $z > 1$ CCSN spectra obtained thus far. The strong lensing magnification in this region will enable unprecedented local host environment studies alongside the highest S/N spectrum yet obtained for a CCSN in this redshift range, but such a study is only possible with NIRSpec obtained now with this program. SN Ares is only the third strongly lensed CCSN ever discovered and is only the second after SN Refsdal with the possibility of spectroscopic follow-up. Furthermore, SN Ares is in the first image of a triply-imaged system, with the trailing images expected to arrive on the order of decades. These are the longest time delays seen so far for a lensed SN and would allow for the most precise time-delay cosmography yet possible, assuming we can constrain the current phase of the SN. In order to harness this incredible science, only a time-sensitive JWST program to observe SN Ares with both NIRCam imaging (to better characterize the SN at long wavelengths and help calibrate follow-up HST photometry) and NIRSpec Fixed Slit PRISM spectroscopy is feasible.

OBSERVING DESCRIPTION

NIRCam: We propose NIRCam imaging in 1 filter pair: F115W & F444W (1.15-5 m) with a single observing epoch, executed as soon as possible.

According to the ETC, the planned exposures (1460s) should detect the SN in the faintest filter (F115W) at 28 mag with $S/N > 5$ even at the limits of plausible phase, and > 10 in F444W given the best phase estimate.

NIRSpec: We use the best-fit models to SN Ares to choose an exposure time that yields $S/N > 5$ at nearly all wavelengths and $S/N > 10$ in critical classification regions. We use the PRISM, low-resolution mode.

In order to obtain a spectrum and NIRCam imaging of the SN target, we require scheduling in the current window, which ends on September 30. With only a single epoch, any time in this window will be sufficient. We do not set any PA requirement the full PA range available is suitable for the observation, but we may need to make small adjustments given the final PA in order to limit the impact of the nearby bright star diffraction spikes

Proposal 9478 - Targets - SN Ares: A Strongly Lensed, High-z CCSN with Remarkable Time Delays

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	Ares	RA: 03 08 53.4179 (47.2225746d) Dec: +26 45 58.63 (26.76629d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[Supernovae]				
(2)	Ares_TA	RA: 03 08 52.9848 (47.2207700d) Dec: +26 46 6.18 (26.76838d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[O stars] Extended=NO				
(3)	Ares_Image2	RA: 03 08 56.2233 (47.2342638d) Dec: +26 45 37.26 (26.76035d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[Supernovae]				
(4)	Ares_Image3	RA: 03 08 57.2816 (47.2386733d) Dec: +26 45 37.04 (26.76029d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[Supernovae]				
(15)	MACSJ0308+2645	RA: 03 08 55.9912 (47.2332967d) Dec: +26 45 37.78 (26.76049d) Equinox: J2000	Proper Motion RA: 0.0 Proper Motion Dec: 0.0	
<i>Comments:</i> Category=Clusters of Galaxies Description=[Galaxy groups]				

Fixed Targets

Proposal 9478 - Observation 1 - SN Ares: A Strongly Lensed, High-z CCSN with Remarkable Time Delays

Wed Sep 17 17:00:10 GMT 2025

Observation	Proposal 9478, Observation 1: NIRSpec Diagnostic Status: Warning Observing Template: NIRSpec Fixed Slit Spectroscopy										
	(NIRSpec (Obs 1)) Warning (Form): Observers are responsible for checking that target acquisition is feasible. (Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.										
Diagnosics											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(1)	Ares	RA: 03 08 53.4179 (47.2225746d) Dec: +26 45 58.63 (26.76629d) Equinox: J2000								
<i>Comments:</i> <i>Category=Star</i> <i>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 Ares_TA	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/Ex #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	PRISM/CLEAR	S200A1	NRSIRS2	11	1	1	NONE	5	5	4084.889

Proposal 9478 - Observation 1 - SN Ares: A Strongly Lensed, High-z CCSN with Remarkable Time Delays

Special Requirements

Before Date 01-OCT-2025:00:00:00
Aperture PA Range 28.84190369 to 32.84190369 Degrees (V3 250.0 to 254.0)
Group Observations 1, 2, Non-interruptible

Proposal 9478 - Observation 2 - SN Ares: A Strongly Lensed, High-z CCSN with Remarkable Time Delays

Wed Sep 17 17:00:10 GMT 2025

Observation	<p>Proposal 9478, Observation 2: NIRCam</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRCam Imaging</p>									
Diagnostics	<p>(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p> <p>(Visit 2:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.</p>									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous		
	(15)	MACSJ0308+2645	RA: 03 08 55.9912 (47.2332967d) Dec: +26 45 37.78 (26.76049d) Equinox: J2000		Proper Motion RA: 0.0 Proper Motion Dec: 0.0					
	<p><i>Comments:</i> <i>Category=Clusters of Galaxies</i> <i>Description=[Galaxy groups]</i></p>									
Template	Module		Subarray			Target Placement				
	ALL		FULL			Module Gap				
Dithers	#	Primary Dither Type		Primary Dithers	Subpixel Dither Type		Dither Size	Subpixel Positions		
	1	INTRAMODULEX		4	STANDARD			1		
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
	1	F115W	F444W	SHALLOW4	7	1	4	4	1460.201	
Special Requirements	<p>Aperture PA Range 249.92542306 to 253.92542306 Degrees (V3 250.0 to 254.0) Offset 100.0 arcsec, 29.0 arcsec</p> <p>Group Observations 1, 2, Non-interruptible</p>									