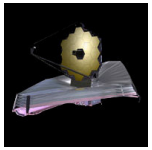

12574 - From photosphere to nebula: the time evolution of a gravitationally lensed, hydrogen-poor superluminous supernova at z ~ 2

Cycle: 5, Proposal Category: DD

INVESTIGATORS

Name	*Institution*
Maggie Luhua Li (PI)	**California Institute of Technology**
Dr. Lin Yan (CoI) (CoPI) (Contact)	California Institute of Technology
Dr. Joel Pearson Johansson (CoI) (ESA Member)	Stockholm University
Prof. Ariel Goobar (CoI) (ESA Member)	Stockholm University
Dr. Steve Schulze (CoI)	Weizmann Institute of Science
Dr. Ragnhild Lunnan (CoI) (ESA Member)	Stockholm University
Dr. Yu-jing Qin (CoI)	California Institute of Technology
Dr. Daniel Perley (CoI) (ESA Member)	Liverpool John Moores University
Dr. Mansi Kasliwal (CoI)	California Institute of Technology

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation 1				
	4	NIRSpec FS	NIRSpec Fixed Slit Spectroscopy	(2) SN2025wny
	3	NIRCam	NIRCam Imaging	(2) SN2025wny
Observation 2				
	2	NIRSpec FS	NIRSpec Fixed Slit Spectroscopy	(2) SN2025wny
	5	NIRCam	NIRCam Imaging	(2) SN2025wny

ABSTRACT

Superluminous supernovae (SLSNe) are powerful probes of low-metallicity massive stars, which are expected to be abundant at high redshift. However, the current sample of SLSNe—especially high-z SLSNe—is extremely limited. SN2025wny is a hydrogen-poor SLSN (SLSN-I) at z=2.011 that provides the first opportunity to overcome this limitation. SN2025wny is strongly lensed (~50x) by two foreground galaxies; this, together with its intrinsically high SLSN-I luminosity and slow time evolution, presents the first opportunity to obtain multi-wavelength spectra and photometry of a high-z SLSNe from its photospheric to nebular phases. We propose JWST NIRSpec IFU, NIRSpec Fixed-Slit, and NIRCam observations to track SN2025wny's rest-frame optical evolution to late times. These observations will directly link SN2025wny to the well-studied local SLSN-I population and establish the first robust spectral templates of a high-z SLSN-I, providing a critical reference for identifying and analyzing high-z SLSNe in the upcoming Roman era.

OBSERVING DESCRIPTION

In Cycle 5, we request 8.7 total hours (including overheads) of JWST NIRSpec Fixed-Slit (FS), and NIRCam observations of SN2025wny. In the first Cycle 5 epoch (03 Oct. to 24 Nov. 2026), we propose using NIRSpec FS with PRISM/Clear, the FULL subarray, S200A1 slit, NRSIRS2RAPID readout pattern, 80 groups, 1 integration, and 3 primary dithers with no subpixel dithers. We wish to perform target acquisition method using the Offset_TA target, WATA TA method, SUB32 subarray, F110W filter, and NRSRAPIDD6 readout pattern. In this epoch, we also request NIRCam Imaging on the SN2025wny_A target, using ALL modules, the FULL subarray, INTRAMODULEBOX dither with 2 primary dithers, and SMALL-GRID-DITHER subpixel dither type with 2 dithers. We request two filter sequences: 1) F115W with F277W and 2) F150W and F277W. Both filter sequences will use 4 groups, 1 integration, and the BRIGHT1 readout pattern. The target placement will be on the Module gap with an Offset of (121.0, 35.0) arcsec.

In the second Cycle 5 epoch (18 Feb. to 10 Apr. 2027), we request the same instruments, but with different setups. The NIRSpec FS observation should use the NRSIRS2 readout mode with the S200A1 slit, the FULL subarray, 24 groups, 2 integrations, with 3 primary dithers and no subpixel dithers. The NIRCam observation is the same setup as the first epoch but with 10 groups.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	SN2025wny	RA: 07 16 34.5039 (109.1437662d) Dec: +38 21 8.11 (38.35225d) Equinox: J2000		
Comments: Observed in the Cycle 5 windows. *Category=Star* *Description=[Supernovae]*				
(3)	Offset_TA	RA: 07 16 38.0871 (109.1586962d) Dec: +38 20 59.02 (38.34973d) Equinox: J2000	Proper Motion RA: 2.2204048898821234 mas/yr Proper Motion Dec: -3.2165995161293024 mas/yr Parallax: 0.0001" Epoch of Position: 2016	
Comments: Observed in the Cycle 5 windows. *Gaia DR3 designation: 946475315886456960. G-type star.* *2MASS designation: 07163807+3820592. 15.5-ish Vega mag in JHK.* *Category=Star* *Description=[G stars]* *Extended=NO*				

Observation

Proposal 12574, Observation 4: NIRSpec FS

Tue Apr 21 13:00:10 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 4:1) 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.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	SN2025wny	RA: 07 16 34.5039 (109.1437662d) Dec: +38 21 8.11 (38.35225d) Equinox: J2000		

Comments: Observed in the Cycle 5 windows.
Category=Star
Description=[Supernovae]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	3 Offset_TA	WATA	SUB32	CLEAR	NRSRAPIDD6	3	1	1	0.26	287527

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	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	80	1	1	NONE	3	3	3545.1	287527

Special Requirements	Between Dates 02-OCT-2026:00:00:00 and 25-NOV-2026:00:00:00

Observation

Proposal 12574, Observation 3: NIRCam Tue Apr 21 13:00:10 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(NIRCam (Obs 3)) Warning (Form): By selecting Target Placement = Module Gap the target coordinates will not fall on any detector unless an appropriate Mosaic, set of Dithers or Offset Special Requirement is specified.

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 3:1) 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.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	SN2025wny	RA: 07 16 34.5039 (109.1437662d) Dec: +38 21 8.11 (38.35225d) Equinox: J2000		

Comments: Observed in the Cycle 5 windows.
Category=Star
Description=[Supernovae]

Template

Module	Subarray	Target Placement
ALL	FULL	Module gap (large extended source)

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	2	SMALL-GRID-DITHER		2

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
1	F115W	F277W	BRIGHT1	4	1	4	4	300.63	287531
2	F150W	F277W	BRIGHT1	4	1	4	4	300.63	287531

Special Requirements

Between Dates 02-OCT-2026:00:00:00 and 25-NOV-2026:00:00:00
Offset 121.0 arcsec, 35.0 arcsec

Observation

Proposal 12574, Observation 2: NIRSpec FS

Tue Apr 21 13:00:10 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	SN2025wny	RA: 07 16 34.5039 (109.1437662d) Dec: +38 21 8.11 (38.35225d) Equinox: J2000		

Comments: Observed in the Cycle 5 windows.
Category=Star
Description=[Supernovae]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID
1	3 Offset_TA	WATA	SUB32	CLEAR	NRSRAPIDD6	3	1	1	0.26	287527

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	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	NRSIRS2	24	2	1	NONE	3	6	10591.534	287527

Special Requirements	Between Dates 17-FEB-2027:00:00:00 and 11-APR-2027:00:00:00

Observation

Proposal 12574, Observation 5: NIRCam Tue Apr 21 13:00:10 GMT 2026

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Diagnostics

(NIRCam (Obs 5)) Warning (Form): By selecting Target Placement = Module Gap the target coordinates will not fall on any detector unless an appropriate Mosaic, set of Dithers or Offset Special Requirement is specified.

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	SN2025wny	RA: 07 16 34.5039 (109.1437662d) Dec: +38 21 8.11 (38.35225d) Equinox: J2000		

Comments: Observed in the Cycle 5 windows.
Category=Star
Description=[Supernovae]

Template

Module	Subarray	Target Placement
ALL	FULL	Module gap (large extended source)

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	2	SMALL-GRID-DITHER		2

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
1	F115W	F277W	BRIGHT1	10	1	4	4	815.995	287531
2	F150W	F277W	BRIGHT1	10	1	4	4	815.995	287531

Special Requirements

Between Dates 17-FEB-2027:00:00:00 and 11-APR-2027:00:00:00
Offset 121.0 arcsec, 35.0 arcsec