



12579 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years After

Cycle: 5, Proposal Category: GO

INVESTIGATORS

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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	MRS Spectroscopy Background	MIRI Medium Resolution Spectroscopy	(2) SN2023fyq-spec-background
	2	MRS Spectroscopy	MIRI Medium Resolution Spectroscopy	(1) SN2023fyq
	3	MIRI imaging in 3 reddest filters	MIRI Imaging	(3) SN2023fyq-imaging
	4	NIRSpec IFU	NIRSpec IFU Spectroscopy	(3) SN2023fyq-imaging

ABSTRACT

Type Ibn supernovae (SN Ibn) are rare explosions of highly stripped stars that interact with helium-rich circumstellar material. SN 2023fyq, the closest Ibn (18.2 Mpc), was imaged by JWST/MIRI three weeks before its explosion, revealing a significant reservoir of cold (120 K) dust. Following the explosion, an extensive observational campaign commenced, including a public DDT program 312 days post-explosion. These JWST data revealed the first definitive detection of warm amorphous silicate dust during this early phase.

We propose to leverage this rare opportunity for continued monitoring of SN 2023fyq with JWST from 2.5 to 4 years after the explosion. These new JWST observations will determine how much pre-existing dust was destroyed, how much new dust formed 312 days after the explosion, determine the dust growth rate and any compositional changes in dust formation over time. We request 15.6 hours of NIRSpec and MIRI observations split across Cycles 4 and 5 (7.8 hours in each cycle). This data will establish a comprehensive legacy archive of SN 2023fyq's evolution. This unique dataset will be crucial for understanding dust formation, binary interactions, late-stage stellar evolution, and rapid mass loss during the final phases of a stripped star's life.

OBSERVING DESCRIPTION

We request 15.6 hrs of GO time (split across Cycle 4 and 5) to obtain NIR/MIR spectra and MIR imaging of the closest Ibn SN~2023fyq from +900d to +1400d. We will use the MRS and NIRSpec IFU modes for spectroscopic observations, and imaging in the three reddest filters (F1800W, F2100W and F2500W) to probe the coolest dust.

Proposal 12579 - Targets - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years After

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2023fyq	RA: 12 25 45.8576 (186.4410733d) Dec: +12 39 48.54 (12.66348d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[Type Ib supernovae] Extended=NO				
(2)	SN2023fyq-spec-background	RA: 12 25 40.8001 (186.4200004d) Dec: +12 38 24.29 (12.64008d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[Type Ib supernovae] Extended=YES				
(3)	SN2023fyq-imaging	RA: 12 25 45.8576 (186.4410733d) Dec: +12 39 48.54 (12.66348d) Equinox: J2000		
<i>Comments:</i> Category=Star Description=[Type Ib supernovae] Extended=NO				

Fixed Targets

Proposal 12579 - Observation 1 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years Af...

Mon Mar 16 22:01:17 GMT 2026

Observation	Proposal 12579, Observation 1: MRS Spectroscopy Background Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observation For: [MRS Spectroscopy (Obs 2)]												
	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Diagnosics													
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous				
	(2)	SN2023fyq-spec-background	RA: 12 25 40.8001 (186.420004d) Dec: +12 38 24.29 (12.64008d) Equinox: J2000										
Comments: Category=Star Description=[Type Ib supernovae] Extended=YES													
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	F560W	All MRS			YES			FULL		Allow Auto Reorder			
Dithers	#	Dither Type			Optimized For			Direction					
	1	4-Point			POINT SOURCE			NEGATIVE					
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1		IMAGER	F560W	FASTR1	19	7	1	None	1	7	385.731	
	1	SHORT(A)	MRSLONG		SLOWR1	29	1	1	None	1	1	692.808	
	1	SHORT(A)	MRSSHORT		SLOWR1	29	1	1	None	1	1	692.808	
	2		IMAGER	F770W	FASTR1	19	7	1	None	1	7	385.731	
	2	MEDIUM(B)	MRSLONG		SLOWR1	29	1	1	None	1	1	692.808	
	2	MEDIUM(B)	MRSSHORT		SLOWR1	29	1	1	None	1	1	692.808	
	3		IMAGER	F1000W	FASTR1	19	7	1	None	1	7	385.731	
	3	LONG(C)	MRSLONG		SLOWR1	29	1	1	None	1	1	692.808	
	3	LONG(C)	MRSSHORT		SLOWR1	29	1	1	None	1	1	692.808	

Proposal 12579 - Observation 1 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years Af...

Special Requirements

Group Observations 1, 2, Non-interruptible
Group Observations 1, 2, 3, 4 within 14 Days

Proposal 12579 - Observation 2 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years Af...

Mon Mar 16 22:01:18 GMT 2026

Observation	Proposal 12579, Observation 2: MRS Spectroscopy Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy Background Observations:[MRS Spectroscopy Background (Obs 1)]												
	(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.												
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous				
	(1)	SN2023fyq	RA: 12 25 45.8576 (186.4410733d) Dec: +12 39 48.54 (12.66348d) Equinox: J2000 <i>Comments:</i> Category=Star Description=[Type Ib supernovae] Extended=NO										
Acquisition	#	Target											
	1	NONE											
Template	AcqFilter	Primary Channel			Simultaneous Imaging			Imager Subarray		Grating Wheel Direction			
	F560W	All MRS			YES			FULL		Allow Auto Reorder			
Dithers	#	Dither Type			Optimized For			Direction					
	1	4-Point			POINT SOURCE			NEGATIVE					
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1		IMAGER	F560W	FASTR1	29	1	1	Dither 1	4	4	321.905	
	1	SHORT(A)	MRSLONG		SLOWR1	29	1	1	Dither 1	4	4	2771.231	228625.21
	1	SHORT(A)	MRSSHORT		SLOWR1	29	1	1	Dither 1	4	4	2771.231	228625.22
	2		IMAGER	F770W	FASTR1	29	1	1	Dither 1	4	4	321.905	
	2	MEDIUM(B)	MRSLONG		SLOWR1	29	1	1	Dither 1	4	4	2771.231	228625.26
	2	MEDIUM(B)	MRSSHORT		SLOWR1	29	1	1	Dither 1	4	4	2771.231	228625.27
	3		IMAGER	F1000W	FASTR1	29	1	1	Dither 1	4	4	321.905	
	3	LONG(C)	MRSLONG		SLOWR1	29	1	1	Dither 1	4	4	2771.231	228625.30
	3	LONG(C)	MRSSHORT		SLOWR1	29	1	1	Dither 1	4	4	2771.231	228625.31

Proposal 12579 - Observation 2 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years Af...

Special Requirements

Group Observations 1, 2, Non-interruptible
Group Observations 1, 2, 3, 4 within 14 Days

Proposal 12579 - Observation 3 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years Af...

Mon Mar 16 22:01:18 GMT 2026

Observation	<p>Proposal 12579, Observation 3: MIRI imaging in 3 reddest filters</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Imaging</p>										
Diagnostics	(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Miscellaneous			
	(3)	SN2023fyq-imaging	RA: 12 25 45.8576 (186.4410733d) Dec: +12 39 48.54 (12.66348d) Equinox: J2000								
	<p><i>Comments:</i> <i>Category=Star</i> <i>Description=[Type Ib supernovae]</i> <i>Extended=NO</i></p>										
Template	<p>Subarray</p> <p>SUB256</p>										
Dithers	#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size	
	1	CYCLING	5	4		1	1			LARGE	
Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	F1800W	FASTR1	5	50	1	Dither 1	4	200	358.226	228625.6
	2	F2100W	FASTR1	5	50	1	Dither 1	4	200	358.226	228625.7
	3	F2550W	FASTR1	10	50	1	Dither 1	4	200	657.746	228625.8
Special Requirements	Group Observations 1, 2, 3, 4 within 14 Days										

Proposal 12579 - Observation 4 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years Af...

Mon Mar 16 22:01:18 GMT 2026

Observation	<p>Proposal 12579, Observation 4: NIRSpec IFU</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec IFU Spectroscopy</p>											
Diagnostics	(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(3)	SN2023fyq-imaging	RA: 12 25 45.8576 (186.4410733d) Dec: +12 39 48.54 (12.66348d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Star</i> <i>Description=[Type Ib supernovae]</i> <i>Extended=NO</i></p>											
Template	TA Method						HFF Readout Mode					
	NONE						false					
Dithers	#	Dither Type		Size	Starting Point		Number of Points		Points			
	1	4-POINT-DITHER										
Spectral Elements	#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	PRISM/CLEAR	NRSIRS2RAPID	20	3	false	true	NONE	4	12	3676.4	228625.36
Special Requirements	Group Observations 1, 2, 3, 4 within 14 Days											