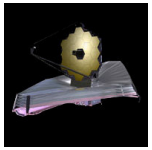

9218 - Tracking Dust Formation and Destruction from the Moment Before a Star Explodes to Four Years After

Cycle: 4, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
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 and 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.

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		
Comments: *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		
Comments: *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		
Comments: *Category=Star* *Description=[Type Ib supernovae]* *Extended=NO*				

Observation

Proposal 9218, Observation 1: MRS Spectroscopy Background Wed Jul 23 20:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [MRS Spectroscopy (Obs 2)]

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	SN2023fyq-spec-background	RA: 12 25 40.8001 (186.4200004d) 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/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc 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	

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

Observation

Proposal 9218, Observation 2: MRS Spectroscopy Wed Jul 23 20:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[MRS Spectroscopy Background (Obs 1)]

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
(1)	SN2023fyq	RA: 12 25 45.8576 (186.4410733d) Dec: +12 39 48.54 (12.66348d) Equinox: J2000		

Comments:
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/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc 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

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

Observation

Proposal 9218, Observation 3: MIRI imaging in 3 reddest filters Wed Jul 23 20:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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		

Comments:
Category=Star
Description=[Type Ib supernovae]
Extended=NO

Template

Subarray
SUB256

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	ETC Wkbk.Calc 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

Observation

Proposal 9218, Observation 4: NIRSpec IFU

Wed Jul 23 20:00:18 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

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		

Comments:
Category=Star
Description=[Type Ib supernovae]
Extended=NO

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	ETC Wkbk.Calc 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