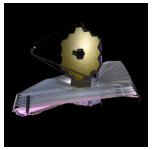

6659 - Dust to Dust: Probing the Survival of Cold Dust, New Hot Dust Formation, and Mass-Loss History of the Nearest Type Ibn Supernova

Cycle: 2, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MRS Spectroscopy	MIRI Medium Resolution Spectroscopy	(1) SN2023fyq
	2	MRS Spectroscopy Background	MIRI Medium Resolution Spectroscopy	(2) SN2023fyq-spec-background
	3	MIRI imaging in 3 reddest filters	MIRI Imaging	(3) SN2023fyq-imaging

ABSTRACT

SN 2023fyq, the closest Type Ibn supernova (SN Ibn) to date, was discovered on April 17, 2023. It exhibited remarkable photometric behaviour, with an optical luminosity of approximately M_r ~ -12 mag for several months, consistent with some LBV outbursts and "SN impostors," before a rapid brightening and terminal explosion in mid-July. Serendipitous imaging by JWST on June 27, 2023, revealed strong dust emission coincident with the SN location, marking the first detection of "cold" (~120 K) dust before peak brightness.

Here, we propose JWST/MIR spectroscopy and imaging observations of SN 2023fyq approximately 300 days after the explosion. These observations will (i) directly observe the survival of circumstellar dust post-explosion, (ii) reveal new dust formation in a hydrogen-poor environment, and (iii) probe the progenitor star's mass-loss history, providing a reference point for future studies. SN 2023fyq offers a rare opportunity to investigate SNe Ibn, their progenitor systems, and their impact on dust in their environments. Given its distance and conducive conditions for dust formation, SN 2023fyq may remain visible in the MIR for a decade. However, early observations are crucial to understanding rapid dust growth and interpreting future observations.

OBSERVING DESCRIPTION

We request 6.3 hrs of non-disruptive ToO time to obtain spectra and imaging of the closest Ibn SN~2023fyq. We will use and the MRS mode for spectroscopic observations, and imaging in the three reddest filters (F1800W, F2100W and F2500W) to probe the coolest dust. This program is rare and exciting opportunity to investigate SNe Ibn, their progenitor systems, dust properties and dust destruction/creation.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2023fyq	RA: 12 25 45.8600 (186.4410833d) Dec: +12 39 48.68 (12.66352d) Equinox: J2000		
Comments: *Category=Star* *Description=[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=[Supernovae]* *Extended=YES*				
(3)	SN2023fyq-imaging	RA: 12 25 45.8600 (186.4410833d) Dec: +12 39 48.68 (12.66352d) Equinox: J2000		
Comments: *Category=Star* *Description=[Supernovae]* *Extended=NO*				

Observation

Proposal 6659, Observation 1: MRS Spectroscopy Tue May 07 21:00:27 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[MRS Spectroscopy Background (Obs 2)]

Diagnostics

(MRS Spectroscopy (Obs 1)) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Exposure) Warning (Form): Record ETC Wkbk.Calc ID used to verify target acquisition.

(Visit 1:1) 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 45.8600 (186.4410833d) Dec: +12 39 48.68 (12.66352d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 SN2023fyq	F560W	FAST	10	1	1	27.75	

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	NEUTRAL

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	181996.21
1	SHORT(A)	MRSSHORT		SLOWR1	29	1	1	Dither 1	4	4	2771.231	181996.22
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	181996.26
2	MEDIUM(B)	MRSSHORT		SLOWR1	29	1	1	Dither 1	4	4	2771.231	181996.27
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	181996.30
3	LONG(C)	MRSSHORT		SLOWR1	29	1	1	Dither 1	4	4	2771.231	181996.31

Special Requirements	Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 6659, Observation 2: MRS Spectroscopy Background Tue May 07 21:00:27 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [MRS Spectroscopy (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
(2)	SN2023fyq-spec-background	RA: 12 25 40.8001 (186.4200004d) Dec: +12 38 24.29 (12.64008d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
F560W	All MRS	YES	FULL	NEUTRAL

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	Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 6659, Observation 3: MIRI imaging in 3 reddest filters

Tue May 07 21:00:27 GMT 2024

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 45.8600 (186.4410833d) Dec: +12 39 48.68 (12.66352d) Equinox: J2000		

Comments:
Category=Star
Description=[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	4-Point-Sets				1	1	POINT SOURCE	POSITIVE	SMALL

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	181996.6
2	F2100W	FASTR1	5	50	1	Dither 1	4	200	358.226	181996.7
3	F2550W	FASTR1	10	50	1	Dither 1	4	200	657.746	181996.8