



4575 - Dust Our Luck – Measuring Molecule and Dust Formation in M101’s Hydrogen-rich SN 2023ixf

Cycle: 2, Proposal Category: DD

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JWST Proposal 4575 (Created: Thursday, March 28, 2024 at 1:00:31 PM Eastern Standard Time) - Overview

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
+205-235d				
	10	NIRspec	NIRSpec Fixed Slit Spectroscopy	(1) SN2023IXF
	11	LRS-MIRI	MIRI Low Resolution Spectroscopy	(1) SN2023IXF
+375d				
	12	NIRspec	NIRSpec Fixed Slit Spectroscopy	(1) SN2023IXF
	13	LRS-MIRI	MIRI Low Resolution Spectroscopy	(1) SN2023IXF

ABSTRACT

On May 19, 2023, the Type II supernova (SN II) 2023ixf was discovered at only 6.6 Mpc from Earth; one of only a handful of SNe found within 7 Mpc in the last century. Discovered hours after explosion, the >8 mag rise over the following days triggered an intense, worldwide, multi-wavelength effort to provide a high-cadence view of SN 2023ixf's evolution. JWST observations will provide extremely valuable insights as the only telescope capable of completing the wavelength coverage in the NIR+MIR. The proximity of 2023ixf provides a perfect opportunity to study details of dust formation and any asymmetries in SNe II. The production sites of dust are still debated. AGB stars are considered to be the primary dust producers, but the first dust likely formed before AGB stars had time to produce it. SNe II are expected to play an important role in dust production since their current rate dominates over all other types of supernovae. We request 7.78 hr of DDT to obtain a NIR+MIR spectral time-series of 2023ixf at 3 epochs between ~ 30 -400 d past explosion to detect and track the formation and evolution of molecules and dust in the ejecta. The observations will provide a legacy data set from which the community can understand dust formation in SNe II to a degree not previously possible. The data will also uniquely constrain the ejecta of a nearby SN II, adding to the handful of SNe II within 7 Mpc, but with the unparalleled insights that JWST provides. Forgoing JWST observations at the proposed phases will hinder any future science (JWST or otherwise) of SN 2023ixf, and the community will be

unable to measure reliably the evolution of dust growth of the nearest SN II in the JWST era.

OBSERVING DESCRIPTION

We request 7.78 hrs of non-disruptive ToO time to obtain 3 NIR+MIR spectra of SN~2023ixf. We will use NIRSpec in the G395M/F290LP and G235M/F170LP gratings and the LRS mode on MIRI. This program will provide an unprecedented dataset on the evolution of CO, SiO and dust formation in the ejecta of the closest SN II in JWST's lifetime, and enable a unique avenue to determine how SNe IIP explode to a degree that was not possible with previous facilities.

Proposal 4575 - Targets - Dust Our Luck – Measuring Molecule and Dust Formation in M101's Hydrogen-rich SN 2023ixf

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000		
	<i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i>				

Proposal 4575 - Observation 10 - Dust Our Luck – Measuring Molecule and Dust Formation in M101's Hydrogen-rich SN 2023ixf

Thu Mar 28 18:00:31 GMT 2024

Observation	<p>Proposal 4575, Observation 10: NIRspec</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec Fixed Slit Spectroscopy</p>											
Diagnostics	(Visit 10:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(1)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i></p>											
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	WATA	SUB32	CLEAR	NRSRAPID	3	1	1	0.08	156228	
Template	Slit				Subarray							
	S400A1				SUBS400A1							
Dithers	#	Primary Dither Positions					Sub-Pixel Pattern					
	1	3					NONE					
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Ex #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	G395M/F290LP	S400A1	NRSRAPID	40	1	1	NONE	3	3	191.695	156228
	2	G235M/F170LP	S400A1	NRSRAPID	40	1	2	NONE	3	3	191.695	156228

Proposal 4575 - Observation 10 - Dust Our Luck – Measuring Molecule and Dust Formation in M101's Hydrogen-rich SN 2023ixf

Special Requirements

Between Dates 07-DEC-2023:00:00:00 and 30-JAN-2024:00:00:00

Group Observations 10, 11 within 3 Days

Proposal 4575 - Observation 11 - Dust Our Luck – Measuring Molecule and Dust Formation in M101’s Hydrogen-rich SN 2023ixf

Thu Mar 28 18:00:31 GMT 2024

Observation	Proposal 4575, Observation 11: LRS-MIRI Diagnostic Status: Warning Observing Template: MIRI Low Resolution Spectroscopy									
Diagnostics	(Visit 11:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections			Miscellaneous			
	(1)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000							
	<i>Comments:</i> Category=Star Description=[Supernovae]									
Acquisition	#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	F560W	FAST	4	1	1	11.1	156231	
Template	Subarray				Obtain Verification Image?					
	FULL				true					
Dithers	#	Dither Type		No. Spectral Steps	Spectral Step Offset	No. Spatial Steps		Spatial Step Offset		
	1	ALONG SLIT NOD								
Pointing Verification	#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	PV ETC Wkbk.Calc ID	Filter
	1	FASTR1	5	4	4	1	1	63.826		F560W

Proposal 4575 - Observation 11 - Dust Our Luck – Measuring Molecule and Dust Formation in M101’s Hydrogen-rich SN 2023ixf

Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	Spectral Requirements	1	FASTR1	30	3	6	1	2	510.607
	Between Dates 07-DEC-2023:00:00:00 and 30-JAN-2024:00:00:00 Group Observations 10, 11 within 3 Days								

Proposal 4575 - Observation 12 - Dust Our Luck – Measuring Molecule and Dust Formation in M101's Hydrogen-rich SN 2023ixf

Thu Mar 28 18:00:31 GMT 2024

Observation	<p>Proposal 4575, Observation 12: NIRSpec</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: NIRSpec Fixed Slit Spectroscopy</p>											
Diagnostics	(Visit 12:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections			Miscellaneous				
	(1)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000									
	<p><i>Comments:</i> <i>Category=Star</i> <i>Description=[Supernovae]</i></p>											
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	WATA	SUB32	CLEAR	NRSRAPIDD6	3	1	1	0.26	156228	
Template	Slit				Subarray							
	S400A1				SUBS400A1							
Dithers	#	Primary Dither Positions					Sub-Pixel Pattern					
	1	3					NONE					
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Ex #	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	G395M/F290LP	S400A1	NRSRAPID	100	1	1	NONE	3	3	472.135	156228
	2	G235M/F170LP	S400A1	NRSRAPID	100	1	2	NONE	3	3	472.135	156228

Proposal 4575 - Observation 12 - Dust Our Luck – Measuring Molecule and Dust Formation in M101's Hydrogen-rich SN 2023ixf

Special Requirements

Between Dates 01-MAY-2024:00:00:00 and 01-JUN-2024:00:00:00

Group Observations 12, 13 within 3 Days

Proposal 4575 - Observation 13 - Dust Our Luck – Measuring Molecule and Dust Formation in M101's Hydrogen-rich SN 2023ixf

Thu Mar 28 18:00:31 GMT 2024

Observation	Proposal 4575, Observation 13: LRS-MIRI Diagnostic Status: Warning Observing Template: MIRI Low Resolution Spectroscopy									
	(Visit 13:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections			Miscellaneous			
	(1)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000							
<i>Comments: Category=Star Description=[Supernovae]</i>										
Acquisition	#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID	
	1	SAME	F560W	FAST	6	1	1	16.65	156231	
Template	Subarray				Obtain Verification Image?					
	FULL				true					
Dithers	#	Dither Type		No. Spectral Steps	Spectral Step Offset		No. Spatial Steps		Spatial Step Offset	
	1	ALONG SLIT NOD								
Pointing Verification	#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	PV ETC Wkbk.Calc ID	Filter
	1	FASTR1	5	4	4	1	1	63.826		F560W

Proposal 4575 - Observation 13 - Dust Our Luck – Measuring Molecule and Dust Formation in M101’s Hydrogen-rich SN 2023ixf

Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
	1	FASTR1	60	3	6	1	2	1010.115	156231
Special Requirements	Between Dates 01-MAY-2024:00:00:00 and 01-JUN-2024:00:00:00								
	Group Observations 12, 13 within 3 Days								