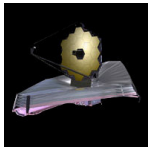

4522 - Dust Our Luck – Measuring Molecule and Dust Formation in M101's Hydrogen-rich SN 2023ixf

Cycle: 1, Proposal Category: DD

INVESTIGATORS

Name	*Institution*
Prof. Chris Ashall (PI)	**Virginia Polytechnic Institute and State University**
Dr. James M DerKacy (CoI) (CoPI)	Virginia Polytechnic Institute and State University
Dr. Eddie Baron (CoI) (CoPI)	Planetary Science Institute
Dr. Melissa Shahbandeh (CoI) (CoPI)	Space Telescope Science Institute
Dr. Peter A. Hoeflich (CoI) (CoPI)	Florida State University
Mr. Kyle Medler (CoI) (ESA Member)	Liverpool John Moores University
Dr. Armin Rest (CoI)	Space Telescope Science Institute
Dr. Maximillian Stritzinger (CoI) (ESA Member)	Aarhus University
Prof. Paolo A. Mazzali (CoI) (ESA Member)	Liverpool John Moores University
Jing Lu (CoI)	Florida State University
Sahana Kumar (CoI)	Florida State University
Prof. Eric Hsiao (CoI)	Florida State University
Dr. Ori Dosovitz Fox (CoI)	Space Telescope Science Institute
Mike Engesser (CoI)	Space Telescope Science Institute
Mr. Qinan Wang (CoI)	The Johns Hopkins University
Dr. Lluis Galbany (CoI) (ESA Member)	Institute of Space Sciences (CSIC-IEEC)
Dr. Peter J. Brown (CoI)	Texas A & M University
Dr. Thomas de Jaeger (CoI) (ESA Member)	Laboratoire de Physique Nucleaire des Hautes Energies
Michael Tucker (CoI)	The Ohio State University
Dr. Mark M. Phillips (CoI)	Carnegie Institution of Washington
Dr. Nicholas B. Suntzeff (CoI)	Texas A & M University

Name	***Institution***
Dr. Nidia Morrell (CoI)	Carnegie Institution of Washington
Mr. Tyco Brahe Mera Evans (CoI)	Florida State University
Dr. Tea Temim (CoI)	Princeton University
Dr. Samaporn Tinyanont (CoI)	National Astronomical Research Institute of Thailand
Muryel Guolo (CoI)	The Johns Hopkins University
Dr. Louis-Gregory Strolger (CoI)	Space Telescope Science Institute
Christopher Burns (CoI)	Carnegie Institution of Washington
Dr. Dietrich Baade (CoI) (ESA Member)	European Southern Observatory - Germany

OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
+40d				
	1	NIRspec	NIRSpec Fixed Slit Spectroscopy	(1) SN2023IXF
	2	LRS-MIRI	MIRI Low Resolution Spectroscopy	(1) SN2023IXF
	3	MIRI-MRS	MIRI Medium 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 ofthe closest SN II in JWSTs lifetime, and enable a unique avenue to determine how SNe IIP explode to a degree that was not possible with previous facilities.

Proposal 4522 - 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		

Comments:
Category=Star
Description=[Supernovae]

Observation

Proposal 4522, Observation 1: NIRspec Fri Jun 09 19:03:13 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

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
(1)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]

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	F140X	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/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395M/F290LP	S400A1	NRS	5	1	1	NONE	3	3	98.215	156228
2	G235M/F170LP	S400A1	NRS	3	1	2	NONE	3	3	60.823	156228

Special Requirements	
	Before Date 24-JUN-2023:00:00:00 Group Observations 1, 2 within 3 Days

Observation

Proposal 4522, Observation 2: LRS-MIRI Fri Jun 09 19:03:13 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(LRS-MIRI (Obs 2)) Warning (Form): Groups/Int cannot be 1, Groups/Int = 2 requires permission and Groups/Int of 3-4 is allowed but not recommended.

(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)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000		

Comments:
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	4	4	4	1	1	52.726		F560W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	15	3	6	1	2	260.854	156231

Special Requirements

Before Date 24-JUN-2023:00:00:00

Group Observations 1, 2 within 3 Days

Observation

Proposal 4522, Observation 3: MIRI-MRS Fri Jun 09 19:03:13 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

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
(1)	SN2023IXF	RA: 14 03 38.5640 (210.9106833d) Dec: +54 18 42.02 (54.31167d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae]

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	ALL	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	F770W	FASTR1	10	1	1	Dither 1	4	4	111.002	
1	LONG(C)	MRSLONG		FASTR1	72	1	1	Dither 1	4	4	799.212	
1	LONG(C)	MRSSHORT		FASTR1	72	1	1	Dither 1	4	4	799.212	
2		IMAGER	F1000W	FASTR1	10	1	1	Dither 1	4	4	111.002	
2	MEDIUM(B)	MRSLONG		FASTR1	72	1	1	Dither 1	4	4	799.212	
2	MEDIUM(B)	MRSSHORT		FASTR1	72	1	1	Dither 1	4	4	799.212	
3		IMAGER	F560W	FASTR1	10	1	1	Dither 1	4	4	111.002	
3	SHORT(A)	MRSLONG		FASTR1	72	1	1	Dither 1	4	4	799.212	
3	SHORT(A)	MRSSHORT		FASTR1	72	1	1	Dither 1	4	4	799.212	