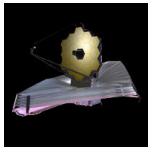

6838 - Boom and Dust: Near- and Mid-IR Observations of the Nearest Type Icn Supernova Dust Factory

Cycle: 3, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	2	NIRSpec Gratings	NIRSpec IFU Spectroscopy	(1) SN2023xgo

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	3	MIRI LRS	MIRI Low Resolution Spectroscopy	(1) SN2023xgo
	4	MIRI Imaging	MIRI Imaging	(1) SN2023xgo

ABSTRACT

We propose to obtain NIRSpec, MIRI LRS and MIRI imaging observations of the nearest (D~60 Mpc) Type Icn Supernova (SN Icn) 2023xgo yet discovered. SNe Icn are an exceedingly rare and only recently discovered class of extremely stripped SNe hallmarked by interaction between the SN shock and dense, C/O-rich, H/He-poor circumstellar medium (CSM). Hydrogen/helium-interacting SNe (IIn/Ibn) observed by Spitzer and JWST have significantly more dust than non-interacting SNe. SNe Icn, with their dense and comparatively dense C/O-rich CSM should be the ideal sites for SN dust. NIR observations of SN 2023xgo at 72 days after explosion show strong dust emission, requiring either extremely rapid dust formation or large amounts of pre-existing dust in the CSM. Here we request 7.5 total hours to obtain NIR-MIR observations of SN 2023xgo around 400 days past explosion. Observations as soon as possible, and particularly at this phase are critical to anchor dust grain growth models, and to compare to MIR observations of SNe Ibn - which only exist at this phase. These observations will robustly characterize the mass, composition, and origin of the dust in SN 2023xgo. These data will provide insights into the yet unknown SN Icn progenitors. Additionally, this test of dust production and growth in the ideal cosmic dust factory will constrain dust growth models, which, in turn, will determine if SNe alone can balance the early universe dust budget.

OBSERVING DESCRIPTION

We request 4.0/7.4 hrs of non-disruptive ToO DD time to obtain spectra and imaging of the closest SN Icn, SN 2023xgo (60 Mpc). We will use NIRSpec IFU + G295M and G395M gratings, MIRI LRS, and MIRI imaging in F1280W, F1500W, F1800W, and F2100W to obtain a full NIR-MIR (~2-23 micron) SED. These 3 spectroscopic and imaging components scientifically complement one another, and will enable the best constraints on the nature of the dust in SN 2023xgo -- including the composition, and emission from cool (~200 K) dust. The observations will execute at ~400 days post-explosion, which allows us to compare to previous observations of similar interacting SNe. The observations DO NOT need to be executed within a single visit, however we request that they be executed within 15 days of one another because the source is transient and evolving. This program is the first opportunity to obtain IR spectroscopic observations of this rare class of SN at late-times, and may be the only opportunity during the prime mission lifetime of JWST.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2023xgo	RA: 05 04 19.1900 (76.0799583d) Dec: +67 37 21.15 (67.62254d) Equinox: J2000		

Comments:
Category=Star
Description=[Circumstellar dust, Circumstellar gas, Supernovae]
Extended=NO

Observation

Proposal 6838, Observation 2: NIRSpec Gratings Tue Nov 12 17:00:17 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

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)	SN2023xgo	RA: 05 04 19.1900 (76.0799583d) Dec: +67 37 21.15 (67.62254d) Equinox: J2000		

Comments:
Category=Star
Description=[Circumstellar dust, Circumstellar gas, Supernovae]
Extended=NO

Template

TA Method
NONE

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	G235M/F170LP	NRSIRS2	5	3	false	true	NONE	4	12	4551.734	215200
2	G395M/F290LP	NRSIRS2	4	2	false	true	NONE	4	8	2450.934	215200

Special Requirements

Before Date 02-FEB-2025

Group Observations 2, 3, 4 within 15 Days

Observation

Proposal 6838, Observation 3: MIRI LRS Tue Nov 12 17:00:17 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Visit 3:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2023xgo	RA: 05 04 19.1900 (76.0799583d) Dec: +67 37 21.15 (67.62254d) Equinox: J2000		

Comments:
Category=Star
Description=[Circumstellar dust, Circumstellar gas, Supernovae]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 SN2023xgo	F560W	FASTGRPAVG8	4	1	1	88.801	215200

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	32	4	4	1	1	363.53		F1130W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	26	24	48	1	2	3590.902	215200

Special Requirements

Before Date 02-FEB-2025
Aperture PA Range 20.75797 to 125.75797 Degrees (V3 16.0 to 121.0)
Aperture PA Range 200.75797 to 305.75797 Degrees (V3 196.0 to 301.0)

Group Observations 2, 3, 4 within 15 Days

Observation

Proposal 6838, Observation 4: MIRI Imaging Tue Nov 12 17:00:17 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(1)	SN2023xgo	RA: 05 04 19.1900 (76.0799583d) Dec: +67 37 21.15 (67.62254d) Equinox: J2000		

Comments:
Category=Star
Description=[Circumstellar dust, Circumstellar gas, Supernovae]
Extended=NO

Template

Subarray
FULL

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	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1280W	FASTR1	32	1	1	Dither 1	4	4	355.205	215200
2	F1500W	FASTR1	40	1	1	Dither 1	4	4	444.006	215200
3	F1800W	FASTR1	20	4	1	Dither 1	4	16	921.313	215200
4	F2100W	FASTR1	16	14	1	Dither 1	4	56	2630.738	215200

Special Requirements

Before Date 02-FEB-2025

Group Observations 2, 3, 4 within 15 Days