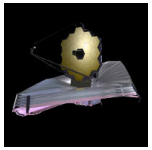

4520 - Near- and Mid-IR Observations to Probe Dust Formation in the Remarkably Nearby Stripped-Envelope Supernova 2023dbc

Cycle: 2, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
Phase 2				
	3	NIRSPEC	NIRSpec Fixed Slit Spectroscopy	(1) SN2023dbc
	4	MIRI/LRS	MIRI Low Resolution Spectroscopy	(1) SN2023dbc
Phase 3				
	5	NIRSPEC	NIRSpec Fixed Slit Spectroscopy	(1) SN2023dbc
	6	MIRI/LRS	MIRI Low Resolution Spectroscopy	(1) SN2023dbc

ABSTRACT

This past week, one of the closest stripped-envelope supernovae (SESNe) was discovered. The Type Ic SN 2023dbc was reported in M108 at only ~10 Mpc, a “once-in-a-decade” event. A worldwide multi-wavelength campaign is already underway, but JWST may provide the most valuable insights. Heavily obscured (AV > 3 mag), the SN is already quite red, but more importantly, the proximity of the SN offers a unique opportunity to study details of dust formation, which is still an open question, particularly in the early Universe. While AGB stars are considered to be primary dust producers, the first dust in the local Universe may have formed before AGB stars had time to make it. SESNe come from the death of massive, shorter-lived stars, and are therefore one of the earliest possible sources of early Universe cosmic dust. Few SESNe have occured close enough to monitor dust formation from early- to late-times. In fact, simultaneous measurements of the fundamental and first overtone of CO, over multiple epochs, has only been achieved for SN 1987A. A SESN provides a dramatic contrast in ejecta composition from which to test theories of dust and

molecule formation and destruction. Here we request 6.6 hr of DDT to obtain an NIR+MIR spectral time-series of SN 2023dbc at three key epochs between 30–350 days past-maximum luminosity to detect, characterize, and monitor the molecules and dust formed in SN 2023dbc. The observations will provide a legacy data set from which to model dust formation and uniquely probe the poorly constrained ejecta composition of SESNe.

OBSERVING DESCRIPTION

We request 6.6 hr of DDT to obtain an NIR+MIR spectral time-series of SN 2023dbc at three key epochs between 30–350 days past-maximum luminosity to detect, characterize, and monitor the molecules and dust formed in SN 2023dbc.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2023dbc	RA: 11 11 39.2110 (167.9133792d) Dec: +55 40 29.23 (55.67479d) Equinox: J2000	Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Supernovae]* *Extended=NO*				
(2)	2MASS	RA: 11 11 42.8438 (167.9285158d) Dec: +55 40 17.96 (55.67166d) Equinox: J2000	Proper Motion RA: -13.469 mas/yr Proper Motion Dec: -4.410 mas/yr Parallax: 0.0012646" Epoch of Position: 2024.28	
Comments: *Category=Star* *Description=[A stars]* *Extended=NO*				

Generic Targets

#	Name	Criteria	Description
(3)	SESN1	The target must be a stripped-envelope supernova	
Comments: The target must be a newly discovered stripped-envelope supernova.			

Observation

Proposal 4520, Observation 3: NIRSPEC Wed May 01 22:01:48 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit 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)	SN2023dbc	RA: 11 11 39.2110 (167.9133792d) Dec: +55 40 29.23 (55.67479d) Equinox: J2000	Epoch of Position: 2000	

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

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	151981.2

Template

Slit	Subarray
S400A1	SUBS400A1

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	2	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	G235M/F170LP	S400A1	NRSRAPID	20	1	1	NONE	2	2	65.477	151981.4
2	G395M/F290LP	S400A1	NRSRAPID	50	1	2	NONE	2	2	158.957	

Special Requirements	
	Between Dates 07-NOV-2023:00:00:00 and 07-JAN-2024:00:00:00 Group Observations 3, 4 within 2 Days

Observation

Proposal 4520, Observation 4: MIRI/LRS Wed May 01 22:01:48 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution 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
(1)	SN2023dbc	RA: 11 11 39.2110 (167.9133792d) Dec: +55 40 29.23 (55.67479d) Equinox: J2000	Epoch of Position: 2000	

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	SAME	F560W	FAST	4	1	1	11.1	151981.1

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	1	1	1	1	13.875		F560W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	100	2	4	1	2	1115.566	151981.3

Special Requirements

Between Dates 07-NOV-2023:00:00:00 and 07-JAN-2024:00:00:00

Group Observations 3, 4 within 2 Days

Observation

Proposal 4520, Observation 5: NIRSPEC

Wed May 01 22:01:48 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(NIRSPEC (Obs 5)) Warning (Form): The slew between the acquisition exposure and the farthest science exposure is 45.147 Arcsec (larger than the recommended limit of 40.000 Arcsec) and may result in reduced or no schedulability. See more information in the diagnostic browser.

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2023dbc	RA: 11 11 39.2110 (167.9133792d) Dec: +55 40 29.23 (55.67479d) Equinox: J2000	Epoch of Position: 2000	

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

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 2MASS	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	151982.2

Template

Slit	Subarray
S200A1	SUBS200A1

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	2	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	PRISM/CLEAR	S200A1	NRS	60	1	1	NONE	2	2	750.997	

Special Requirements	
	Between Dates 02-MAY-2024:00:00:00 and 16-MAY-2024:00:00:00 Group Observations 5, 6 within 1 Days

Observation

Proposal 4520, Observation 6: MIRI/LRS Wed May 01 22:01:48 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2023dbc	RA: 11 11 39.2110 (167.9133792d) Dec: +55 40 29.23 (55.67479d) Equinox: J2000	Epoch of Position: 2000	

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	SAME	F560W	FAST	8	1	1	22.2	151982.1

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	8	1	1	1	1	22.2		F560W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	100	15	30	1	2	8402.821	151982.3

Special Requirements

Between Dates 02-MAY-2024:00:00:00 and 16-MAY-2024:00:00:00

Group Observations 5, 6 within 1 Days