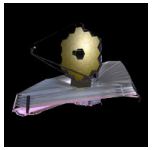

6811 - So Close, Yet So Faint: NIR+MIR Spectroscopy of the Nearest SN Iax 2024vjm

Cycle: 3, Proposal Category: DD

INVESTIGATORS

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Dr. Dale Andrew Howell (CoI)	Las Cumbres Observatory Global Telescope Network

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI MRS + NIRSPEC G395M/G235M WDSN-1				
	1	MRS	MIRI Medium Resolution Spectroscopy	(1) SN2024VJM
	2	NIR G395M+G235M+ G140M	NIRSpec Fixed Slit Spectroscopy	(1) SN2024VJM

ABSTRACT

SN 2024vjm was discovered in NGC 6744 at 7 Mpc just over a week ago, becoming the most nearby type Iax supernova (SN Iax) to-date. Originally classified as a peculiar nova, SN 2024vjm is also one of the faintest SNe Iax observed, providing an unprecedented and indispensible opportunity for detailed study of the characteristics and explosion mechanisms of the weakest thermonuclear SNe. JWST has been revolutionizing the study of thermonuclear SNe, opening a new window to unique infrared signatures and connecting different parts of the thermonuclear supernova zoo to different progenitor and explosion scenarios. Thought to arise from pure deflagrations of Chandrasekhar-mass white dwarfs, SNe Iax are a faint and diverse SN Ia subclass spanning an enormous range of luminosities and characterized by narrow spectral lines due to low velocities. However, current models struggle to reproduce the lowest luminosity SNe Iax. Here we request 12.9 hrs of DDT to obtain medium resolution NIR+MIR spectra of SN 2024vjm before the JWST observability window closes on 08-October-2024. These observations will allow us to directly test current theories and determine whether extremely low luminosity SNe Iax have distinct astrophysical origins.

OBSERVING DESCRIPTION

We request 12.9 hrs of DDT to observe the extremely nearby (7 Mpc) SN Iax 2024vjm in a single visit approximately two week post maximum-light. For this observation, we will use the NIRSpec G140M, G295M, and G395M gratings and MIRI MRS to obtain spectroscopic coverage from 1 to 28 microns at medium resolution (R~1000), which will enable us to clearly resolve the narrow lines that SNe Iax exhibit. The MRS observations will cover many important MIR emission lines of Ar, Co, Ni, and Ne; while the NIR data will show many narrow photospheric absorption and emission lines that are either not accessible (due to telluric absorption) or very difficult to observe with high S/N (due to the intrinsically faint nature of these objects) from the ground. This NIR + MIR spectrum will allow us to test models for the astrophysical origins of the weakest thermonuclear explosions.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2024VJM	RA: 19 09 25.8050 (287.3575208d) Dec: -63 50 1.76 (-63.83382d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae, Type Ia supernovae, White dwarfs]
Extended=NO

Observation

Proposal 6811, Observation 1: MRS Wed Sep 25 00:00:21 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution 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)	SN2024VJM	RA: 19 09 25.8050 (287.3575208d) Dec: -63 50 1.76 (-63.83382d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae, Type Ia supernovae, White dwarfs]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	F560W	FASTGRPAVG8	4	1	1	88.801	218369

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	YES	FULL	Allow Auto Reorder

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	50	4	1	Dither 1	4	16	2253.332	218369
1	SHORT(A)	MRSLONG		SLOWR1	52	2	1	Dither 1	4	8	10033.766	218369
1	SHORT(A)	MRSSHORT		SLOWR1	52	2	1	Dither 1	4	8	10033.766	218369
2		IMAGER	F770W	FASTR1	50	4	1	Dither 1	4	16	2253.332	218369
2	MEDIUM(B)	MRSLONG		SLOWR1	52	2	1	Dither 1	4	8	10033.766	218369
2	MEDIUM(B)	MRSSHORT		SLOWR1	52	2	1	Dither 1	4	8	10033.766	218369
3		IMAGER	F1000W	FASTR1	50	4	1	Dither 1	4	16	2253.332	218369
3	LONG(C)	MRSLONG		SLOWR1	52	2	1	Dither 1	4	8	10033.766	218369
3	LONG(C)	MRSSHORT		SLOWR1	52	2	1	Dither 1	4	8	10033.766	218369

Special Requirements	
	Between Dates 01-SEP-2024 and 01-NOV-2024 Group Observations 1, 2, Non-interruptible

Observation

Proposal 6811, Observation 2: NIR G395M+G235M+G140M Wed Sep 25 00:00:21 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit 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)	SN2024VJM	RA: 19 09 25.8050 (287.3575208d) Dec: -63 50 1.76 (-63.83382d) Equinox: J2000		

Comments:
Category=Star
Description=[Supernovae, Type Ia supernovae, White dwarfs]
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	SUB2048	F110W	NRSRAPID	3	1	1	3.628	218369

Template

Slit	Subarray
S200A1	FULL

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	S200A1	NRSIRS2RAPID	19	1	1	NONE	3	3	875.333	218369
2	G235M/F170LP	S200A1	NRSIRS2RAPID	19	1	2	NONE	3	3	875.333	218369
3	G140M/F100LP	S200A1	NRSIRS2RAPID	19	1	3	NONE	3	3	875.333	218369

Special Requirements	Group Observations 1, 2, Non-interruptible