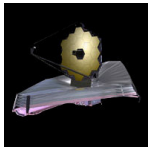

2754 - Unique Constraints on Early Dust Growth in Core-Collapse Supernovae

Cycle: 1, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI Imaging	MIRI Imaging	(1) SN2021AFDX
	2	Dedicated Background	MIRI Imaging	(2) SN2021AFDX-BG

ABSTRACT

On June 12, NIRCam observations of the Cartwheel galaxy (ERO 2727; PI Pontoppidan) provided a serendipitous glance at the core-collapse supernova (CCSN) 2021afdx. Three days later, complementary MIRI observations enabled the first analysis of CCSN ejecta dust using JWST observations. Probing the evolution of dust formation in CCSNe provides one of the most promising means of understanding the elevated dust levels

in high-redshift galaxies, but recent work has shown >99% of CCSN ejecta dust could be very cool (<150K), requiring precision observations at >15um to understand. The rate at which CCSNe form dust and the total mass formed are therefore highly uncertain due to the relative lack of old CCSN mid-IR data, with observations and models disagreeing by 2-3 orders of magnitude. This proposal leverages the existing JWST ERO observations of a CCSN, which already reveal the highest measured dust mass at this epoch post-explosion, to tightly constrain the cool ejecta dust and provide a legacy dataset for measuring dust growth acceleration the future. This program will provide the most accurate dust constraints thus far for CCSNe before 500 days post-explosion, where the handful of existing dust measurements span 2 orders of magnitude and do not probe the cold dust component. A DD program is the only opportunity to use this fortuitous dataset to obtain these constraints, as observations ~contemporaneous with the ERO data are required for a robust analysis.

OBSERVING DESCRIPTION

This proposal will image SN 2021axdf, SN II at z=0.03, with MIRI. The single epoch observation will consist of F1500W, F2100W, F2550W (with dedicated background) and a 4-point dither pattern.

Proposal 2754 - Targets - Unique Constraints on Early Dust Growth in Core-Collapse Supernovae

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SN2021AFDX	RA: 00 37 42.5748 (9.4273950d) Dec: -33 43 24.74 (-33.72354d) Equinox: J2000		
Comments: *Category=Star* *Description=[Type II supernovae]* *Extended=NO*				
(2)	SN2021AFDX-BG	RA: 00 37 53.3600 (9.4723333d) Dec: -33 43 5.60 (-33.71822d) Equinox: J2000		
Comments: *Category=Star* *Description=[Type II supernovae]* *Extended=NO*				

Observation

Proposal 2754, Observation 1: MIRI Imaging

Mon Oct 31 23:01:17 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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)	SN2021AFDX	RA: 00 37 42.5748 (9.4273950d) Dec: -33 43 24.74 (-33.72354d) Equinox: J2000		

Comments:
Category=Star
Description=[Type II 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	CYCLING	5	4		1	1			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	F1500W	FASTR1	36	1	1	Dither 1	4	4	399.606	120057
2	F2100W	FASTR1	41	6	1	Dither 1	4	24	2786.14	120057
3	F2550W	FASTR1	28	29	1	Dither 1	4	116	9324.134	120057

Special Requirements

Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 2754, Observation 2: Dedicated Background Mon Oct 31 23:01:17 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(2)	SN2021AFDX-BG	RA: 00 37 53.3600 (9.4723333d) Dec: -33 43 5.60 (-33.71822d) Equinox: J2000		

Comments:
Category=Star
Description=[Type II 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				5	1	EXTENDED 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	F2550W	FASTR1	28	7	1	Dither 1	4	28	2242.232	

Special Requirements

Sequence Observations 1, 2, Non-interruptible