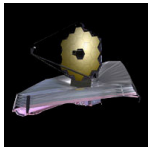

4712 - Looking into the core of a stellar explosion - the case of SNR 0540-69.3

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MRS				
	1		MIRI Medium Resolution Spectroscopy	(1) MRS-SNR0540
	2		MIRI Medium Resolution Spectroscopy	(2) MRS-Background
NIRSpec IFU				
	3		NIRSpec IFU Spectroscopy	(3) NIRspec-SNR0540
	4	G140H mosaic	NIRSpec IFU Spectroscopy	(4) NIRSpec-mosaic-SNR0540

ABSTRACT

JWST observations of supernova remnants (SNRs) offer a unique opportunity to uncover the physics governing stellar explosions, the ejected debris and resulting compact objects. We propose to observe a particular interesting remnant, SNR0540, which stems from a massive star that exploded in the LMC 1100 years ago. The NIRSpec and MRS IFUs will be used to obtain the first spatially resolved infrared spectroscopy of the inner region of the system. This region contains an energetic pulsar surrounded by a pulsar wind nebula (PWN), warm dust, as well as a highly asymmetric

distribution of line-emitting ejecta, making it possible to address a wide range of open questions. We will determine the abundances and 3D distribution of the ejecta, the location of the dust, the spatial variations of the synchrotron continuum in the PWN, and also obtain the first mid-infrared spectrum of the pulsar. These results in turn offer key diagnostics of the progenitor, explosion mechanism, dust production and particle acceleration. The proposed observations will thus provide a uniquely detailed view of all the physics operating at the core of a SN.

OBSERVING DESCRIPTION

Observations of SNR 0540-69.3, covering the inner ejecta and pulsar

1) MIRI MRS
2) MIRI MRS background (in non-interruptible sequence with 1)
3) NIRSpec IFU with G235M/F and G395M
4) NIRSpec IFU mosaic (2 positions) with G140H.

PA constraints have been included to cover the most interesting parts of the remnant with MRS and NIRSpec.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	MRS-SNR0540	RA: 05 40 11.1413 (85.0464221d) Dec: -69 19 54.64 (-69.33184d) Equinox: J2000	Epoch of Position: 2000	
Comments: Position for MRS observation *Category=Star* *Description=[Supernovae]* *Extended=YES*				
(2)	MRS-Background	RA: 05 40 14.5899 (85.0607912d) Dec: -69 20 21.97 (-69.33944d) Equinox: J2000		
Comments: *Category=Calibration* *Description=[Telescope/sky background]*				
(3)	NIRspec-SNR0540	RA: 05 40 11.0980 (85.0462417d) Dec: -69 19 54.75 (-69.33187d) Equinox: J2000		
Comments: Position for NIRSpec G235M and G395M observations *Category=Star* *Description=[Supernovae]* *Extended=YES*				
(4)	NIRSpec-mosaic-SNR0540	RA: 05 40 11.3160 (85.0471500d) Dec: -69 19 54.08 (-69.33169d) Equinox: J2000		
Comments: Central position for the NIRSpec G140H mosaic *Category=Star* *Description=[Supernovae]* *Extended=YES*				

Observation

Proposal 4712, Observation 1 Wed Jan 15 21:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Data Excess over lower threshold

(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)	MRS-SNR0540	RA: 05 40 11.1413 (85.0464221d) Dec: -69 19 54.64 (-69.33184d) Equinox: J2000	Epoch of Position: 2000	

Comments: Position for MRS observation
Category=Star
Description=[Supernovae]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	NO	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED 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	SHORT(A)	MRSLONG		FASTR1	98	5	1	Dither 1	4	20	5483.479	
1	SHORT(A)	MRSSHORT		FASTR1	98	5	1	Dither 1	4	20	5483.479	
2	MEDIUM(B)	MRSLONG		FASTR1	98	5	1	Dither 1	4	20	5483.479	
2	MEDIUM(B)	MRSSHORT		FASTR1	98	5	1	Dither 1	4	20	5483.479	
3	LONG(C)	MRSLONG		FASTR1	98	5	1	Dither 1	4	20	5483.479	
3	LONG(C)	MRSSHORT		FASTR1	98	5	1	Dither 1	4	20	5483.479	

Special Requirements	
	Aperture PA Range 55 to 65 Degrees (V3 55.0 to 65.0) Aperture PA Range 235 to 245 Degrees (V3 235.0 to 245.0) Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 4712, Observation 2 Wed Jan 15 21:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution 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
(2)	MRS-Background	RA: 05 40 14.5899 (85.0607912d) Dec: -69 20 21.97 (-69.33944d) Equinox: J2000		

Comments:
Category=Calibration
Description=[Telescope/sky background]

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	NO	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED 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	SHORT(A)	MRSLONG		FASTR1	98	2	1	Dither 1	4	8	2186.732	
1	SHORT(A)	MRSSHORT		FASTR1	98	2	1	Dither 1	4	8	2186.732	
2	MEDIUM(B)	MRSLONG		FASTR1	98	2	1	Dither 1	4	8	2186.732	
2	MEDIUM(B)	MRSSHORT		FASTR1	98	2	1	Dither 1	4	8	2186.732	
3	LONG(C)	MRSLONG		FASTR1	98	2	1	Dither 1	4	8	2186.732	
3	LONG(C)	MRSSHORT		FASTR1	98	2	1	Dither 1	4	8	2186.732	

Special Requirements	Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 4712, Observation 3

Wed Jan 15 21:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU 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
(3)	NIRspec-SNR0540	RA: 05 40 11.0980 (85.0462417d) Dec: -69 19 54.75 (-69.33187d) Equinox: J2000		

Comments: Position for NIRSpec G235M and G395M observations
Category=Star
Description=[Supernovae]
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

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	NRSIRS2RAPID	50	1	false	true	NONE	4	4	2976.134	
2	G395M/F290LP	NRSIRS2RAPID	50	1	false	true	NONE	4	4	2976.134	

Special Requirements

Aperture PA Range 55 to 65 Degrees (V3 276.02835083 to 286.02835083)
Aperture PA Range 235 to 245 Degrees (V3 96.02835083 to 106.02835083)

Observation

Proposal 4712, Observation 4: G140H mosaic

Wed Jan 15 21:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 4:1) Warning (Form): Data Excess over lower threshold

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	NIRSpec-mosaic-SNR0540	RA: 05 40 11.3160 (85.0471500d) Dec: -69 19 54.08 (-69.33169d) Equinox: J2000		

Comments: Central position for the NIRSpec G140H mosaic
Category=Star
Description=[Supernovae]
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
2	1	10.0	10.0	0.0	0.0	DEFAULT

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	G140H/F100LP	NRSIRS2RAPID	75	2	false	true	NONE	4	8	8870.045	

Special Requirements	Aperture PA Range 55 to 65 Degrees (V3 276.02835083 to 286.02835083) Aperture PA Range 235 to 245 Degrees (V3 96.02835083 to 106.02835083)