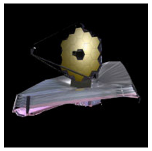

3177 - Beholding star cluster formation, feedback, and evolution with the 'Evil Eye'

Cycle: 2, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI	MIRI Imaging	(1) M-64
	2	NIRCAM + MIRI-off	NIRCam Imaging	(1) M-64

ABSTRACT

We propose NIRCam+MIRI multi-band imaging for the Evil Eye Galaxy (M64), a unique nearby merger-induced starburst system. We will uncover a large population of deeply embedded star clusters in the dusty, compact, inner disk of M64, where the high gas surface densities and complex orbital configurations provide very favorable conditions for massive cluster formation and survival. At the 4.4 Mpc distance to this target, NIRCam can resolve massive star clusters and the HII regions they power, yielding accurate size estimates and thus robust quantifications of the strength of various stellar feedback processes. Meanwhile, MIRI can map the multi-phase gas distribution down to the diffuse gas limit (< 10 Msun/pc^2) and resolve the filamentary gas structures that underlie and possibly fuel the dense, cluster-forming hubs. The proximity and compactness of M64 make it possible to address such a rich set of science goals regarding cluster formation, feedback, and evolution with only 3 hours of total charged time. With rich multiwavelength data in hand, this program will provide the last missing piece for a first synthesized study of star clusters, gas clouds, and HII regions in a unique, close-by, merger-driven starburst system.

OBSERVING DESCRIPTION

We use NIRCam and MIRI imaging modes to observe the nearby merger-induced starburst galaxy, M64. The field of view (FoV) of both instruments is enough to cover in a single pointing the entire dusty inner disk, where nearly all star formation takes place in M64. The MIRI observation requires a PA constraint to ensure complete coverage of this area of interest. As this area spans much of the MIRI FoV, we also request a MIRI off-target pointing in parallel with the on-target NIRCam imaging to facilitate background subtraction. This additionally requires the NIRCam+MIRI-off and MIRI-on observations to be taken without interruption.

We choose a set of filters and determine the required exposure time according to the following specific aims: (1) to derive robust age, mass, and extinction for young star clusters, (2) to trace the filamentary gas structure down to the surface densities characteristic of the diffuse ISM, and (3) to capture the reprocessed stellar radiation by gas and dust in HII regions. For the NIRCam observations, we use only module B with a 4-point INTRAMODULEBOX dither and either BRIGHT1 (for broad/medium bands) or BRIGHT2 (for narrow bands) readout. The total integration times are 214.7s, 214.7s, 1073.7s, and 386.5s for the four filter pairs (F150W–F335M, F200W–F300M, F187N–F405N, F150W–F430M), respectively. For the MIRI observations, we use a 4-point dither and the FASTR1 readout mode. The total integration times are 66.6s, 111.0s, 188.7s, 144.3s for F770W, F1130W, F1000W, and F2100W, respectively. This setup minimizes the chances of saturation on the bright M64 nucleus.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	M-64	RA: 12 56 43.6960 (194.1820667d) Dec: +21 40 57.57 (21.68266d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Disk galaxies]

Observation

Proposal 3177, Observation 1: MIRI

Tue Mar 12 00:00:19 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

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

(MIRI (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	M-64	RA: 12 56 43.6960 (194.1820667d) Dec: +21 40 57.57 (21.68266d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Disk galaxies]

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	1	4		6	1			LARGE

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1000W	FASTR1	28	2	1	Dither 1	4	8	632.709	139806
2	F1130W	FASTR1	15	1	1	Dither 1	4	4	166.502	139806
3	F1130W	FASTR1	15	1	1	Dither 1	4	4	166.502	139806

Special Requirements

Aperture PA Range 94.83544897 to 134.83544897 Degrees (V3 90.0 to 130.0)

Group Observations 1, 2, Non-interruptible
Same Aperture PA 1, 2 (V3 PAs differ)

Observation

Proposal 3177, Observation 2: NIRCAM + MIRI-off Tue Mar 12 00:00:19 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRCam Imaging

Coordinated Parallel Template(s): MIRI Imaging

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(NIRCAM + MIRI-off (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	M-64	RA: 12 56 43.6960 (194.1820667d) Dec: +21 40 57.57 (21.68266d) Equinox: J2000	Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Galaxy
Description=[Disk galaxies]

Template

NIRCam Imaging	MIRI Imaging
Module: B	Subarray: FULL
Subarray: FULL	
Target Placement: Module Gap	

Dithers

#	Primary Dither Type	Primary Dithers	Dither Size	Subpixel Positions	Coordinated Parallel Subpixel Selector	Dither Direct Images Primes
1	INTRAMODULEBOX	4		1	NIRCam Only	NO_DITHERING

Spectral Elements

NIRCam Imaging	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	F187N	F405N+F444W	SHALLOW4	8	1	4	4	1674.936	139806
2	F150W	F430M	BRIGHT2	7	1	4	4	601.259	139806
3	F200W	F300M	BRIGHT2	5	1	4	4	429.471	139806

Spectral Elements

MIRI Imaging	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1000W	FASTR1	28	2	1		4	8	632.709	
2	F1130W	FASTR1	15	1	1		4	4	166.502	
3	F1130W	FASTR1	15	1	1		4	4	166.502	

Special Requirements	
	Offset 6.0 arcsec, 6.0 arcsec No Parallel Attachments Group Observations 1, 2, Non-interruptible Same Aperture PA 1, 2 (V3 PAs differ)