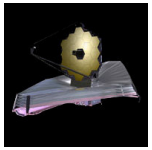

2987 - Resolving HII Regions and ISM Structure Across the Milky Way Analog NGC 253

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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Dr. Erik Rosolowsky (CoI) (CSA Member)	University of Alberta
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Dr. Jonathan Henshaw (CoI) (ESA Member)	Liverpool John Moores University
Dr. Eric Koch (CoI)	Smithsonian Institution Astrophysical Observatory
Dr. Kathryn Kreckel (CoI) (ESA Member)	Universitat Heidelberg

Name	***Institution***
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Dr. Amy Sardone (CoI)	The Ohio State University
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Dr. Jiayi Sun (CoI)	Princeton University
Dr. Antonio Usero (CoI) (ESA Member)	Observatorio Astronomico Nacional
Dr. David Thilker (CoI) (Contact)	The Johns Hopkins University
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Jaeyeon Kim (CoI) (ESA Member)	Heidelberg Institute for Theoretical Studies
Dr. Justus Neumann (CoI) (ESA Member)	Max Planck Institute for Astronomy
Ivana Beslic (CoI) (ESA Member)	Observatoire de Paris

OBSERVATIONS

Folder	***Observation***	***Label***	***Observing Template***	***Science Target***
NGC 253 MIRI Mosaic				
	3	Full MIRI only	MIRI Imaging	(1) NGC-0253
	4	MIRI Background	MIRI Imaging	(2) NGC-0253-BACKGROUND

ABSTRACT

We propose to survey mid-IR emission from the the whole disk of the closest massive, star-forming southern galaxy: the prototypical spiral NGC 253. At the 3.6 Mpc distance to NGC 253, MIRI achieves 5 pc resolution in the PAH-tracing F770W band and 12 pc resolution in the continuum-dominated F2100W band, which allows the prospect (only possible in the closest galaxies) to resolve individual HII regions and ISM structures

including molecular clouds and filaments. Pairing JWST with a unique full-galaxy 100 pointing VLT/MUSE map, we will measure resolved PAH and continuum profiles for > 6,500 HII regions. This will allow us to build a quantitative, data-driven model for the multiwavelength structure of HII regions as a function of powering luminosity and evolutionary state. Also building on investments by ALMA and MeerKAT, our survey will span from the gas-rich inner galaxy out to atomic-dominated regions analogous to the Solar Circle (rgal > 10 kpc), achieving a sharp view of the ISM over c. 300 kpc^2. The inclination of NGC 253 acts to our advantage here: we can easily distinguish individual regions and the inclined view gives access to vertical structure in the arms and bar. Overall, with a 22h investment, JWST can produce a revolutionary view of both HII region and neutral ISM structure that spans across the whole area of a prototypical spiral.

OBSERVING DESCRIPTION

We observe a large MIRI mosaic with an 11x3 orientation. To avoid saturation, we manually exclude the center. The PA is fixed and then a row offset angle is specified to match the extent of optical spectral mapping and ALMA CO coverage of the disk. The result is that we cover the whole disk beyond to the Solar Circle analog in 33 fields.

Regarding scheduling, we need a specific combination of row offset and PA to cover the target, and have specified one such combination in the submission. But if desired at Phase 2, we can adjust to a different PA + row offset combination in order to help with scheduling.

We also target a background mosaic, linked in time and validated to be free of IR emission in IRAC and MIPS images. We target a 2x2 mosaic for the background using an identical strategy to the on-source observations. The four background fields mean that we can construct a single high S/N off image, which avoids any extra noise in the case of pixel-by-pixel background subtraction.

As described in detail in the proposal, we picked the depths to detect individual star forming regions and ISM clouds, and have validated them against the PHANGS-JWST observing strategy (we expose slightly longer in F770W and the same in F2100W and target a nearer, brighter target). We also validate using the ETC that our observations detect the minimum intensity of the galaxy at > 10 S/N and that the maximum intensity in the image (outside the central field) does not saturate the image.

Proposal 2987 - Targets - Resolving HII Regions and ISM Structure Across the Milky Way Analog NGC 253

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NGC-0253	RA: 00 47 33.1200 (11.8880000d) Dec: -25 17 17.59 (-25.28822d) Equinox: J2000		
Comments: This object was generated by the targetselector and retrieved from the NED database. *Category=Galaxy* *Description=[Barred spiral galaxies]* *Extended=YES*				
(2)	NGC-0253-BACKGROUND	RA: 00 48 33.1200 (12.1380000d) Dec: -25 23 17.59 (-25.38822d) Equinox: J2000		
Comments: Right now 5 arcmin down from center. Shoulds tweak. *Category=Calibration* *Description=[Telescope/sky background]* *Extended=YES*				

Observation

Proposal 2987, Observation 3: Full MIRI only Wed Jun 21 19:02:36 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Comments: The orthogonal scheduling option is possible, meets science goals, and actually has more time during Cycle 2. But this generates micrometeorite warnings, and so we have opted for this choice as more conservative. It would be easy to adjust according to scheduling pressure during Phase 2 if relevant.

Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:5) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:6) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:7) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:8) Warning (Form): Overheads are provisional until the Visit Planner has been run.
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(Visit 3:31) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 3:32) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	NGC-0253	RA: 00 47 33.1200 (11.8880000d) Dec: -25 17 17.59 (-25.28822d) Equinox: J2000		

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=Galaxy
Description=[Barred spiral galaxies]
Extended=YES

Template

Subarray
FULL

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
11	3	10.0	10.0	10.0	0.0	HILBERT_CURVE

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	F770W	FASTR1	10	1	1	Dither 1	4	4	111.002	137804
2	F2100W	FASTR1	15	2	1	Dither 1	4	8	344.105	137804

Special Requirements

Group Visits within 53.0 Days
Aperture PA Range 39.17544897 to 41.97544897 Degrees (V3 34.34 to 37.14)
Visits Same PA

Sequence Observations 3, 4, Non-interruptible

Observation

Proposal 2987, Observation 4: MIRI Background Wed Jun 21 19:02:36 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 4:2) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 4:3) Warning (Form): Overheads are provisional until the Visit Planner has been run.
(Visit 4:4) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	NGC-0253-BACKGROUND	RA: 00 48 33.1200 (12.1380000d) Dec: -25 23 17.59 (-25.38822d) Equinox: J2000		

Comments: Right now 5 arcmin down from center. Shoulds tweak.
Category=Calibration
Description=[Telescope/sky background]
Extended=YES

Template

Subarray
FULL

Mosaic

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

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	F770W	FASTR1	10	1	1	Dither 1	4	4	111.002	
2	F2100W	FASTR1	15	2	1	Dither 1	4	8	344.105	

Special Requirements	
	Group Visits within 53.0 Days Visits Same PA Sequence Observations 3, 4, Non-interruptible