



2433 - Imaging the disk-halo boundary layer: PAH emission as a probe of the energetics and physics of interstellar thick disks

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
Observation 1 Mosaic Group				
	1		MIRI Imaging	(1) NGC-891
	2	Observation 1 Background Tile	MIRI Imaging	(2) NGC-891-INSERT

ABSTRACT

Most nearby spiral galaxies show thick disks of interstellar gases supported and fed by the feedback from star formation. This material serves as the interface between the disk and the circumgalactic medium; it regulates the flows between the two, dictating the time and length scales for the circulation of baryons and metals within a galaxy. Interstellar thick disks are complex, showing the full range of phases as the underlying thin disks; this includes a cold neutral/molecular medium from which thick disk stars are actively formed. We propose to take advantage of the incredible leaps in resolution and sensitivity offered by JWST to map the PAH emission from the interstellar thick disk of the canonical edge-on spiral galaxy NGC 891, the the local galaxy with the best-studied thick disk over all phases. Our proposed images probe the interstellar thick disk to unprecedented

heights, probing the distribution of metal-bearing PAHs to the boundary between the galaxy and its circumgalactic medium. With our proposed images we will 1) characterize the spatial distribution of PAH emission, including decomposing the emission associated with the well-known diffuse ionized gas from the other phases; 2) identify thick disk filaments fed directly by disk star forming regions to determine the stellar energy required to create outflows from the disk; and 3) obtain a complete census of star formation and masses of young stellar clusters in the thick disk. Together these goals will help paint a complete picture of the physics at work in shaping and maintaining the physical and phase structure of the thick disk interstellar medium.

OBSERVING DESCRIPTION

We will obtain MIRI images of NGC 891 in the F770W filter to observe the 7.7 μm PAH band. The F770W filter samples both PAH and stellar emission. We will create a stellar continuum image using a scaled F560W image, subtracting it from the F770W data to create a PAH-only image (McCormick et al. 2013).

Our F770W observations assume a 2-point dither at each mosaic position, with (50 groups) x (6 integrations) at each dither step. We limit the number of groups to 50 in order to avoid saturating the emission from the central disk. The F560W have a lower exposure (25 groups) x (3 integrations), sufficient to detect individual K supergiants at the distance of NGC 891, though they will be used to detect the integrated (unresolved) stellar light (fainter in F770W than in F560W) underlying the PAH emission. We include one offset background image at higher z-height than our prime mosaic to facilitate background subtraction. This field extends the vertical coverage to $z \sim 11$ kpc from the midplane of NGC 891.

We have constrained the PA in v3 coordinates to 80 – 140 to observe a large vertical extent over a reasonable radial range and give an overlapping background field at large enough z-height. The background pointing is a slightly more constrained PA requirement at 90 – 130. There are no problems with scheduling.

Proposal 2433 - Targets - Imaging the disk-halo boundary layer: PAH emission as a probe of the energetics and physics of interstellar ...

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	NGC-891	RA: 02 22 33.0583 (35.6377429d) Dec: +42 20 49.36 (42.34704d) Equinox: J2000 <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Galaxy Description=[Spiral galaxies]	Epoch of Position: 2015.5	
(2)	NGC-891-INSERT	RA: 02 22 52.3606 (35.7181692d) Dec: +42 21 8.24 (42.35229d) Equinox: J2000 <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Galaxy Description=[Spiral galaxies]	Epoch of Position: 2015.5		

Proposal 2433 - Observation 1 - Imaging the disk-halo boundary layer: PAH emission as a probe of the energetics and physics of inter...

Tue Mar 30 20:09:51 GMT 2021

Observation	Proposal 2433, Observation 1 Diagnostic Status: Warning Observing Template: MIRI Imaging																										
	(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:2) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:3) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:4) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:5) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:6) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:7) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:8) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:9) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:10) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:11) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:12) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:13) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:14) Warning (Form): Overheads are provisional until the Visit Planner has been run. (Visit 1:15) Warning (Form): Overheads are provisional until the Visit Planner has been run.																										
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Proposal 2433 - Observation 1 - Imaging the disk-halo boundary layer: PAH emission as a probe of the energetics and physics of inter...

Spectral Elements	#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
		1	F560W	FAST	25	3	1	Dither 1	2	6	416.256
	2	F770W	FAST	50	6	1	Dither 1	2	12	1665.024	60738
Special Requirements	Group Visits within 53.0 Days Aperture PA Range 84.83425324 to 144.83425324 Degrees (V3 80.0 to 140.0) Visits Same PA										

Proposal 2433 - Observation 2 - Imaging the disk-halo boundary layer: PAH emission as a probe of the energetics and physics of inter...

Tue Mar 30 20:09:51 GMT 2021

Observation	<p>Proposal 2433, Observation 2: Observation 1 Background Tile</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Imaging</p>										
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)	NGC-891-INSERT	RA: 02 22 52.3606 (35.7181692d) Dec: +42 21 8.24 (42.35229d) Equinox: J2000		Epoch of Position: 2015.5						
	<p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i></p> <p><i>Category=Galaxy</i></p> <p><i>Description=[Spiral galaxies]</i></p>										
Template	<p>Subarray</p> <p>FULL</p>										
Dithers	#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size	
	1	2-Point								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	F560W	FAST	25	3	1	Dither 1	2	6	416.256	60738
	2	F770W	FAST	50	6	1	Dither 1	2	12	1665.024	60738
Special Requirements	Aperture PA Range 94.83425324 to 134.83425324 Degrees (V3 90.0 to 130.0)										