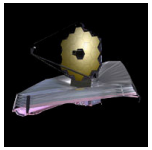

4201 - The Butterfly Effect: Determining the distribution of ices across a young disk to constrain planet formation

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI science	MIRI Medium Resolution Spectroscopy	(1) IRAS04302-MIRI
	2	MIRI background	MIRI Medium Resolution Spectroscopy	(2) MIRI-BACKGROUND
	3	NIRSpec	NIRSpec IFU Spectroscopy	(3) IRAS04302-NIRSPEC

ABSTRACT

Young disks (Class I) orbiting nascent stars are the birthplaces of planets. In order to link the elemental composition of exoplanets, that JWST will provide in plenty, to their formation history, one needs to determine the chemical composition of both the gas and solids across the disk. With ALMA a stunning progress has been made to map the gas content of disks, but the distribution and compositions of ices remains poorly known. We aim to target IRAS 04302 (the Butterfly Star) with MIRI MRS and NIRSpec IFU, to map the major carbon and oxygen carriers in the ice phase: CO, CO2, CH4 and H2O. The exact edge-on geometry and large size makes this young disk uniquely suited to unveil for the first time the vertical and radial

structure of the ices. We will obtain the radial and vertical location of the CO, CO2, H2O snow surfaces, which are setting the C/O ratio of the gas and dust. These observations will demonstrate the impact that JWST will have on the studies of planet formation.

OBSERVING DESCRIPTION

We target a Class I protostar IRAS-04302 with MIRI MRS in full spectral coverage of 5-28 micron, and with NIRSpec IFU in high spectral resolution grating/filter combination: G395H/F290LP and G235H/F170LP. This spectral setup covers H2O, CO2, CO, CH4 features, essential for determining the C/O ratio of the ice mantle.

17 groups per sub-band, per dither, per mosaic tile is spent with MIRI (in slow readout mode) resulting in total science time of 4.1 hrs, and 10 groups per grating, per dither, per mosaic tile on NIRSpec resulting in 2.92 hrs of science observation. For MIRI a mosaic of 3x1 is selected to cover the entire extent of the disk and the inner envelope. Since Spitzer images show more exteded emission at 3.6 micron compared to 5.8 micron, we use a 3x3 mosaic for NIRSpec to maximize spatial information. A 4-point dither is used for both instruments to maximize the spatial and spectral sampling. A dedicated sky background is targeted with MIRI.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	IRAS04302-MIRI	RA: 04 33 16.5000 (68.3187500d) Dec: +22 53 20.40 (22.88900d) Equinox: J2000		
Comments: *Category=ISM* *Description=[Interstellar dust, Protostars]* *Extended=YES*				
(2)	MIRI-BACKGROUND	RA: 04 33 16.0100 (68.3167083d) Dec: +23 03 50.40 (23.06400d) Equinox: J2000		
Comments: *Category=Calibration* *Description=[Telescope/sky background]* *Extended=YES*				
(3)	IRAS04302-NIRSPEC	RA: 04 33 16.5000 (68.3187500d) Dec: +22 53 20.40 (22.88900d) Equinox: J2000		
Comments: *Category=ISM* *Description=[Interstellar dust, Protostars]* *Extended=YES*				

Observation

Proposal 4201, Observation 1: MIRI science Mon Jul 10 23:01:58 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[MIRI background (Obs 2)]

Diagnostics

(MIRI science (Obs 1)) Warning (Form): Imager Filter overlap.

(MIRI science (Obs 1)) Warning (Form): Imager Filter overlap.

(MIRI science (Obs 1)) Warning (Form): Imager Filter overlap.

(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)	IRAS04302-MIRI	RA: 04 33 16.5000 (68.3187500d) Dec: +22 53 20.40 (22.88900d) Equinox: J2000		

Comments:
Category=ISM
Description=[Interstellar dust, Protostars]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	ALL	YES	FULL	NEUTRAL

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
1	3	10.0	10.0	0.0	0.0	DEFAULT

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		IMAGER	F1800W	SLOWR1	17	1	1	Dither 1	4	4	1624.515	
1	LONG(C)	MRSLONG		SLOWR1	17	1	1	Dither 1	4	4	1624.515	63038.1
1	LONG(C)	MRSSHORT		SLOWR1	17	1	1	Dither 1	4	4	1624.515	
2		IMAGER	F1500W	SLOWR1	17	1	1	Dither 1	4	4	1624.515	
2	MEDIUM(B)	MRSLONG		SLOWR1	17	1	1	Dither 1	4	4	1624.515	
2	MEDIUM(B)	MRSSHORT		SLOWR1	17	1	1	Dither 1	4	4	1624.515	
3		IMAGER	F1280W	SLOWR1	17	1	1	Dither 1	4	4	1624.515	
3	SHORT(A)	MRSLONG		SLOWR1	17	1	1	Dither 1	4	4	1624.515	
3	SHORT(A)	MRSSHORT		SLOWR1	17	1	1	Dither 1	4	4	1624.515	

Special Requirements	Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 4201, Observation 2: MIRI background Mon Jul 10 23:01:58 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [MIRI science (Obs 1)]

Diagnostics

(MIRI background (Obs 2)) Warning (Form): Imager Filter overlap.

(MIRI background (Obs 2)) Warning (Form): Imager Filter overlap.

(MIRI background (Obs 2)) Warning (Form): Imager Filter overlap.

(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)	MIRI-BACKGROUND	RA: 04 33 16.0100 (68.3167083d) Dec: +23 03 50.40 (23.06400d) Equinox: J2000		

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

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	ALL	YES	FULL	NEUTRAL

Dithers

#	Dither Type	Optimized For	Direction
1	2-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		IMAGER	F1800W	SLOWR1	17	1	1	Dither 1	2	2	812.257	
1	LONG(C)	MRSLONG		SLOWR1	17	1	1	Dither 1	2	2	812.257	
1	LONG(C)	MRSSHORT		SLOWR1	17	1	1	Dither 1	2	2	812.257	
2		IMAGER	F1500W	SLOWR1	17	1	1	Dither 1	2	2	812.257	
2	MEDIUM(B)	MRSLONG		SLOWR1	17	1	1	Dither 1	2	2	812.257	
2	MEDIUM(B)	MRSSHORT		SLOWR1	17	1	1	Dither 1	2	2	812.257	
3		IMAGER	F1280W	SLOWR1	17	1	1	Dither 1	2	2	812.257	
3	SHORT(A)	MRSLONG		SLOWR1	17	1	1	Dither 1	2	2	812.257	
3	SHORT(A)	MRSSHORT		SLOWR1	17	1	1	Dither 1	2	2	812.257	

Special Requirements	Sequence Observations 1, 2, Non-interruptible

Observation

Proposal 4201, Observation 3: NIRSpec Mon Jul 10 23:01:58 GMT 2023

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)	IRAS04302-NIRSPEC	RA: 04 33 16.5000 (68.3187500d) Dec: +22 53 20.40 (22.88900d) Equinox: J2000		

Comments:
Category=ISM
Description=[Interstellar dust, Protostars]
Extended=YES

Template

TA Method
NONE

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
3	3	10.0	10.0	0.0	-25.0	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	G395H/F290LP	NRSIRS2RAPID	10	1	false	true	NONE	4	4	641.911	63038.4
2	G235H/F170LP	NRSIRS2RAPID	10	1	false	true	NONE	4	4	641.911	