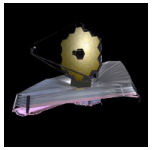

5709 - What causes warm dust interior to planetesimal belts?

Cycle: 3, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI imaging				
	1	Gam Oph - F2550W	MIRI Imaging	(1) -gam-Oph
	2	Gam Oph - F1500W	MIRI Imaging	(1) -gam-Oph
	3	Background - F2550W	MIRI Imaging	(3) Background

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	4	Background - F1500W	MIRI Imaging	(3) Background
	5	Zet Ser - F2550W	MIRI Imaging	(2) -zet-Ser
	6	Zet Ser - F1500W	MIRI Imaging	(2) -zet-Ser

ABSTRACT

One of the most notable findings of JWST in exoplanetary systems so far has been the discovery of a continuous distribution of warm dust permeating the space interior to the planetesimal belt in Fomalhaut. An intermediate dust ring was also discovered within this dust distribution that pointed to the presence of perturbing planets, highlighting the unique capability of JWST to probe this intermediate region of planetary systems. Such a discovery has prompted a re-evaluation of our understanding of debris disk structures more generally, while opening up a new method to search for planets by looking at planetary perturbations within continuous inner warm dust distributions. In this proposal, we aim to test whether there exists a common mechanism for causing this inner warm dust, which may be ubiquitous in debris disks. We target the Gamma Oph system, which is the best target to image with MIRI to probe this inner dust distribution alongside Fomalhaut and Vega which have been observed as part of GTO programs. We will be able to test whether these systems host inner warm dust commonly explained by Poynting-Robertson drag, as has been modelled in Fomalhaut, or whether a more diverse range of mechanisms are at play, such as comet delivery or a two-belt configuration analogous to the Solar System. In all possible scenarios, we will be able to constrain the planetary architecture in Gamma Oph to compare with Fomalhaut and Vega, leading to a more complete understanding of debris disk structures in this new region enabled by JWST and the architecture of otherwise invisible planets.

OBSERVING DESCRIPTION

Our observations consist of MIRI imaging of the debris disk of Gamma Oph. The MIRI observations will be carried out with the F1500W and F2550W filters. Both are sensitive to the inner structure of the disk, revealing the radial distribution of the dust interior to the planetesimal belt at 100 au and whether asymmetries are present. An integration time of ~10 min and ~7 min with the F2550W and F1500W provides a high S/N to enable subsequent dynamical modelling in combination with ALMA data to determine the origin of dust and constrain the architecture of any perturbing planets. The spatially resolved mid-infrared spectral index between the two filters will constrain the dust composition and grain size to test whether they are consistent with our model hypotheses. Detector subarrays are chosen to avoid saturation with 5 groups. The reference star Zet Ser will be observed at a similar S/N to enable efficient PSF subtraction. ADI is not applied to avoid removing any disk emission.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	-gam-Oph	RA: 17 47 53.5606 (266.9731692d)	Proper Motion RA: -23.936 mas/yr	
		Dec: +02 42 26.20 (2.70728d)	Proper Motion Dec: -74.46199990681635 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[A dwarfs, A stars, Circumstellar disks, Circumstellar dust, Debris disks]*				
(2)	-zet-Ser	RA: 18 00 29.0101 (270.1208754d)	Proper Motion RA: 154.66 mas/yr	
		Dec: -03 41 24.98 (-3.69027d)	Proper Motion Dec: -45.909000095889496 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[F dwarfs, F stars]*				
(3)	Background	RA: 17 47 58.6080 (266.9942000d)	Proper Motion RA: 0 mas/yr	
		Dec: +02 43 24.32 (2.72342d)	Proper Motion Dec: 0 mas/yr	
		Equinox: J2000	Epoch of Position: 2024	
Comments: Background observations for science target and PSF *Category=Calibration* *Description=[Telescope/sky background]*				

Observation

Proposal 5709, Observation 1: Gam Oph - F2550W Fri Jul 12 18:00:12 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.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	-gam-Oph	RA: 17 47 53.5606 (266.9731692d)	Proper Motion RA: -23.936 mas/yr	
		Dec: +02 42 26.20 (2.70728d)	Proper Motion Dec: -74.46199990681635 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[A dwarfs, A stars, Circumstellar disks, Circumstellar dust, Debris disks]

Template

Subarray
SUB256

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	EXTENDED SOURCE	POSITIVE	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	F2550W	FASTR1	10	45	1	Dither 1	4	180	591.852	176469

Special Requirements

Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Observation

Proposal 5709, Observation 2: Gam Oph - F1500W Fri Jul 12 18:00:12 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(1)	-gam-Oph	RA: 17 47 53.5606 (266.9731692d)	Proper Motion RA: -23.936 mas/yr	
		Dec: +02 42 26.20 (2.70728d)	Proper Motion Dec: -74.46199990681635 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[A dwarfs, A stars, Circumstellar disks, Circumstellar dust, Debris disks]

Template

Subarray
SUB128

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	EXTENDED SOURCE	POSITIVE	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	F1500W	FASTR1	5	310	1	Dither 1	4	1240	885.181	176469

Special Requirements

Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Observation

Proposal 5709, Observation 3: Background - F2550W Fri Jul 12 18:00:12 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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)	Background	RA: 17 47 58.6080 (266.9942000d) Dec: +02 43 24.32 (2.72342d) Equinox: J2000	Proper Motion RA: 0 mas/yr Proper Motion Dec: 0 mas/yr Epoch of Position: 2024	

Comments: Background observations for science target and PSF
Category=Calibration
Description=[Telescope/sky background]

Template

Subarray
SUB256

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	EXTENDED SOURCE	POSITIVE	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	F2550W	FASTR1	10	45	1	Dither 1	4	180	591.852	176469

Special Requirements

Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Observation

Proposal 5709, Observation 4: Background - F1500W Fri Jul 12 18:00:12 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	Background	RA: 17 47 58.6080 (266.9942000d)	Proper Motion RA: 0 mas/yr	
		Dec: +02 43 24.32 (2.72342d)	Proper Motion Dec: 0 mas/yr	
		Equinox: J2000	Epoch of Position: 2024	

Comments: Background observations for science target and PSF
Category=Calibration
Description=[Telescope/sky background]

Template

Subarray
SUB128

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	EXTENDED SOURCE	POSITIVE	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	F1500W	FASTR1	5	310	1	Dither 1	4	1240	885.181	176469

Special Requirements

Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Observation

Proposal 5709, Observation 5: Zet Ser - F2550W

Fri Jul 12 18:00:12 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	-zet-Ser	RA: 18 00 29.0101 (270.1208754d)	Proper Motion RA: 154.66 mas/yr	
		Dec: -03 41 24.98 (-3.69027d)	Proper Motion Dec: -45.909000095889496 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[F dwarfs, F stars]

Template

Subarray
SUB256

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	EXTENDED SOURCE	POSITIVE	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	F2550W	FASTR1	10	45	1	Dither 1	4	180	591.852	176469

Special Requirements

Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible

Observation

Proposal 5709, Observation 6: Zet Ser - F1500W

Fri Jul 12 18:00:12 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	-zet-Ser	RA: 18 00 29.0101 (270.1208754d)	Proper Motion RA: 154.66 mas/yr	
		Dec: -03 41 24.98 (-3.69027d)	Proper Motion Dec: -45.909000095889496 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[F dwarfs, F stars]

Template

Subarray
SUB128

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				1	1	EXTENDED SOURCE	POSITIVE	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	F1500W	FASTR1	5	310	1	Dither 1	4	1240	885.181	176469

Special Requirements

Group Observations 1, 2, 3, 4, 5, 6, Non-interruptible