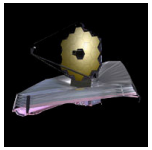

9245 - The unprecedented appearance and future evolution of silicate emission in the disk of T Cha

Cycle: 3, Proposal Category: DD

INVESTIGATORS

Name	*Institution*
Dr. Agnes Kospal (PI) (ESA Member)	**Konkoly Observatory**
Dr. Peter Abraham (CoI) (ESA Member)	Konkoly Observatory
Dr. Jozsef Varga (CoI) (ESA Member)	Universiteit Leiden
Dr. Foteini Lykou (CoI) (ESA Member)	Konkoly Observatory
Dr. Lei Chen (CoI) (ESA Member)	Konkoly Observatory
Prof. Ilaria Pascucci (CoI) (US Admin CoI)	University of Arizona
Chengyan Xie (CoI)	University of Arizona

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	T Cha MIRI MRS	MIRI Medium Resolution Spectroscopy	(1) V-T-Cha
	2	T Cha background MIRI MRS	MIRI Medium Resolution Spectroscopy	(2) T-Cha-background

ABSTRACT

The T Tauri star T Cha was observed with JWST/MIRI in 2022. Neither this mid-infrared spectrum, nor an earlier Spitzer spectrum showed any sign of silicate emission in the N-band. Analysing a VLTI/MATISSE observation from this January, however, we discovered a strong, spectacular silicate emission feature. Such a sudden change in the thermal spectrum of a young star is unprecedented. The origin of the silicate emission may be 1) recondensation of dust evaporated from the inner disk wall in a preceding burst; 2) the illumination of pre-existing grains due to changing disk shadow pattern; or 3) planetesimal collision producing debris. Here we propose to obtain a new JWST/MIRI spectrum, aiming to provide the first

sensitive, high signal-to-noise observation of the silicate feature, reveal its temporal evolution, and study the disk structure and mineralogy. Our ultimate goal is to identify the origin of the new feature. We apply for a DDT to follow-up the newly discovered silicate feature, which may be a transient phenomenon with fast time-evolution, thus the observations are urgent. T Cha is visible starting in February 2025, which is still Cycle 3 of JWST.

OBSERVING DESCRIPTION

We propose to obtain a MIRI MRS spectrum of the highly variable young stellar object T Chamaeleontis. Our aim is to study the variability of the continuum and the emission features in comparison with an earlier MIRI MRS spectrum of the object obtained in 2022. For most wavelength regimes, we set 25 groups per integration, same as in the MIRI observation from 2022. In line with our expectation that T Cha will be brighter now, we set 7 integrations per exposure, a lower number than in 2022. This has the added benefit that we avoid excessive data rates. The exceptions are the Short Medium and Short Long wavelength ranges, where T Cha is expected to be significantly brighter thanks to the appearance of a strong 10 micrometer silicate features. Here, we will use 15 groups per integration and 11 integrations per exposure, to have similar exposure times as in all other wavelength ranges. We will use a 4-point dither pattern. The ETC tells us that we will reach a signal-to-noise ratio of 830-1140 in Channels 1-3 and 360-660 in Channel 4. This will allow us a proper comparison with the spectrum from 2022 and is well suited for the planned modeling of the continuum and spectral features. We will use target acquisition with the neutral density filter to properly center our target in the small MIRI field of view. We checked with the ETC that T Cha does not saturate the detector and target acquisition should be feasible. We will observe a separate sky region to enable proper background subtraction. This sky observation uses the same exposure parameters as the science observation but only 2 dither positions.

Proposal 9245 - Targets - The unprecedented appearance and future evolution of silicate emission in the disk of T Cha

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V-T-Cha	RA: 11 57 13.5245 (179.3063521d) Dec: -79 21 31.53 (-79.35876d) Equinox: J2000	Proper Motion RA: -41.586 mas/yr Proper Motion Dec: -8.654999942336872 mas/yr Parallax: 0.0097356" Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.* *Category=Star* *Description=[Circumstellar disks, K stars, Pre-main sequence stars, Protoplanetary disks, T Tauri stars]* *Extended=NO*				
(2)	T-Cha-background	RA: 11 56 32.0000 (179.1333333d) Dec: -79 20 9.50 (-79.33597d) Equinox: J2000	Epoch of Position: 2000	
Comments: *Category=Calibration* *Description=[Telescope/sky background]* *Extended=YES*				

Observation

Proposal 9245, Observation 1: T Cha MIRI MRS Tue Feb 18 16:00:16 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[T Cha background MIRI MRS (Obs 2)]

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)	V-T-Cha	RA: 11 57 13.5245 (179.3063521d)	Proper Motion RA: -41.586 mas/yr	
		Dec: -79 21 31.53 (-79.35876d)	Proper Motion Dec: -8.654999942336872 mas/yr	
		Equinox: J2000	Parallax: 0.0097356"	
			Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=Star
Description=[Circumstellar disks, K stars, Pre-main sequence stars, Protoplanetary disks, T Tauri stars]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 V-T-Cha	FND	FAST	4	1	1	11.1	240471

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	NO	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	POINT 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	SHORT(A)	MRSLONG		FASTR1	25	7	1	Dither 1	4	28	2009.129	226093
1	SHORT(A)	MRSSHORT		FASTR1	25	7	1	Dither 1	4	28	2009.129	226093
2	MEDIUM(B)	MRSLONG		FASTR1	25	7	1	Dither 1	4	28	2009.129	226093
2	MEDIUM(B)	MRSSHORT		FASTR1	15	11	1	Dither 1	4	44	1942.528	226093
3	LONG(C)	MRSLONG		FASTR1	25	7	1	Dither 1	4	28	2009.129	226093
3	LONG(C)	MRSSHORT		FASTR1	15	11	1	Dither 1	4	44	1942.528	226093

Special Requirements	
	Before Date 31-MAR-2025:23:59:59 Group Observations 1, 2, Non-interruptible

Observation

Proposal 9245, Observation 2: T Cha background MIRI MRS Tue Feb 18 16:00:16 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [T Cha MIRI MRS (Obs 1)]

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)	T-Cha-background	RA: 11 56 32.0000 (179.1333333d) Dec: -79 20 9.50 (-79.33597d) Equinox: J2000	Epoch of Position: 2000	

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 MRS	NO	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	2-Point	BACKGROUND	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	SHORT(A)	MRSLONG		FASTR1	25	7	1	Dither 1	2	14	1004.564	
1	SHORT(A)	MRSSHORT		FASTR1	25	7	1	Dither 1	2	14	1004.564	
2	MEDIUM(B)	MRSLONG		FASTR1	25	7	1	Dither 1	2	14	1004.564	
2	MEDIUM(B)	MRSSHORT		FASTR1	15	11	1	Dither 1	2	22	971.264	
3	LONG(C)	MRSLONG		FASTR1	25	7	1	Dither 1	2	14	1004.564	
3	LONG(C)	MRSSHORT		FASTR1	15	11	1	Dither 1	2	22	971.264	

Special Requirements	Group Observations 1, 2, Non-interruptible