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Spectroscopy of the circumplanetary disk around the young planet-mass companion CT Cha b

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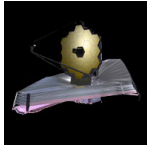
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1958 - Spectroscopy of the circumplanetary disk around the young planet-mass companion CT Cha b

Cycle: 1, Proposal Category: GO

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	MIRI	MIRI Medium Resolution Spectroscopy	(1) V-CT-CHA-B

ABSTRACT

Several planet-mass companions (PMCs) on wide-orbits have been imaged around young stars (1-10 Myr). Their estimated mass is just around the brown dwarf to giant planet transition (~13 Jupiter masses), which makes them especially interesting for both star and planet formation theories. Several formation scenarios exist, but none of them can explain all properties of the currently known PMCs. There are strong theoretical reasons to expect disks around PMCs, and indirect evidence for disks around PMCs from optical and near-infrared emission exists. However, attempts to detect

JWST Proposal 1958 (Created: Tuesday, August 10, 2021 at 11:00:13 AM Eastern Standard Time) - Overview

the dust and gas emission of the disk directly have been unsuccessful. The high sensitivity of JWST MIRI will allow detecting disks with sizes smaller than one au, masses as low 1/10000 of a Jupiter mass and will provide first constraints on the solid and gas composition of disks around PMCs. We propose to observe the PMC CT Cha b with the MIRI spectrograph to detect the dust and gas emission (water lines) of its disk. Those results allow for a comparison to the composition of the primary disk of CT Cha, which is observed simultaneously, and to observations of protoplanetary disks, providing new constraints for possible differences in disk evolution. Those observations, together with forthcoming complementary ALMA observations, will put stringent limits on the mass and size of the companion's disk; quantities most relevant for PMC formation theories and spin-evolution studies. The proposed program will be a big step forward for our understanding of the mysterious nature of wide-orbit planet-mass companions and will serve as a pioneering study for future JWST surveys of PMCs.

OBSERVING DESCRIPTION

We observe the disks around the wide-orbit planet-mass companion CT Cha b and its primary CT Cha with MIRI MRS. We use a standard setup for the MRS to cover the full available wavelength range.

The chosen target is the companion CT Cha b at ICRS coord. 11 04 8.4400 -76 27 18.00. However, the primary ICRS coord.: 11 04 9.0009 -76 27 19.33 will be in the same FOV and is observed simultaneously. To secure that the primary is within the FOV, even at the shortest wavelengths (Channel 1), we request to point between the primary and companion with about 0.5 arcsec offset from the companion ICRS coord.: at 11 04 08.633 -76 27 18 249 . This will be verified again prior to the observations.

Chnages 10.08.2021 (after review)

We rechecked the possibility to provide an offset. However, we decided now to do include an offset as it is not required for the main science goal (to detect CT Cha b). Also the primary will still be on the FOV for several channels even without an offset.

We reduced the data excess from 12187.53 MB to 7358.11 MB by only using the SUB64 subarray in the simultaneous imaging. As switching of the simultaneous imaging does not have a significant effect anymore we like to still include this. This has no impact on the science case.

Proposal 1958 - Targets - Spectroscopy of the circumplanetary disk around the young planet-mass companion CT Cha b

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	V-CT-CHA-B	RA: 11 04 8.4400 (166.0351667d) Dec: -76 27 18.00 (-76.45500d) Equinox: J2000	Epoch of Position: 2015.5	
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=Star</i> <i>Description=[Exoplanets, Pre-main sequence stars, Protoplanetary disks]</i>					

Proposal 1958 - Observation 1 - Spectroscopy of the circumplanetary disk around the young planet-mass companion CT Cha b

Tue Aug 10 16:00:13 GMT 2021

Observation	Proposal 1958, Observation 1: MIRI Diagnostic Status: Warning Observing Template: MIRI Medium Resolution Spectroscopy												
	(Visit 1:1) Warning (Form): Data Excess over lower threshold (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-CT-CHA-B	RA: 11 04 8.4400 (166.0351667d) Dec: -76 27 18.00 (-76.45500d) Equinox: J2000				Epoch of Position: 2015.5						
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> <i>Category=Star</i> <i>Description=[Exoplanets, Pre-main sequence stars, Protoplanetary disks]</i>													
Acquisition	#											Target	
	1											NONE	
Template	AcqFilter	Primary Channel				Simultaneous Imaging			Imager Subarray				
	F1000W	ALL				YES			SUB64				
Dithers	#	Dither Type				Optimized For			Direction				
	1	4-Point				POINT SOURCE			NEGATIVE				
Spectral Elements	#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/E xp	Exposures/Dit h	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1		IMAGER	F560W	FASTR1	50	3	1	Dither 1	4	12	51.753	59065
	1	SHORT(A)	MRSLONG		FASTR1	50	6	1	Dither 1	4	24	3385.549	59065
	1	SHORT(A)	MRSSHORT		FASTR1	50	6	1	Dither 1	4	24	3385.549	59065
	2		IMAGER	F770W	FASTR1	50	3	1	Dither 1	4	12	51.753	59065
	2	MEDIUM(B)	MRSLONG		FASTR1	50	6	1	Dither 1	4	24	3385.549	59065
	2	MEDIUM(B)	MRSSHORT		FASTR1	50	6	1	Dither 1	4	24	3385.549	59065
	3		IMAGER	F1130W	FASTR1	50	3	1	Dither 1	4	12	51.753	59065
	3	LONG(C)	MRSLONG		FASTR1	50	6	1	Dither 1	4	24	3385.549	59065
	3	LONG(C)	MRSSHORT		FASTR1	50	6	1	Dither 1	4	24	3385.549	59065