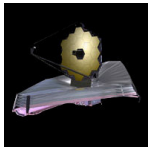

7792 - Does the apple fall far from the tree? Comparative chemistry between a CPD and its host disk

Cycle: 4, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Gabriele Cugno (PI) (ESA Member)	**Universitat Zurich**
Dr. Polychronis Alexandros Patapis (CoI) (ESA Member) (CoPI)	
Dr. Sierra Grant (CoI) (CoPI) (US Admin CoI)	Carnegie Institution of Washington
Dr. Andrea Banzatti (CoI)	Texas State University

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		MIRI Medium Resolution Spectroscopy	(1) V-GQ-Lup

ABSTRACT

GQ Lup B, an accreting companion surrounded by a circumplanetary disk (CPD), presents a unique opportunity to study i) the CPD chemistry, ii) the comparison between the chemistry in the CPD and the primary, and iii) potentially the dynamical interaction between the two. While extensive efforts have focused on the dust component of this CPD in both the infrared and mm, the gas remains uncharted. We will now leverage the power of MIRI/MRS to fill this gap.

Shallow Cycle 1 data, focused on the bright primary, serendipitously revealed molecular gas signatures in GQ Lup B's CPD through cross-correlation with a reference spectrum of an isolated object with a molecule-rich disk. This molecular detection is significant, meaning that (at least some of) the molecules in the isolated disk are also present in GQ Lup B's CPD; however, the SNR is not sufficient to determine which species are responsible for the correlation or what their properties are. Our proposed observations, optimized for the faint emission from GQ Lup B, will allow us to not only determine the molecular inventory, but with state-of-the-art retrieval tools, determine the gas conditions — temperature, column density,

and emitting area — in a CPD for the first time.

By probing the molecular composition of both circumstellar and circumplanetary disks, we can do comparative chemistry in the same system to explore the impact that they have on each other (e.g., companion-induced radial drift). Finally, by accessing the CPD chemistry we can investigate a potentially moon-forming environment, shedding light on the chemical diversity seen in the moons in our own Solar system, such as water-rich Europa vs. carbon-rich Titan.

OBSERVING DESCRIPTION

We plan to observe the circumplanetary disk (CPD) around the forming companion GQ Lup B with MIRI/MRS to detect spectral features associated with molecular gas and dust.

Wwe do Target Acquisition on the main star which will be at the center of the field of view. We will use 4 point dithering treating the scene as a point source and not an extended source.

We repeat the observations from Cycle 1 with deeper ramps and longer integration times. Along the ramp up to 3 pixels could saturate, but this is not going to create any issue with the study of the companion emission.

Proposal 7792 - Targets - Does the apple fall far from the tree? Comparative chemistry between a CPD and its host disk

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V-GQ-Lup	RA: 15 49 12.1054 (237.3004392d)	Proper Motion RA: -14.133 mas/yr	
		Dec: -35 39 5.06 (-35.65141d)	Proper Motion Dec: -23.328999941440998 mas/yr	
		Equinox: J2000	Parallax: 0.0064893"	
			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=[K stars, Protoplanetary disks]
Extended=NO

Observation

Proposal 7792, Observation 1

Tue May 20 21:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 1:1) Warning (Form): Data Excess over middle threshold

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

Fixed Targets

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(1)	V-GQ-Lup	RA: 15 49 12.1054 (237.3004392d)	Proper Motion RA: -14.133 mas/yr	
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Category=Star
Description=[K stars, Protoplanetary disks]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 V-GQ-Lup	FND	FAST	4	1	1	11.1	222604.3

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	100	6	1	Dither 1	4	24	6715.597	
1	SHORT(A)	MRSSHORT		FASTR1	100	6	1	Dither 1	4	24	6715.597	
2	MEDIUM(B)	MRSLONG		FASTR1	100	6	1	Dither 1	4	24	6715.597	
2	MEDIUM(B)	MRSSHORT		FASTR1	100	6	1	Dither 1	4	24	6715.597	
3	LONG(C)	MRSLONG		FASTR1	100	6	1	Dither 1	4	24	6715.597	
3	LONG(C)	MRSSHORT		FASTR1	100	6	1	Dither 1	4	24	6715.597	

Special Requirements	
	Aperture PA Range 50.0 to 70.0 Degrees (V3 50.0 to 70.0) Aperture PA Range 100.0 to 120.0 Degrees (V3 100.0 to 120.0) Aperture PA Range 165.0 to 185.0 Degrees (V3 165.0 to 185.0) Aperture PA Range 225.0 to 245.0 Degrees (V3 225.0 to 245.0) Aperture PA Range 290.0 to 310.0 Degrees (V3 290.0 to 310.0) Aperture PA Range 345.0 to 5.0 Degrees (V3 345.0 to 5.0)