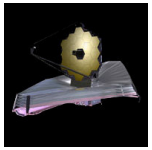

4332 - A JWST IFU deep study of gas, dust, and PAHs in a prototypical externally illuminated protoplanetary disk

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		MIRI Medium Resolution Spectroscopy	(1) HST10
	2		NIRSpec IFU Spectroscopy	(1) HST10
	62		NIRSpec IFU Spectroscopy	(1) HST10

ABSTRACT

What is the thermo-chemical structure of a proplyd Photodissociation Region (PDR)? What is the composition, and hence reservoir, in dust, gas and PAHs in a typical EUV+FUV externally illuminated disk? How the external irradiation affects the process of planet formation in these disks? And how their properties differ from those of disks found in more quiescent environments, such as Taurus-Auriga?

In order to address these questions we propose to conduct a JWST deep observational study of an externally illuminated protoplanetary disk (proplyd) using the IFU modes of NIRSpec and MIRI-MRS. The JWST IFU observations will spatially resolve, for the first time, the disk, neutral cocoon and ionization front simultaneously over the 0.9 - 28.5 micron spectral range, providing key line, continuum and PAHs diagnostics that trace the physical conditions, chemical composition and abundances under the effect of external FUV-radiation. It is the FUV radiation that changes the thermal structure and chemical composition of the disk and sets the mass-loss rate through photoevaporation.
By comparing our results to those of proto-planetary disks (TTauris) found in nearby low-mass star forming regions and targeted by several JWST GTO and GO programs (e.g. Taurus-Auriga, Lupus) one can start to assess the real effects of a FUV-dominant environment on protoplanetary disk evolution and planet formation.

Earth’s atmosphere and proplyd faintness in the mid-IR makes them almost out of reach sources for mid-IR spectroscopy from the ground. And hence, the James Webb Space Telescope (JWST) is currently the only observatory able to perform the proposed observations and study.

OBSERVING DESCRIPTION

Observations in this program will be conducted with NIRSpec and MIRI-MRS IFUs to obtain deep spectral maps of an extended source located in a massive star-forming region in our Galaxy.

NIRSpec IFU spectrocopy:

- We will obtain a single pointing using all the gratings above 1 micron with the H grisms. The observations will be conducted with the NRSRAPID readout, using a 4 point dither. We include a dark exposure to quantify the leakage of the Micro-Shutter Array (MSA) and also include simultanous imaging with the F560W setting to obtain a reference image at short MIRI wavelengths. We perform target acquisition with the F110W filter, using the WATA method, SUB32 subarray and the NRSRAPID readout.

MIRI IFU spectroscopy:

- we will obtain a single pointing over the entire spectral range. We use the F560W filter for target acquisition and apply a 4 point dither optimized for extended sources. For the short and long detectors, we use the FAST readout. We also include (as a bonus), simultaneous Imager observation with the F560W filter, to obtain a additional image of the PDR in the continuum.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	HST10	RA: 05 35 18.2350 (83.8259792d) Dec: -05 24 13.70 (-5.40381d) Equinox: J2000	Epoch of Position: 2000	
Comments: *Category=Star* *Description=[Proplyds]* *Extended=YES*				
(2)	TA_star	RA: 05 35 17.3929 (83.8224704d) Dec: -05 24 13.91 (-5.40386d) Equinox: J2000	Proper Motion RA: -0.098 mas/yr Proper Motion Dec: -1.100 mas/yr Parallax: 0.0024279" Epoch of Position: 2000	
Comments: *Category=Star* *Description=[M dwarfs, Young stellar objects]* *Extended=NO*				

Observation

Proposal 4332, Observation 1 Mon Mar 11 16:00:31 GMT 2024

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

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)	HST10	RA: 05 35 18.2350 (83.8259792d) Dec: -05 24 13.70 (-5.40381d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[Proplyds]
Extended=YES

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 TA_star	F560W	FAST	4	1	1	11.1	181227

Template

Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
All MRS	NO	FULL	NEUTRAL

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	LONG(C)	MRSLONG		FASTR1	16	3	1	Dither 1	4	12	555.008	181227
1	LONG(C)	MRSSHORT		FASTR1	16	3	1	Dither 1	4	12	555.008	181227
2	MEDIUM(B)	MRSLONG		FASTR1	16	3	1	Dither 1	4	12	555.008	181227
2	MEDIUM(B)	MRSSHORT		FASTR1	16	3	1	Dither 1	4	12	555.008	181227
3	SHORT(A)	MRSLONG		FASTR1	16	3	1	Dither 1	4	12	555.008	181227
3	SHORT(A)	MRSSHORT		FASTR1	16	3	1	Dither 1	4	12	555.008	181227

Observation

Proposal 4332, Observation 2

Mon Mar 11 16:00:31 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

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)	HST10	RA: 05 35 18.2350 (83.8259792d) Dec: -05 24 13.70 (-5.40381d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[Proplyds]
Extended=YES

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 TA_star	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	181227

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	7	8	

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	G140H/F070LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
2	G140H/F070LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227
3	G140H/F100LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
4	G140H/F100LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227
5	G235H/F170LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
6	G235H/F170LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227
7	G395H/F290LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
8	G395H/F290LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227

Observation

Proposal 4332, Observation 62

Mon Mar 11 16:00:31 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 62:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	HST10	RA: 05 35 18.2350 (83.8259792d) Dec: -05 24 13.70 (-5.40381d) Equinox: J2000	Epoch of Position: 2000	

Comments:
Category=Star
Description=[Proplyds]
Extended=YES

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 TA_star	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	181227

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	7	8	

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	G140H/F070LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
2	G140H/F070LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227
3	G140H/F100LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
4	G140H/F100LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227
5	G235H/F170LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
6	G235H/F170LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227
7	G395H/F290LP	NRSIRS2RAPID	15	1	false	true	NONE	8	8	1867.378	181227
8	G395H/F290LP	NRSIRS2RAPID	15	1	true	true	NONE	8	8	1867.378	181227