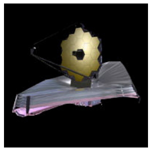

9443 - CIGMA (Crystals, Ice, and Gas Molecules under Accretion): How Bursts Transform the Circumstellar Disk WL17

Cycle: 4, Proposal Category: DD

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	MIRI	MIRI Medium Resolution Spectroscopy	(1) WL-17
	2	NIRSPEC	NIRSpec IFU Spectroscopy	(3) WL-17_NIRSPec
	3	MIRI_BKG	MIRI Medium Resolution Spectroscopy	(2) BKG_WL17

ABSTRACT

Understanding how burst accretion events reshape the dust, ice, and gas in protoplanetary disks requires time-sensitive observations that directly compare quiescent and burst phases with consistent instrumentation for a single burst event.

WL 17, a Class I low-mass protostar in Ophiuchus, recently brightened by a factor of 3.4, offering an important chance to monitor a disk-dominated

source before and during a burst with JWST's unprecedented sensitivity. Unlike EC53, WL17's minimal envelope and ALMA-resolved ring-gap structure allow clear isolation of disk-specific changes. Pre-burst spectra from IRTF/SpeX and JWST MIRI MRS reveal rich molecular emission and multiple ice features. Our new IGRINS spectrum confirms that WL 17 remains in its burst phase. We propose time-critical JWST NIRSpec IFU and MIRI MRS observations to track real-time changes in silicate crystallization, ice sublimation, and hot molecular chemistry. Combined with the unique pre-burst baseline, these data will provide a robust test of how burst accretion processes transform disk material, setting a benchmark for models of how dust, volatiles, and processed gas are delivered to planet-forming regions. This rare opportunity will close a key gap left since the Spitzer era and cannot be repeated once WL 17's burst fades.

OBSERVING DESCRIPTION

We propose to observe WL 17, a disk-dominated protostar that has recently undergone an outburst by ~2 (~1.5) magnitudes at 3.4 micron (4.6 micron)

By comparing with the pre-burst JWST MIRI MRS spectra, this proposal aims to investigate the ice, gas composition, and dust mineralogy of the disk and their variations. NIRSPEC and MIRI IFU observations will provide spatially resolved distributions of various species. The NIRSpec spectra will cover chemically important ice features, such as H2O at 3.0 micron, CO2 at 4.27 micron, and CO at 4.67 micron, along with the Br alpha line, which can be used to constrain the current mass accretion rate. In addition, NIRSpec will trace warm gas emission from the disk surface.

The MIR spectra of MIRI over ~5-28 micron will capture absorption features by a bulk of icy complex organic molecules and thermal emissions from the disk surface. Moreover, MIRI will observe silicate dust features, including both amorphous and crystalline components, in absorption and emission. To trace real-time changes in silicate crystallization, ice sublimation, and burst-driven chemistry in this unique disk laboratory, we propose time-critical JWST observations with NIRSpec IFU and MIRI MRS.

Given the extended H2 outflow-like feature detected in previous MIRI observation, we will adopt a 4-point dither pattern optimized for a point source in MIRI MRS, and a 6-point cycling dithering with a large size for NIRSpec IFU to ensure coverage of this extended feature.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	WL-17	RA: 16 27 6.7506 (246.7781275d) Dec: -24 38 15.59 (-24.63766d) Equinox: J2000	Proper Motion RA: -0.0007334368 sec of time/yr Proper Motion Dec: -0.0279000 arcsec/yr Parallax: 0.007" Epoch of Position: 2023.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Protostars] Extended=YES				
(2)	BKG_WL17	RA: 16 27 19.2290 (246.8301208d) Dec: -24 34 33.62 (-24.57601d) Equinox: J2000		
Comments: Category=Unidentified Description=[Blank field]				
(3)	WL-17_NIRSPec	RA: 16 27 6.7506 (246.7781275d) Dec: -24 38 15.59 (-24.63766d) Equinox: J2000	Proper Motion RA: -0.0007334368 sec of time/yr Proper Motion Dec: -0.0279000 arcsec/yr Parallax: 0.007" Epoch of Position: 2023.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Protostars] Extended=YES				

Observation

Proposal 9443, Observation 1: MIRI

Thu Jul 31 17:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[MIRI_BKG (Obs 3)]

Diagnostics

(MIRI (Obs 1)) Warning (Form): Imager Filter overlap.

(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)	WL-17	RA: 16 27 6.7506 (246.7781275d) Dec: -24 38 15.59 (-24.63766d) Equinox: J2000	Proper Motion RA: -0.0007334368 sec of time/yr Proper Motion Dec: -0.0279000 arcsec/yr Parallax: 0.007" Epoch of Position: 2023.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Protostars]
Extended=YES

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	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		IMAGER	F560W	FASTR1	15	2	1	Dither 1	4	8	344.105	
1	SHORT(A)	MRSLONG		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
1	SHORT(A)	MRSSHORT		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
2		IMAGER	F770W	FASTR1	15	2	1	Dither 1	4	8	344.105	
2	MEDIUM(B)	MRSLONG		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
2	MEDIUM(B)	MRSSHORT		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
3		IMAGER	F1800W	FASTR1	15	2	1	Dither 1	4	8	344.105	
3	LONG(C)	MRSLONG		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
3	LONG(C)	MRSSHORT		FASTR1	15	2	1	Dither 1	4	8	344.105	256578

Special Requirements	
	Before Date 31-AUG-2025:00:00:00 Group Observations 1, 2 within 1 Days Sequence Observations 1, 3, Non-interruptible

Observation

Proposal 9443, Observation 2: NIRSPEC

Thu Jul 31 17:00:17 GMT 2025

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
(3)	WL-17_NIRSPec	RA: 16 27 6.7506 (246.7781275d) Dec: -24 38 15.59 (-24.63766d) Equinox: J2000	Proper Motion RA: -0.0007334368 sec of time/yr Proper Motion Dec: -0.0279000 arcsec/yr Parallax: 0.007" Epoch of Position: 2023.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Protostars]
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

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

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	G235M/F170LP	NRSRAPID	4	1	false	true	NONE	7	7	375.787	256578
2	G395M/F290LP	NRSRAPID	4	1	false	true	NONE	7	7	375.787	256578

Special Requirements

Before Date 31-AUG-2025:00:00:00

Group Observations 1, 2 within 1 Days

Observation

Proposal 9443, Observation 3: MIRI_BKG Thu Jul 31 17:00:17 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [MIRI (Obs 1)]

Diagnostics

(MIRI_BKG (Obs 3)) Warning (Form): Imager Filter overlap.

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	BKG_WL17	RA: 16 27 19.2290 (246.8301208d) Dec: -24 34 33.62 (-24.57601d) Equinox: J2000		

Comments:
Category=Unidentified
Description=[Blank field]

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
	All MRS	YES	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		IMAGER	F560W	FASTR1	15	2	1	Dither 1	4	8	344.105	
1	SHORT(A)	MRSLONG		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
1	SHORT(A)	MRSSHORT		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
2		IMAGER	F770W	FASTR1	15	2	1	Dither 1	4	8	344.105	
2	MEDIUM(B)	MRSLONG		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
2	MEDIUM(B)	MRSSHORT		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
3		IMAGER	F1800W	FASTR1	15	2	1	Dither 1	4	8	344.105	
3	LONG(C)	MRSLONG		FASTR1	15	2	1	Dither 1	4	8	344.105	256578
3	LONG(C)	MRSSHORT		FASTR1	15	2	1	Dither 1	4	8	344.105	256578

Special Requirements	
	Before Date 31-AUG-2025:00:00:00 Sequence Observations 1, 3, Non-interruptible