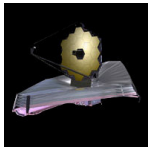

6361 - Bridging Accretion Mechanisms from Stars to Planets with NIR Diagnostics

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Katherine Brutlag Follette (PI)	**Amherst College**
Dr. Kimberly Ward-Duong (CoI)	Smith College
Ms. Helena Treiber (CoI)	Amherst College
Dr. Connor Robinson (CoI)	Alfred University
Dr. Sarah Betti (CoI)	Space Telescope Science Institute
Dr. Yuhiko Aoyama (CoI)	Peking University
Dr. Gabriel-Dominique Marleau (CoI) (ESA Member)	Max Planck Institute for Astronomy
Dr. Marshall Perrin (CoI)	Space Telescope Science Institute
Dr. Michael S. Petersen (CoI) (ESA Member)	University of Edinburgh, Institute for Astronomy
Dr. Jeffrey S. Bary (CoI)	Colgate University
Alyssa Cordero (CoI)	Amherst College
Beck Dacus (CoI)	University of California - San Diego
Suyash Deshmukh (CoI)	Amherst College
Catherine Sarosi (CoI)	Amherst College

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	CT Cha b	NIRSpec Fixed Slit Spectroscopy	(1) V-CT-CHA-B
	2	CHXR 73 b	NIRSpec Fixed Slit Spectroscopy	(2) CHXR-73B
	3	Isolated Accretor 1	NIRSpec Fixed Slit Spectroscopy	(3) ISOLATED-ACCRETOR1-J1106-7618
	4	Isolated Accretor 2	NIRSpec Fixed Slit Spectroscopy	(4) ISOLATED-ACCRETOR2-J1110-7642
	5	Phot. Template 1	NIRSpec Fixed Slit Spectroscopy	(5) PHOT-TEMPLATE-1-J1110-7714

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	6	Phot. Template 2	NIRSpec Fixed Slit Spectroscopy	(6) PHOT-TEMPLATE-2-TWA-29

ABSTRACT

We propose to conduct an innovative line ratio based comparison of NIR accretion diagnostics for bound and unbound planetary-mass objects in the ~2Myr Chamaeleon Star Forming Region with NIRSpec fixed-slit spectroscopy. The hydrogen series lines accessible only to JWST (including Paschen alpha and Brackett beta), combined with JWST's unique sensitivity to traditional accretion line diagnostics at very low flux levels (Paschen Beta, Brackett Gamma) will enable discrimination between traditional magnetospheric paradigms of accretion assumed for stars and newly-developed accretion models designed for protoplanets. Critical to our understanding and calibration of accreting protoplanet discoveries, the proposed observations will provide diagnostic line ratios for multiple accretion tracers that will improve relations used to interpret accretion rates for accreting protoplanet candidates such as PDS70bc, Delorme 1 (AB) b, etc. With a uniform sample of planetary-mass objects of the same spectral type and age that includes both bound 'planetary' companions and 'free-floating' isolated objects, we will be able to inform whether the accretion mechanisms governing the formation of these objects differ depending on companionship, illuminating the origins of young giant planets and rogue planetary-mass objects.

OBSERVING DESCRIPTION

Overall Strategy

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We propose to acquire high resolution spectroscopy with the S200A1 slit and G140H/F100LP, G235H/F170LP, and G395H/F290LP configurations. All six of the proposed targets will be observed using the same configuration to provide a uniformly comparative dataset and enable calibration through precise continuum subtraction of photospheric emission, enabling the scientific goals of detection of faint emission line accretion diagnostics.

PA Special Requirements

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In order to minimize contamination from the stellar halo and diffraction spikes in the fixed slit spectra of the companion, and to avoid dithering motions moving the primary star into the slit, aperture position angle restrictions are required for the two companion objects in the proposed study. PA restrictions are as follows:

CT Cha b: Observe at 150-270 deg or 330-90 deg

CHXR 73 b: Observe at 90-200 deg or 270-20 deg (observations are 10 deg more restrictive due to closer separation of CHXR companion).

The remaining four targets do not have special requirements.

Target Acquisition

Target acquisitions have been calculated in the ETC separately for each of the six targets in the proposed program, based upon target spectral type and magnitude. All observations use the SUB2048 or SUB32 array and various readout patterns to reach a minimum SNR~35.

Exposure Times, Groups, and Integrations

All exposure times have been calculated using the JWST ETC to achieve sensitivity to line ratios for the emission line diagnostics targeted in this study, specifically aiming to reach line sensitivities of a ~few x 10^-17 erg/s/cm2, necessary to discriminate between various accretion physics models. ETC simulations with lines at various sensitivities injected were performed, reaching S/N in each mode of ~113 (G140H), ~70 (G235H), and ~38 (G395H). The maximum numbers of groups were selected in order to minimize noise and avoid saturation, with corresponding integrations used to reach the total exposure time in three separate slit dither positions. As all of our targets have comparable NIR magnitudes and are selected to share very similar physical properties (i.e., temperature and spectral type) the total integrations are largely the same for all of the targets in the study. The one non-Chamaeleon target, TWA 29, has a correspondingly shorter exposure time due to the fact that it is much closer and two magnitudes brighter.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	V-CT-CHA-B	RA: 11 04 8.3330 (166.0347208d) Dec: -76 27 18.00 (-76.45500d) Equinox: J2000	Proper Motion RA: -22.223360798921444 mas/yr Proper Motion Dec: 0.01949340698729092 mas/yr Parallax: 0.005264482063413752" Epoch of Position: 2016.0	
Comments: Jan 2025 KBF *Updated to Gaia DR3 coordinates for CT Cha A + offset from Wu et al. 2015* *Category=Star* *Description=[Exoplanets, Substellar companions]* *Extended=NO*				
(2)	CHXR-73B	RA: 11 06 28.3632 (166.6181800d) Dec: -77 37 33.96 (-77.62610d) Equinox: J2000	Proper Motion RA: -22.501828240754598 mas/yr Proper Motion Dec: -0.0448815879939778 mas/yr Parallax: 0.005225594989299537 " Epoch of Position: 2016	
Comments: Jan 2025 KBF *Updated to Gaia DR3 coordinates for CXHR 73 A + offset from Martinez 2022* *Category=Star* *Description=[Exoplanets, Substellar companions]* *Extended=NO*				
(3)	ISOLATED-ACCRETOR1-J1106-7618	RA: 11 06 28.5400 (166.6189167d) Dec: -76 18 3.90 (-76.30108d) Equinox: J2000	Proper Motion RA: -14.1 mas/yr Proper Motion Dec: -6.2 mas/yr Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Jan 2025 KBF* *Corrected epoch to 2000* *Added proper motions from Esplin+ 2017. dec pm uncertainty is 5mas/yr, so have included this* *Category=Star* *Description=[Brown dwarfs, Exoplanets, Young stellar objects]* *Extended=NO*				
(4)	ISOLATED-ACCRETOR2-J1110-7642	RA: 11 10 6.5882 (167.5274508d) Dec: -76 42 48.66 (-76.71352d) Equinox: J2000	Proper Motion RA: -11.8 mas/yr Proper Motion Dec: -1.4 mas/yr Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Jan 2025 KBF* *Corrected epoch to 2000* *Added proper motions from Esplin+ 2017.* *Category=Star* *Description=[Brown dwarfs, Exoplanets, Young stellar objects]* *Extended=NO*				
(5)	PHOT-TEMPLATE-1-J1110-7714	RA: 11 10 57.7200 (167.7405000d) Dec: -77 14 57.00 (-77.24917d) Equinox: J2000	Proper Motion RA: -12.1 mas/yr Proper Motion Dec: -1.7 mas/yr Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Jan 2025 KBF* *Corrected epoch to 2000* *Added proper motions from Esplin+ 2017.* *Category=Star* *Description=[Brown dwarfs, Exoplanets, Young stellar objects]* *Extended=NO*				

(6)	PHOT-TEMPLATE-2-TWA-29	RA: 12 45 14.0918 (191.3087158d)	Proper Motion RA: -46.15237747900009 mas/yr
		Dec: -44 29 8.09 (-44.48558d)	Proper Motion Dec: -22.516688964298353 mas/yr
		Equinox: J2000	Epoch of Position: 2016

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

Jan 2025 KBF
Updated to Gaia DR3 coordinate
Category=Star
Description=[Brown dwarfs, Exoplanets, Young stellar objects]
Extended=NO

Observation

Proposal 6361, Observation 1: CT Cha b Mon Feb 17 19:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit 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)	V-CT-CHA-B	RA: 11 04 8.3330 (166.0347208d) Dec: -76 27 18.00 (-76.45500d) Equinox: J2000	Proper Motion RA: -22.223360798921444 mas/yr Proper Motion Dec: 0.01949340698729092 mas/yr Parallax: 0.005264482063413752" Epoch of Position: 2016.0	

Comments: Jan 2025 KBF
Updated to Gaia DR3 coordinates for CT Cha A + offset from Wu et al. 2015
Category=Star
Description=[Exoplanets, Substellar companions]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 V-CT-CHA-B	WATA	SUB2048	F110W	NRSRAPID	3	1	1	3.628	238638.31

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F100LP	S200A1	NRSIRS2RAPID	23	4	1	NONE	3	12	4201.6	238638.10
2	G235H/F170LP	S200A1	NRSIRS2RAPID	21	4	2	NONE	3	12	3851.467	238638.11
3	G395H/F290LP	S200A1	NRSIRS2RAPID	15	1	3	NONE	3	3	700.267	238638.12

Special Requirements	
	Aperture PA Range 150 to 270 Degrees (V3 11.15809631 to 131.15809631) Aperture PA Range 330 to 90 Degrees (V3 191.15809631 to 311.15809631)

Observation

Proposal 6361, Observation 2: CHXR 73 b

Mon Feb 17 19:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit 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
(2)	CHXR-73B	RA: 11 06 28.3632 (166.6181800d) Dec: -77 37 33.96 (-77.62610d) Equinox: J2000	Proper Motion RA: -22.501828240754598 mas/yr Proper Motion Dec: -0.0448815879939778 mas/yr Parallax: 0.005225594989299537 " Epoch of Position: 2016	

Comments: Jan 2025 KBF
Updated to Gaia DR3 coordinates for CXHR 73 A + offset from Martinez 2022
Category=Star
Description=[Exoplanets, Substellar companions]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 CHXR-73B	WATA	SUB32	CLEAR	NRSRAPID	3	1	1	0.08	238638.32

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F100LP	S200A1	NRSIRS2RAPID	30	3	1	NONE	3	9	4070.3	238638.36
2	G235H/F170LP	S200A1	NRSIRS2RAPID	42	2	2	NONE	3	6	3763.934	238638.37
3	G395H/F290LP	S200A1	NRSIRS2RAPID	14	1	3	NONE	3	3	656.5	238638.38

Special Requirements	
	Aperture PA Range 90 to 200 Degrees (V3 311.15809631 to 61.15809631) Aperture PA Range 270 to 20 Degrees (V3 131.15809631 to 241.15809631000002)

Observation

Proposal 6361, Observation 3: Isolated Accretor 1

Mon Feb 17 19:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	ISOLATED-ACCRETOR1-J1106-7618	RA: 11 06 28.5400 (166.6189167d) Dec: -76 18 3.90 (-76.30108d) Equinox: J2000	Proper Motion RA: -14.1 mas/yr Proper Motion Dec: -6.2 mas/yr Epoch of Position: 2000	

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

Jan 2025 KBF
Corrected epoch to 2000
Added proper motions from Esplin+ 2017. dec pm uncertainty is 5mas/yr, so have included this
Category=Star
Description=[Brown dwarfs, Exoplanets, Young stellar objects]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	3 ISOLATED-ACCRETOR1-J1106-7618	WATA	SUB32	CLEAR	NRSRAPID	3	1	1	0.08	238638.41

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F100LP	S200A1	NRSIRS2RAPID	30	3	1	NONE	3	9	4070.3	238638.42
2	G235H/F170LP	S200A1	NRSIRS2RAPID	42	2	2	NONE	3	6	3763.934	238638.43
3	G395H/F290LP	S200A1	NRSIRS2RAPID	14	1	3	NONE	3	3	656.5	238638.44

Observation

Proposal 6361, Observation 4: Isolated Accretor 2

Mon Feb 17 19:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(4)	ISOLATED-ACCRETOR2-J1110-7642	RA: 11 10 6.5882 (167.5274508d)	Proper Motion RA: -11.8 mas/yr	
		Dec: -76 42 48.66 (-76.71352d)	Proper Motion Dec: -1.4 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

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

Jan 2025 KBF
Corrected epoch to 2000
Added proper motions from Esplin+ 2017.
Category=Star
Description=[Brown dwarfs, Exoplanets, Young stellar objects]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4 ISOLATED-ACCRETOR2-J1110-7642	WATA	SUB32	CLEAR	NRSRAPID	3	1	1	0.08	238638.48

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F100LP	S200A1	NRSIRS2RAPID	30	3	1	NONE	3	9	4070.3	238638.45
2	G235H/F170LP	S200A1	NRSIRS2RAPID	42	2	2	NONE	3	6	3763.934	238638.46
3	G395H/F290LP	S200A1	NRSIRS2RAPID	14	1	3	NONE	3	3	656.5	238638.47

Observation

Proposal 6361, Observation 5: Phot. Template 1

Mon Feb 17 19:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(5)	PHOT-TEMPLATE-1-J1110-7714	RA: 11 10 57.7200 (167.7405000d)	Proper Motion RA: -12.1 mas/yr	
		Dec: -77 14 57.00 (-77.24917d)	Proper Motion Dec: -1.7 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

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

Jan 2025 KBF
Corrected epoch to 2000
Added proper motions from Esplin+ 2017.
Category=Star
Description=[Brown dwarfs, Exoplanets, Young stellar objects]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	5 PHOT-TEMPLATE-1-J1110-7714	WATA	SUB2048	F110W	NRSRAPID	3	1	1	3.628	238638.52

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F100LP	S200A1	NRSIRS2RAPID	23	4	1	NONE	3	12	4201.6	238638.49
2	G235H/F170LP	S200A1	NRSIRS2RAPID	21	4	2	NONE	3	12	3851.467	238638.50
3	G395H/F290LP	S200A1	NRSIRS2RAPID	15	1	3	NONE	3	3	700.267	238638.51

Observation

Proposal 6361, Observation 6: Phot. Template 2

Mon Feb 17 19:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec Fixed Slit Spectroscopy

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(6)	PHOT-TEMPLATE-2-TWA-29	RA: 12 45 14.0918 (191.3087158d) Dec: -44 29 8.09 (-44.48558d) Equinox: J2000	Proper Motion RA: -46.15237747900009 mas/yr Proper Motion Dec: -22.516688964298353 mas/yr Epoch of Position: 2016	

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

Jan 2025 KBF
Updated to Gaia DR3 coordinate
Category=Star
Description=[Brown dwarfs, Exoplanets, Young stellar objects]
Extended=NO

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	6 PHOT-TEMPLATE-2-TWA-29	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	238638.56

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	3	NONE

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G140H/F100LP	S200A1	NRSIRS2RAPID	20	2	1	NONE	3	6	1838.2	238638.53
2	G235H/F170LP	S200A1	NRSIRS2RAPID	20	1	2	NONE	3	3	919.1	238638.54
3	G395H/F290LP	S200A1	NRSIRS2RAPID	5	1	3	NONE	3	3	262.6	238638.55