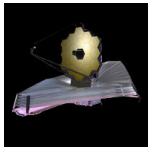

5814 - Auroral chemistry in the atmospheres of T dwarfs

Cycle: 3, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	SIMP0136	NIRSpec Fixed Slit Spectroscopy	(1) SIMP-J013656.5+093347.3
	2	BDR 1750	NIRSpec Fixed Slit Spectroscopy	(4) VCS2020-BDR-J1750+3809
	3	2MASS 1237	NIRSpec Fixed Slit Spectroscopy	(2) 2MASS-J12373919+6526148
	4	2MASS 1019	NIRSpec Fixed Slit Spectroscopy	(3) 2MASS-J10190575+6529526

ABSTRACT

We propose to obtain high-resolution, L and M band spectroscopy of five T dwarfs with JWST /NIRSpec. These T dwarfs possess strong evidence of auroral activity in the form of polarized radio emission from an electron-cyclotron maser process. Through a cross-correlation and subsequent atmospheric retrieval analysis, we will place constraints on auroral chemistry, primarily the production of H3+ , and the compositions of these dwarfs. Successful detection of H3+ will enable characterization of the otherwise invisible upper atmospheres of these objects. Our proposal will help to understand the conditions in the upper atmospheres of objects at the transition between stellar and planetary masses, and the effect that powerful magnetosphere processes can have on them. At the most fundamental level, our proposal will explore why some BDs appear to have extremely powerful aurora, what consequence those processes have on their atmospheres, and what similar processes may be occurring in giant exoplanets

OBSERVING DESCRIPTION

We will target five T dwarfs in four systems (SIMP J013656.5+093347.3, 2MASS J12373919+6526148, 2MASS J10190575+6529526 - T dwarf binary, BDR J1750+3809) with circularly polarized radio emission to understand upper atmosphere chemistry.

NIRSpec:
G395H/F290LP grating/filter for all observations. S200A1 slit with three point dither except for 2MASS J10190575+6529526, which will have a subpixel dither in spatial direction due to it being a resolved binary. 2MASS J10190575+6529526 also requires a narrow range of V3PA from 205 to 215 so that the the binary is positioned along the length of the slit. Science integrations on each target range from 35 minutes for the brightest target (K~12.6) to 149 minutes for the dimmest target (K~19.2). For the longer integrations, we use NRSIRS2 readout instead of NRSIRS2RAPID to reduce data excess. Total science integration is 5.86 hours, which requires 11.25 hours with overheads.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	SIMP-J013656.5+093347.3	RA: 01 36 57.8999 (24.2412496d) Dec: +09 33 47.05 (9.56307d) Equinox: J2000	Proper Motion RA: 1238.244 mas/yr Proper Motion Dec: -16.156000083356048 mas/yr Parallax: 0.1634478" Epoch of Position: 2016	
Comments: Coordinates updated to Gaia DR3 epoch *Category=Star* *Description=[Brown dwarfs, T dwarfs]*				
(2)	2MASS-J12373919+6526148	RA: 12 37 38.8870 (189.4120292d) Dec: +65 26 13.52 (65.43709d) Equinox: J2000	Proper Motion RA: -1002.0 mas/yr Proper Motion Dec: -524.9999999023203 mas/yr Parallax: 0.09607" Epoch of Position: 2001.0718	
Comments: Updated to SDSS DR12 epoch and coordinates. These coordinates are more consistent with the observed position reported in recent HST program 15870 acquisition images than other references, although the precision of that HST position is unknown. *Category=Star* *Description=[Brown dwarfs, T dwarfs]*				
(3)	2MASS-J10190575+6529526	RA: 10 19 5.6405 (154.7735021d) Dec: +65 29 54.15 (65.49837d) Equinox: J2000	Proper Motion RA: -88.75 mas/yr Proper Motion Dec: 121.67 mas/yr Parallax: 0.04125" Epoch of Position: 2010.939726	
Comments: Updated to Kirkpatrick+2011 epoch coordinates *Category=Star* *Description=[Brown dwarfs, T dwarfs]*				
(4)	VCS2020-BDR-J1750+3809	RA: 17 50 1.1300 (267.5047083d) Dec: +38 09 19.50 (38.15542d) Equinox: J2000	Proper Motion RA: -120 mas/yr Proper Motion Dec: 200 mas/yr Epoch of Position: 2000	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. *Category=Star* *Description=[Brown dwarfs, T dwarfs]*				

Observation

Proposal 5814, Observation 1: SIMP0136

Fri Oct 04 20:00:10 GMT 2024

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)	SIMP-J013656.5+093347.3	RA: 01 36 57.8999 (24.2412496d) Dec: +09 33 47.05 (9.56307d) Equinox: J2000	Proper Motion RA: 1238.244 mas/yr Proper Motion Dec: -16.156000083356048 mas/yr Parallax: 0.1634478" Epoch of Position: 2016	

Comments: Coordinates updated to Gaia DR3 epoch
Category=Star
Description=[Brown dwarfs, T dwarfs]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 SIMP-J013656.5+093347.3	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	171405.3

Template

Slit	Subarray
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	G395H/F290LP	S200A1	NRSIRS2RAPID	5	8	1	NONE	3	24	2100.8	171405.1

Observation

Proposal 5814, Observation 2: BDR 1750

Fri Oct 04 20:00:10 GMT 2024

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
(4)	VCS2020-BDR-J1750+3809	RA: 17 50 1.1300 (267.5047083d)	Proper Motion RA: -120 mas/yr	
		Dec: +38 09 19.50 (38.15542d)	Proper Motion Dec: 200 mas/yr	
		Equinox: J2000	Epoch of Position: 2000	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Brown dwarfs, T dwarfs]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	4 VCS2020-BDR-J1750+3809	WATA	SUB2048	F140X	NRSRAPID	3	1	1	3.628	171405.4

Template

Slit	Subarray
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	G395H/F290LP	S200A1	NRSIRS2	10	4	1	NONE	3	12	8928.401	171405.7

Observation

Proposal 5814, Observation 3: 2MASS 1237

Fri Oct 04 20:00:10 GMT 2024

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
(2)	2MASS-J12373919+6526148	RA: 12 37 38.8870 (189.4120292d)	Proper Motion RA: -1002.0 mas/yr	
		Dec: +65 26 13.52 (65.43709d)	Proper Motion Dec: -524.9999999023203 mas/yr	
		Equinox: J2000	Parallax: 0.09607"	
			Epoch of Position: 2001.0718	

Comments: Updated to SDSS DR12 epoch and coordinates. These coordinates are more consistent with the observed position reported in recent HST program 15870 acquisition images than other references, although the precision of that HST position is unknown.
Category=Star
Description=[Brown dwarfs, T dwarfs]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 2MASS-J12373919+6526148	WATA	SUB32	CLEAR	NRSRAPID	3	1	1	0.08	171405.5

Template

Slit	Subarray
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	G395H/F290LP	S200A1	NRSIRS2RAPID	25	3	1	NONE	3	9	3413.8	171405.8

Observation

Proposal 5814, Observation 4: 2MASS 1019

Fri Oct 04 20:00:10 GMT 2024

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
(3)	2MASS-J10190575+6529526	RA: 10 19 5.6405 (154.7735021d) Dec: +65 29 54.15 (65.49837d) Equinox: J2000	Proper Motion RA: -88.75 mas/yr Proper Motion Dec: 121.67 mas/yr Parallax: 0.04125" Epoch of Position: 2010.939726	

Comments: Updated to Kirkpatrick+2011 epoch coordinates
Category=Star
Description=[Brown dwarfs, T dwarfs]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	3 2MASS-J10190575+6529526	WATA	SUB2048	F110W	NRSRAPID	3	1	1	3.628	171405.6

Template

Slit	Subarray
S200A1	FULL

Dithers

#	Primary Dither Positions	Sub-Pixel Pattern
1	NONE	SPATIAL

Spectral Elements

#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	S200A1	NRSIRS2	10	5	1	NONE	2	10	7440.334	171405.9

Special Requirements	Aperture PA Range 344.0 to 354.0 Degrees (V3 205.15809631 to 215.15809631)