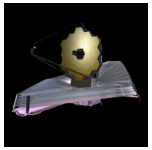

6084 - Is CWISE 1055+5443 the first young Y-type brown dwarf?

Cycle: 3, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
NIRSPEC				
	1	W1055+5443	NIRSpec Fixed Slit Spectroscopy	(1) W1055

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
MIRI LRS				
	2	W1055+5443	MIRI Low Resolution Spectroscopy	(1) W1055
MIRI Imaging				
	3	W1055+5443	MIRI Imaging	(1) W1055

ABSTRACT

Y-type brown dwarfs (Teff <= 500 K) overlap in mass and temperature with giant exoplanets, providing unique laboratories for studying cold atmospheres, free from contaminating glare of a host star. However, substellar objects cool gradually over billions of years and thus suffer from a fundamental degeneracy between age, temperature, and mass which is not readily disentangled via the observable spectral energy distribution. At present, no Y dwarf is known to be young, and none has any age constraint more accurate than +/- 20-30+%. This lack of Y dwarf ages critically limits our ability to test brown dwarf (and exoplanet) evolutionary and atmospheric models. At a very nearby distance of just 6-8 parsecs, CWISE 1055+5443 (Teff ~ 500 +/- 150 K) is the first strong candidate for a young Y dwarf. Its nearly complete kinematics yield a > 98% probability of membership in the Crius 197 moving group (only 180 +/- 9 Myr old), and its peculiar 1-2.4 um spectrum favors very low gravities log(g) ~ 3-3.5, also consistent with youth. We will use NIRSpec/G395H to measure an accurate (uncertainty ~ 1-2 km/s) radial velocity for CWISE 1055+5443, completing its kinematic profile and conclusively testing its young moving group membership. We will further combine JWST NIRSpec and MIRI from ~1-21 um to accurately measure a bolometric luminosity and hence temperature for CWISE 1055+5443, providing a unique anchor for brown dwarf evolutionary models. JWST is the only facility capable of accurately measuring the radial velocity or bolometric luminosity of CWISE 1055+5443.

OBSERVING DESCRIPTION

In this JWST proposal we have targeted a nearby and potentially young Y-type brown dwarf in order to complete its kinematic profile with a radial velocity, obtain a full 1-21 micron spectral energy distribution, calculate bolometric luminosity, and investigate the atmospheric chemistry resolved in JWST data. We propose to acquire a NIRSpec/G395H spectrum along with low resolution MIRI/LRS and NIRSpec/PRISM spectra. The G395H grating covers the peak of the flux for our target where an accurate radial velocity, as well as detailed chemistry, can be measured from absorption features. The NIRSpec/PRISM and MIRI/LRS data along with a few MIRI photometric data points will allow us to calculate a bolometric luminosity anchoring all observations with this fundamental observed parameter.

Proposal 6084 - Targets - Is CWISE 1055+5443 the first young Y-type brown dwarf?

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	W1055	RA: 10 55 11.8906 (163.7995442d) Dec: +54 43 28.31 (54.72453d) Equinox: J2000	Proper Motion RA: -1518.7 mas/yr Proper Motion Dec: -222.7 mas/yr Parallax: .145" Epoch of Position: 2016.53	

Comments:
Category=Star
Description=[Brown dwarfs]
Extended=NO

Observation

Proposal 6084, Observation 1: W1055+5443

Wed Feb 12 18:00:11 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)	W1055	RA: 10 55 11.8906 (163.7995442d) Dec: +54 43 28.31 (54.72453d) Equinox: J2000	Proper Motion RA: -1518.7 mas/yr Proper Motion Dec: -222.7 mas/yr Parallax: .145" Epoch of Position: 2016.53	

Comments:
Category=Star
Description=[Brown dwarfs]
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 W1055	WATA	SUB32	CLEAR	NRSRAPIDD6	3	1	1	0.26	174522

Template

HFF Readout Mode	Slit	Subarray
false	S200A1	SUBS200A1

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	PRISM/CLEAR	S200A1	NRSRAPID	10	5	1	NONE	3	15	257.377	174522
2	G395H/F290LP	S200A1	NRSRAPID	20	15	2	NONE	3	45	1473.232	174522

Special Requirements	Group Observations 1, 2, 3, Non-interruptible

Observation

Proposal 6084, Observation 2: W1055+5443

Wed Feb 12 18:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution 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)	W1055	RA: 10 55 11.8906 (163.7995442d) Dec: +54 43 28.31 (54.72453d) Equinox: J2000	Proper Motion RA: -1518.7 mas/yr Proper Motion Dec: -222.7 mas/yr Parallax: .145" Epoch of Position: 2016.53	

Comments:
Category=Star
Description=[Brown dwarfs]
Extended=NO

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	F560W	FASTGRPAVG	4	1	1	44.401	174522

Template

Subarray	Obtain Verification Image?
FULL	true

Dithers

#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset
1	ALONG SLIT NOD				

Pointing Verification

#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	PV ETC Wkbk.Calc ID	Filter
1	FASTR1	8	1	1	1	1	22.2		F560W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	120	5	10	1	2	3352.248	174522

Special Requirements

Group Observations 1, 2, 3, Non-interruptible

Observation

Proposal 6084, Observation 3: W1055+5443

Wed Feb 12 18:00:11 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Imaging

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
(1)	W1055	RA: 10 55 11.8906 (163.7995442d) Dec: +54 43 28.31 (54.72453d) Equinox: J2000	Proper Motion RA: -1518.7 mas/yr Proper Motion Dec: -222.7 mas/yr Parallax: .145" Epoch of Position: 2016.53	

Comments:
Category=Star
Description=[Brown dwarfs]
Extended=NO

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	CYCLING	20	4						DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1500W	FASTR1	5	1	1	Dither 1	4	4	55.501	174522
2	F1800W	FASTR1	8	1	1	Dither 1	4	4	88.801	174522
3	F2100W	FASTR1	16	2	1	Dither 1	4	8	366.305	174522

Special Requirements

Group Observations 1, 2, 3, Non-interruptible