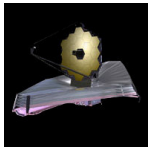

5485 - How big can you make a planet? Spectroscopic characterization of HD 206893B

Cycle: 3, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	HD 206893B IFU	NIRSpec IFU Spectroscopy	(1) HD-206893B

ABSTRACT

We propose moderate resolution spectroscopic characterization of HD 206893B, a ~28Mjup directly imaged (DI) companion with strong evidence of formation via a circumstellar disk. Measuring the detailed abundances of this closely separated companion will provide a window into the utility of formation diagnostic tools at the extreme upper end of the planet formation process. We propose observations with an R~2,700 fixed-slit NIRSpec spectra between 3-5um. New analysis of NIRSpec capabilities suggests that detection is easily achievable despite the high contrast and tight separation of the companion (~0.2"). We will measure molecular lines from species such as CO, CO2, H2S, CH4, and H2O. These detections will be

used to derive the metallicity, carbon-to-oxygen ratio, volatile-to-sulfur ratio, and cloud properties of HD 206893B. The different abundance ratios we propose to measure on this planet could give detailed insights into its formation pathways. Furthermore, due to its extremely red color and dusty atmosphere, HD 206893B offers an opportunity to investigate the impact of extreme clouds on the spectra in this wavelength regime.

OBSERVING DESCRIPTION

We propose to use the 200 mas-wide fixed slits (S200A1 and S200A2) of the NIRSpec along with the 2.9-5.1um filter (F290LP) and the G395H grating to obtain moderate resolution (R~2,700) spectra of HD 206893B. This will enable us to characterize the atmosphere of this companion (including looking for signatures of H2S) and also elucidate the differences in formation pathways between companion objects of super-Jovian and brown dwarf masses. The planet will be 200mas away from the star in cycle 3 and we require the slit to be oriented perpendicular to the planet-star axis to avoid saturation. Light from the stellar halo will dominate our science observation, so we require reference observations of the speckle field on the other side of the star. This reference spectra will be used to model and/or subtract the stellar light in the science data that includes the planet signal. The observations will be split into otherwise identical sequences between the two 200mas slits. Since the host star (HD 206893) is too bright for target acquisition, an offset star with Gaia astrometry will be used.

Proposal 5485 - Targets - How big can you make a planet? Spectroscopic characterization of HD 206893B

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	HD-206893B	RA: 21 45 21.8960 (326.3412333d) Dec: -12 46 59.93 (-12.78331d) Equinox: J2000	Proper Motion RA: 94.112 mas/yr Proper Motion Dec: -0.4630000830729841 mas/yr Parallax: 0.0245275" Epoch of Position: 2000.0	
Comments: Position of the companion (not the star). *The stellar position was retrieved from Simbad (J2000) and the offset of the companion at J2000 was retrieved from http://whereistheplanet.com/. This offset was used to calculate the planet coordinates at J2000.* *Category=Star* *Description=[Exoplanets]*				
(2)	21452055-1246280	RA: 21 45 20.5467 (326.3356112d) Dec: -12 46 28.16 (-12.77449d) Equinox: J2000	Proper Motion RA: 16.4975 mas/yr Proper Motion Dec: -6.6963 mas/yr Parallax: 0.0017695" Epoch of Position: 2000.0	
Comments: TA star Gaia DR3 6843672087120109056/2MASS 21452055-1246280 *J mag = 14.89* *Category=Unidentified* *Description=[Blank field]*				

Observation

Proposal 5485, Observation 1: HD 206893B IFU Fri Sep 06 22:00:11 GMT 2024

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: We require the orientation of the IFU slits to be perpendicular to the star-planet separation direction in order to prevent saturation of the IFU at the planet location. This is best achieved by having the highest possible V3PA angle (~78 deg) that is feasible in this observing window (also cross-checked visually using Aladin). We request the instrument scientist and scheduler to schedule our observations such that the telescope can be oriented at a V3PA of 78 deg.

Diagnostics

(HD 206893B IFU (Obs 1)) Warning (Form): The slew between the acquisition exposure and the farthest science exposure is 69.859 Arcsec (larger than the recommended limit of 50.000 Arcsec) and may result in reduced or no schedulability. See more information in the diagnostic browser.

(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)	HD-206893B	RA: 21 45 21.8960 (326.3412333d)	Proper Motion RA: 94.112 mas/yr	
		Dec: -12 46 59.93 (-12.78331d)	Proper Motion Dec: -0.4630000830729841 mas/yr	
		Equinox: J2000	Parallax: 0.0245275"	
			Epoch of Position: 2000.0	

Comments: Position of the companion (not the star).
The stellar position was retrieved from Simbad (J2000) and the offset of the companion at J2000 was retrieved from http://whereistheplanet.com/. This offset was used to calculate the planet coordinates at J2000.
Category=Star
Description=[Exoplanets]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 21452055-1246280	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	213956

Mosaic

Rows	Columns	Row Overlap %	Column Overlap %	Row shift (deg)	Column shift (deg)	Tile Order
1	2	10.0	50.0	0.0	0.0	DEFAULT

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	MEDIUM	1	20	

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	G395H/F290LP	NRSRAPID	4	11	false	true	NONE	20	220	11810.447	210940

Special Requirements	Aperture PA Range 212.97164917 to 216.97164917 Degrees (V3 74.0 to 78.0)