



2001 - Mineral clouds in the atmosphere of the hot Jupiter HD189733b

Cycle: 1, Proposal Category: GO

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
	1		MIRI Low Resolution Spectroscopy	(1) HD-189733B

ABSTRACT

Hot Jupiters are gas giant planets in short period, tidally locked orbits. Their properties offer a unique opportunity to study the composition of the gas and clouds in their atmospheres, which carry crucial information on their formation history. We propose to use JWST/MIRI in LRS mode for a detailed characterization of the aerosols in the atmosphere of HD189733b, one of the best studied, prototypical cloudy hot Jupiters. We will (1) establish the presence and composition of theoretically predicted mineral clouds, and (2) determine for the first time the chemical composition of the atmosphere by consistently including gas and clouds. This will constrain the formation history of HD189733b. Models for gas giant planet formation predict large variations in elemental abundances of the atmosphere resulting from accretion of pebbles and planetesimals. Cloud properties depend critically on this chemistry, and strongly impact the observable atmosphere. The MIRI instrument on board JWST offers for the first time access to the mid-infrared wavelength range for exoplanet studies, crucial for mineral cloud characterization. HD189733b has many advantages for the study of mineralogical clouds: 1) detailed studies have convincingly shown that clouds and/or hazes are present in the upper atmosphere, but their nature is not constrained, 2) from a theoretical perspective the temperature structure of the planet is ideal for hosting mineral clouds, 3) the exquisite observational properties of HD189733b and superb sensitivity of JWST allow us to even address day/night asymmetries in its atmosphere using a various parts of a single transit observation.

OBSERVING DESCRIPTION

This observation is designed to observe a single transit of the transiting exoplanet HD189733b with the low resolution spectrograph of the MIRI instrument. We use MIRI/LRS in the slit-less mode without dithers to ensure optimal spectro-photometric stability required for these type of observations. We use a TA on the source itself to properly center the target on the ideal pixel on the slitless subarray. As the target is very bright, we only use 5 groups per integration, and 21135 integrations in total to cover the entire transit. we have defined the starting time of the time series observations in orbital phase of the planet, with a starting window of 1h. We further imposed PA constraints such that near by stars do not contaminate the spectrum of the target star.

Proposal 2001 - Targets - Mineral clouds in the atmosphere of the hot Jupiter HD189733b

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	HD-189733B	RA: 20 00 43.7093 (300.1821221d) Dec: +22 42 35.19 (22.70978d) Equinox: J2000	Proper Motion RA: -2.380559461785614E-4 sec of time/yr Proper Motion Dec: -0.25022499999067804 arcsec/yr Epoch of Position: 2015.5	
<i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> Category=Star Description=[Exoplanets, K stars] Extended=NO					

Proposal 2001 - Observation 1 - Mineral clouds in the atmosphere of the hot Jupiter HD189733b

Tue Sep 28 20:00:51 GMT 2021

Observation	<p>Proposal 2001, Observation 1</p> <p>Diagnostic Status: Warning</p> <p>Observing Template: MIRI Low Resolution Spectroscopy</p>								
Diagnostics	<p>(Observation 1) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.</p> <p>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>								
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Acquisition	#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	SAME	F1500W	FAST	6	1	1	0.954	89124
Template	Subarray			Obtain Verification Image?					
	SLITLESSPRISM			true					
Dithers	#	Dither Type	No. Spectral Steps	Spectral Step Offset	No. Spatial Steps	Spatial Step Offset			
	1	NONE							
Pointing Verification	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID		
	1	FAST	6	1	1	0.954	89124		

Proposal 2001 - Observation 1 - Mineral clouds in the atmosphere of the hot Jupiter HD189733b

Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
Special Requirements	1	FASTR1	5	17656	17656	1	1	16847.902	89124
	Phase 0.946 to 0.9655 with period 2.218575200 Days and zero-phase 2453955.525551 HJD Aperture PA Range 77 to 87 Degrees (V3 72.16574676 to 82.16574676) Aperture PA Range 119 to 145 Degrees (V3 114.16574676 to 140.16574676) Aperture PA Range 203 to 219 Degrees (V3 198.16574676 to 214.16574676) Aperture PA Range 255 to 269 Degrees (V3 250.16574676 to 264.16574676) Time Series Observation No Parallel								