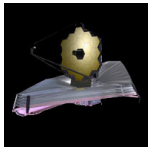

2008 - A Blast From the Past: A Spectroscopic look at the Flash Heating of HD80606b

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	HD 80606b phase curve	MIRI Low Resolution Spectroscopy	(1) HD-80606

ABSTRACT

High-eccentricity exoplanets are a unique class of planets that experience dramatic increases in insolation and tidal forcing near periastron passage. By observing the thermal response of the atmosphere before, during, and after periastron passage (the ‘flash-heating’ event), we can constrain physical processes within a single set of observations. We propose to utilize MIRI/LRS to observe a partial spectroscopic phase curve of the eccentric hot Jupiter HD 80606b. In conducting our spectroscopic observations from 12 hrs before through to 8 hrs after periastron, we will capture the time- and wavelength-dependent flux before, during and after HD 80606b’s flash-heating event. This information will allow us to constrain the internal

heating of HD 80606b, probe variations in clouds and chemistry throughout HD 80606b's orbit, and assess the role of dynamical mixing in HD 80606b's atmosphere. Our proposed MIRI/LRS observations of HD~80606b will build upon the rich legacy of Spitzer, Hubble, and now TESS and bring a new experimental look into fundamental processes that shape the phase-curve observations of not only eccentric hot Jupiters, but all hot Jupiters.

OBSERVING DESCRIPTION

These observations aim to capture the temporal thermal variations in the highly eccentric exoplanet HD80606b's atmosphere during its periastron passage. The overall length of the observations and the achievable precision are key to meeting the science goals. We will use the MIRI LRS slitless mode to maximize both the signal from the planet and the achievable precision. Our observations will be taken in the standard MIRI LRS slitless configuration that uses the slitlessprism subarray, fast readmode, and no filter. We have selected 14 groups per integration so as to not exceed 80% full well and avoid saturation while maximizing the observing efficiency. The observations will consist of 32337 integrations with 2.3856 seconds per integration covering roughly 20 hours of HD80606b's orbit centered on the secondary eclipse event and inclusive of periastron passage. Given the target brightness and leveraging simulations from JWST PandExo, we expect to achive a one-sigma precision of 100 ppm at 8 micron on a 1 hour timescale. We have allowed for a full 60 minute window/phase range at the start of the observation, which will still allow for capture of the relevant events/timescales during the course of the observations. This observation start window has been specified to ensure that sufficient time before and after the periastron passage of the planet are captured to allow for characterization of the planet's heating and subsequent response. We will consider discarding the first 30-45 minutes of the observation if necessary due to detector ramp effects with no impact on the overall science goals. Given the observability of the target and its orbital period, there are two opportunities to capture the periastron passage of HD80606b during cycle 1.

For target acquisition we have followed the proceedure outlined in JDox for MIRI LRS slitless observations. We will acquire on the science target using the slitlessprism subarray with the fast readout pattern with 4 groups per integration and 1 integration resulting in a 0.64 second exposure time. We have selected the F1000W filter in our target acquisition strategy to avoid saturation while still achieving a SNR of 389 during the target acquistion.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	HD-80606	RA: 09 22 37.6680 (140.6569500d) Dec: +50 36 13.60 (50.60378d) Equinox: J2000	Proper Motion RA: 0.005875195586551243 sec of time/yr Proper Motion Dec: 0.01034 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanet Systems, G stars]

Observation

Proposal 2008, Observation 1: HD 80606b phase curve

Thu Apr 28 23:00:45 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(HD 80606b phase curve (Obs 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.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
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Category=Star
Description=[Exoplanet Systems, G stars]

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	F1000W	FAST	4	1	1	0.636	60953

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	4	1	1	0.636	60953

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	14	10812	32436	3	1	77378.844	

Special Requirements

Phase 0.9418 to 0.9422 with period 111.43639 Days and zero-phase 2455210.642 HJD
Aperture PA Range 100 to 247 Degrees (V3 95.16574676 to 242.16574676)
Aperture PA Range 282 to 65 Degrees (V3 277.16574676 to 60.16574676)
Time Series Observation
No Parallel