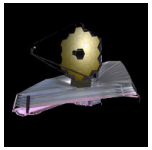

3784 - Mapping the atmosphere or surface of a hot ultra-short-period super Earth

Cycle: 2, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Michael Zhang (PI)	**University of Chicago**
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Dr. Renyu Hu (CoI)	Jet Propulsion Laboratory

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRSpec Bright Object Time Series	(1) 2MASS-J02531581+0003087

ABSTRACT

We propose to obtain a spectroscopic (2.0--5.3 um) phase curve of TOI 2445b, a hot (1340 K) 1.33 R_earth super-Earth which has the second highest planet-to-star flux ratio among rocky planets. The phase curve will constrain the planet's dayside and nightside temperatures, phase offset, Bond albedo, and heat recirculation efficiency. The large eclipse depth reduces the impact of the systematics and the large wavelength range captures 80% of the planet's thermal emission, ensuring accurate measurements of these quantities. A significant atmosphere would manifest as a diminished day-night temperature contrast, non-zero phase offset, and if there are clouds, high albedo. If there is significant eccentricity, the resulting tidal heating would be visible as anomalously high thermal emission. If there is no atmosphere, the observations are capable of distinguishing between different surface compositions. A basaltic crust of the type common on solar system terrestrial planets, for example, would be featureless and bright, while a Ca/Al-rich crust would be much colder and fainter. Our observations would shed light on the properties and origins of ultra-short-period planets, and serve as a pathfinder to future studies of the planet.

OBSERVING DESCRIPTION

We propose to observe TOI-2445b for 13.4 hours using NIRSpec BOTS with the PRISM. We will use the SUB512 subarray with the NRSRAPID readout pattern and 7 groups per integration. The observations will take a total of 26,365 integrations.

The should observations start before a secondary eclipse and end shortly after the following secondary eclipse, enabling us to capture two eclipses in one phase curve observation. We add 1 h of baseline before the first eclipse and after the second, and 2 h of extra padding at the beginning of the observation to mitigate the ramp.

Target acquisition should be done on the target itself. Even though it partially saturates the central pixel by 0.2 magnitudes, there are no better target acquisition targets nearby.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	2MASS-J02531581+0003087	RA: 02 53 15.8773 (43.3161554d) Dec: +00 03 8.41 (.05234d) Equinox: J2000	Proper Motion RA: 0.003814134924555953 sec of time/yr Proper Motion Dec: -0.024049999956332613 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[M dwarfs]
Extended=NO

Observation

Proposal 3784, Observation 1

Thu May 11 04:02:45 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(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.

(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)	2MASS-J02531581+0003087	RA: 02 53 15.8773 (43.3161554d) Dec: +00 03 8.41 (.05234d) Equinox: J2000	Proper Motion RA: 0.003814134924555953 sec of time/yr Proper Motion Dec: -0.024049999956332613 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[M 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	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	141806

Template

Subarray
SUB512

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	PRISM/CLEAR	NRSRAPID	7	26365	1	1	26365	48241.622	141806

Special Requirements

Phase -0.46 to -0.40 with period 0.7422572 Days and zero-phase 2458411.21990 HJD
Time Series Observation
No Parallel Attachments