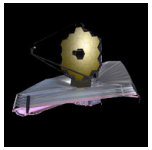

1803 - Unlocking the Mysteries of the Archetype Sub-Neptune GJ1214b with a Full-Orbit Phase Curve

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	PhaseCurve_1	MIRI Low Resolution Spectroscopy	(1) GJ1214

ABSTRACT

GJ1214b is by far the best characterized exoplanet smaller than Neptune. Yet its extensively-observed transmission spectrum has only revealed a thick layer of aerosols, which obscures the molecular features that are needed to determine the planet's atmospheric composition. Furthermore, we still don't know what the aerosols are made of and why the planet is so thoroughly enshrouded.

We propose to use MIRI/LRS to observe the phase curve of the sub-Neptune GJ1214b in order to unlock the mysteries of its atmosphere. In one fell swoop, our observations will measure the planet's broadband phase curve, its phase-resolved thermal emission spectrum, and its mid-IR transmission spectrum. This program will give us first-time access to GJ1214b's thermal emission and the part of its transmission spectrum that should be the least impacted by aerosol scattering - both uniquely enabled by JWST. We anticipate that these observations will finally reveal the composition of GJ1214b's atmosphere and home in on the identity of its pervasive aerosols. This program will also provide the first map of a warm, sub-Neptune size planet, thus extending previous studies of atmospheric heat transport and dynamics into a new regime.

Ten years after its discovery, GJ1214b remains the highest S/N sub-Neptune size exoplanet for both transmission and thermal emission measurements. It is unlikely that a better target for investigating the nature of such planets will ever be found. These observations will therefore serve as a legacy dataset for contextualizing all previous and future studies of the ubiquitous sub-Neptune exoplanets.

OBSERVING DESCRIPTION

This is a long, un-interrupted stare to measure the phase curve of the planet GJ1214b. The orbital period of the planet is 1.58 days. We aim to start 1.23 hr before a secondary eclipse, observe through the eclipse, a transit, and a second eclipse, and contine for 1 hr after the second eclipse. Due to data volume constraints, we broke the observation up into two visits. The break between the visits occurs about 1 hour after the transit ends. The two visits should occur consecutively, with as short an interuption as possible.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	GJ1214	RA: 17 15 19.5358 (258.8313992d) Dec: +04 57 38.45 (4.96068d) Equinox: J2000	Proper Motion RA: 0.03884195791936605 sec of time/yr Proper Motion Dec: -0.7495879999396493 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, M stars]

Observation

Proposal 1803, Observation 1: PhaseCurve_1

Tue Jul 05 16:00:13 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(PhaseCurve_1 (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, M stars]

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	SAME	F560W	FAST	4	1	1	0.636	63027.2

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	63027.2

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	42	4320	21600	5	1	147715.557	63027.1

Special Requirements

Phase 0.22142082 to 0.23460310 with period 3.160808660 Days and zero-phase 2454966.525129 HJD
Time Series Observation
No Parallel