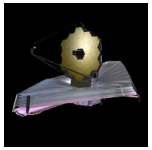

1846 - A Search for Signatures of Volcanism and Geodynamics on the Hot Rocky Exoplanet LHS 3844b

Cycle: 1, Proposal Category: GO

INVESTIGATORS

Name	*Institution*
Dr. Laura Kreidberg (PI) (ESA Member)	**Max Planck Institute for Astronomy**
Matej Malik (CoI)	University of Maryland
Dr. Renyu Hu (CoI) (CoPI) (US Admin CoI)	Jet Propulsion Laboratory
Prof. Edwin S Kite (CoI)	University of Chicago
Dr. Caroline Morley (CoI)	University of Texas at Austin
Dr. Laura Schaefer (CoI)	Stanford University
Daniel Koll (CoI)	Massachusetts Institute of Technology
Ms. Emily Whittaker (CoI)	University of Maryland

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
LHS 3844b eclipse				
	1		MIRI Low Resolution Spectroscopy	(1) LHS-3844
	2		MIRI Low Resolution Spectroscopy	(1) LHS-3844
	102		MIRI Low Resolution Spectroscopy	(1) LHS-3844
	3		MIRI Low Resolution Spectroscopy	(1) LHS-3844

ABSTRACT

Rocky planets orbiting close to M-dwarf stars are among the most common planets known in the Galaxy. While many of these worlds have similar masses and radii to the Solar System terrestrial planets, they may have vastly different geology due to their short-period orbits. Here we propose to observationally constrain the past and present geology of the hot rocky exoplanet LHS 3844b by measuring its thermal emission spectrum with

MIRI/LRS. Recent Spitzer observations of this planet indicate that it is most likely a bare rock, inviting detailed study of the surface. Our proposed emission spectrum will tightly constrain the surface fractions of different types of rock, including basalt (expected from volcanism akin to present-day Earth), ultramafic rock (expected from a solidified magma ocean or high-temperature volcanism), and granite (an indicator of crustal reprocessing). Our data will also be highly sensitive to trace amounts of sulfur dioxide that could arise from ongoing volcanic outgassing (> 3sigma detection of 100 parts per million sulfur dioxide in 0.01 bar atmosphere). Together, these measurements will provide the first empirical constraints on the geologic history of a rocky exoplanet orbiting an M-dwarf.

OBSERVING DESCRIPTION

The observations consist of time series spectroscopy of the LHS 3844 system with MIRI/LRS in slitless spectroscopy mode. The observations must be timed to coincide with secondary eclipses of the planet and executed in a continuous sequence. LHS 3844 is an M-dwarf with K mag = 9.1, so we can directly acquire the target.

Proposal 1846 - Targets - A Search for Signatures of Volcanism and Geodynamics on the Hot Rocky Exoplanet LHS 3844b

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	LHS-3844	RA: 22 41 59.0890 (340.4962042d) Dec: -69 10 19.59 (-69.17211d) Equinox: J2000	Proper Motion RA: 0.06269080123004732 sec of time/yr Proper Motion Dec: -0.7269740000765523 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 dwarfs]

Observation

Proposal 1846, Observation 1

Wed Oct 11 19:00:10 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Observation 1) Warning (Form): Groups/Int cannot be 1, Groups/Int = 2 requires permission and Groups/Int of 3-4 is allowed but not recommended.

(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)	LHS-3844	RA: 22 41 59.0890 (340.4962042d) Dec: -69 10 19.59 (-69.17211d) Equinox: J2000	Proper Motion RA: 0.06269080123004732 sec of time/yr Proper Motion Dec: -0.7269740000765523 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 dwarfs]

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 LHS-3844	F1000W	FAST	4	1	1	0.636	54946.03

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

#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	PV ETC Wkbk.Calc ID	Filter
1	FASTR1	4	1	1	1	1	0.636		F1000W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	30	1887	1887	1	1	9303.204	54956.01

Special Requirements

Phase 0.31989683820501846 to 0.40999342239131353 with period 0.462929551 Days and zero-phase 2459085.392951 HJD
Time Series Observation
No Parallel Attachments
No Parallel Attachments

2 After 1 by 60 Days to <None specified>

Observation

Proposal 1846, Observation 2

Wed Oct 11 19:00:10 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Observation 2) Warning (Form): Groups/Int cannot be 1, Groups/Int = 2 requires permission and Groups/Int of 3-4 is allowed but not recommended.

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	LHS-3844	RA: 22 41 59.0890 (340.4962042d) Dec: -69 10 19.59 (-69.17211d) Equinox: J2000	Proper Motion RA: 0.06269080123004732 sec of time/yr Proper Motion Dec: -0.7269740000765523 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 dwarfs]

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 LHS-3844	F1000W	FAST	4	1	1	0.636	54946.03

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

#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	PV ETC Wkbk.Calc ID	Filter
1	FASTR1	4	1	1	1	1	0.636		F1000W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	30	1887	1887	1	1	9303.204	54956.01

Special Requirements

Phase 0.31989683820501846 to 0.40999342239131353 with period 0.462929551 Days and zero-phase 2459085.392951 HJD
Time Series Observation
No Parallel Attachments
No Parallel Attachments

2 After 1 by 60 Days to <None specified>

Observation

Proposal 1846, Observation 102

Wed Oct 11 19:00:10 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Observation 102) Warning (Form): Groups/Int cannot be 1, Groups/Int = 2 requires permission and Groups/Int of 3-4 is allowed but not recommended.

(Visit 102:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	LHS-3844	RA: 22 41 59.0890 (340.4962042d) Dec: -69 10 19.59 (-69.17211d) Equinox: J2000	Proper Motion RA: 0.06269080123004732 sec of time/yr Proper Motion Dec: -0.7269740000765523 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 dwarfs]

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 LHS-3844	F1000W	FAST	4	1	1	0.636	54946.03

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

#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	PV ETC Wkbk.Calc ID	Filter
1	FASTR1	4	1	1	1	1	0.636		F1000W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	30	1887	1887	1	1	9303.204	54956.01

Special Requirements

Phase 0.31989683820501846 to 0.40999342239131353 with period 0.462929551 Days and zero-phase 2459085.392951 HJD
Time Series Observation
No Parallel Attachments
No Parallel Attachments

Observation

Proposal 1846, Observation 3

Wed Oct 11 19:00:10 GMT 2023

Diagnostic Status: Warning

Observing Template: MIRI Low Resolution Spectroscopy

Diagnostics

(Observation 3) Warning (Form): Groups/Int cannot be 1, Groups/Int = 2 requires permission and Groups/Int of 3-4 is allowed but not recommended.

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	LHS-3844	RA: 22 41 59.0890 (340.4962042d) Dec: -69 10 19.59 (-69.17211d) Equinox: J2000	Proper Motion RA: 0.06269080123004732 sec of time/yr Proper Motion Dec: -0.7269740000765523 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 dwarfs]

Acquisition

#	Target	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	1 LHS-3844	F1000W	FAST	4	1	1	0.636	54946.03

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

#	PV Readout Pattern	PV Groups/Int	PV Integrations/Exp	PV Total Integrations	PV Exposures/Dith	PV Total Dithers	PV Total Exposure Time	PV ETC Wkbk.Calc ID	Filter
1	FASTR1	4	1	1	1	1	0.636		F1000W

Spectral Elements

#	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Exposures/Dith	Total Dithers	Total Exposure Time	ETC Wkbk.Calc ID
1	FASTR1	30	1887	1887	1	1	9303.204	54956.01

Special Requirements

Phase 0.31989683820501846 to 0.40999342239131353 with period 0.462929551 Days and zero-phase 2459085.392951 HJD
Time Series Observation
No Parallel Attachments
No Parallel Attachments