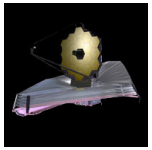

12656 - Rocky Worlds DDT: JWST Observations of TOI-771 b

Cycle: 4, Proposal Category: DD

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
TOI-771 b MIRI Eclipses				
	1	Eclipse 1	MIRI Imaging	(1) TOI-771
	2	Eclipse 2	MIRI Imaging	(1) TOI-771
	3	Eclipse 3	MIRI Imaging	(1) TOI-771
	4	Eclipse 4	MIRI Imaging	(1) TOI-771

ABSTRACT

Rocky Worlds is a joint JWST and HST Director's Discretionary Program designed to implement the top recommendations from the Working Group on Strategic Exoplanet Initiatives with HST and JWST. The JWST side of the Rocky Worlds DDT focuses on secondary eclipse measurements of rocky exoplanets orbiting nearby M dwarfs. We will take secondary eclipse time series observations at 15 microns with the MIRI/F1500W photometric filter. With these observations we will measure the dayside temperatures of these rocky worlds, which can be compared to planetary models to interpret whether or not an atmosphere may be present. The Rocky Worlds DDT will advance our understanding of individual rocky exoplanets and broadly explore the existence of an M-dwarf Cosmic Shoreline. Follow-up, complementary observations of Rocky Worlds targets are encouraged.

Each rocky world observed by JWST in the Rocky Worlds DDT program has its own set of Program IDs. The observations in this program will focus on TOI-771 b.

OBSERVING DESCRIPTION

This DDT program will observe secondary eclipses of a sample of rocky planets orbiting M dwarfs with MIRI Imaging photometry at 15 microns using the F1500W filter. The goal of the observations is to measure the dayside temperature as a proxy for the planet's heat redistribution, as well as to measure possible absorption signatures by CO2. The JWST observations will be combined with HST ultraviolet to blue-optical observations to characterize the host star. The stellar UV spectrum is an essential input for models of atmospheric loss and photochemistry.

The 4 eclipse observations of TOI-771 b are designed to (a) enable a differentiation, at 3-sigma with a statistical power >80%, between an exoplanet

with full redistribution of energy from the day to the nightside, assuming an albedo of 0.3, and a bare rock scenario (modeled as a blackbody), with an assumed albedo of 0.1, and (b) account for the uncertainty on the time of secondary eclipse. The former definition sets the number of eclipses to observe (4), assuming noise properties coming from the JWST Exposure Time Calculator. The latter defines the observing time and phase-constraints ingested in this APT file, computed using a “Tinker Scheduling” algorithm, for which we calculated a risk of only ~10% of missing the eclipses if the orbit is truly eccentric. The risk of missing the eclipses if the orbit is circular is zero.

These observations are in turn divided in two “Checkpoints”, after which assessments will be made by the Core Implementation Team (CIT) and the Science Advisory Committee (SAC). Checkpoint 1 (set to Observation 2), will try to detect the eclipse of TOI-771 b at 3-sigma, which is the best case scenario assuming a bare rock. To add the possibility of slight deviations from the JWST ETC calculations, we have estimated that if the eclipse depth error is 25% larger than the ETC calculation, we should make this detection on the second eclipse. In the event that the eclipse is confidently detected after Checkpoint 1, we will be able to shorten the subsequent observing windows for subsequent observations. As such, Observations 3 and 4 are placed on hold until the Checkpoint 1 eclipses are analyzed. TOI-771 b was determine to require 4 eclipses for Checkpoints 1 and 2. No observation splitting is required for this target.

More information about the details of the scheduling constraints can be found in the Rocky Worlds DDT webpage (rockyworlds.stsci.edu), which has a full report of the observing strategy defined for TOI-771 b.

Proposal 12656 - Targets - Rocky Worlds DDT: JWST Observations of TOI-771 b

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TOI-771	RA: 10 56 27.3381 (164.1139088d)	Proper Motion RA: 39.300 mas/yr	
		Dec: -72 59 6.66 (-72.98518d)	Proper Motion Dec: -76.417 mas/yr	
		Equinox: J2000	Parallax: 0.03944672968039077"	
			Epoch of Position: 2016.0	

Comments: Object has been updated manually with Gaia DR3 coordinates, proper motions, parallax, and epoch. Done by T. Baines, checked by M. Alam.
Category=Star
Description=[M dwarfs]
Extended=NO

Observation

Proposal 12656, Observation 1: Eclipse 1

Wed May 27 23:00:42 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Eclipse 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
(1)	TOI-771	RA: 10 56 27.3381 (164.1139088d)	Proper Motion RA: 39.300 mas/yr	
		Dec: -72 59 6.66 (-72.98518d)	Proper Motion Dec: -76.417 mas/yr	
		Equinox: J2000	Parallax: 0.03944672968039077"	
			Epoch of Position: 2016.0	

Comments: Object has been updated manually with Gaia DR3 coordinates, proper motions, parallax, and epoch. Done by T. Baines, checked by M. Alam.
Category=Star
Description=[M dwarfs]
Extended=NO

Template

Subarray
BRIGHTSKY

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	F1500W	FASTR1	39	496	1	None	1	496	17166.29	

Special Requirements

Between Dates 01-JUN-2026:00:00:00 and 01-JUL-2026:00:00:00
Phase 0.9394513525523609 to 0.957366444602793 with period 2.326018376909667 Days and zero-phase 2461111.2724501714 HJD
Time Series Observation
No Parallel Attachments

2 After 1 by 7 Days to <None specified>

Observation

Proposal 12656, Observation 2: Eclipse 2

Wed May 27 23:00:42 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TOI-771	RA: 10 56 27.3381 (164.1139088d)	Proper Motion RA: 39.300 mas/yr	
		Dec: -72 59 6.66 (-72.98518d)	Proper Motion Dec: -76.417 mas/yr	
		Equinox: J2000	Parallax: 0.03944672968039077"	
			Epoch of Position: 2016.0	

Comments: Object has been updated manually with Gaia DR3 coordinates, proper motions, parallax, and epoch. Done by T. Baines, checked by M. Alam.
Category=Star
Description=[M dwarfs]
Extended=NO

Template

Subarray
BRIGHTSKY

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	F1500W	FASTR1	39	497	1	None	1	497	17200.901	

Special Requirements

Between Dates 11-JUN-2026:00:00:00 and 13-JUN-2026:00:00:00
Phase 0.9393258604294787 to 0.9572409524799108 with period 2.326018376909667 Days and zero-phase 2461111.2734214207 HJD
Time Series Observation
No Parallel Attachments

2 After 1 by 7 Days to <None specified>
3 After 2 by 7 Days to <None specified>

Observation

Proposal 12656, Observation 3: Eclipse 3

Wed May 27 23:00:42 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TOI-771	RA: 10 56 27.3381 (164.1139088d)	Proper Motion RA: 39.300 mas/yr	
		Dec: -72 59 6.66 (-72.98518d)	Proper Motion Dec: -76.417 mas/yr	
		Equinox: J2000	Parallax: 0.03944672968039077"	
			Epoch of Position: 2016.0	

Comments: Object has been updated manually with Gaia DR3 coordinates, proper motions, parallax, and epoch. Done by T. Baines, checked by M. Alam.
Category=Star
Description=[M dwarfs]
Extended=NO

Template

Subarray
BRIGHTSKY

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	F1500W	FASTR1	39	517	1	None	1	517	17893.125	

Special Requirements

Between Dates 01-JUN-2026:00:00:00 and 01-JUL-2026:00:00:00
Phase 0.9375775351255026 to 0.9554926271759346 with period 2.326018376909667 Days and zero-phase 2461111.2680916376 HJD
Time Series Observation
No Parallel Attachments

3 After 2 by 7 Days to <None specified>
4 After 3 by 30 Days to <None specified>

Observation

Proposal 12656, Observation 4: Eclipse 4

Wed May 27 23:00:42 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(Eclipse 4 (Obs 4)) 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 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TOI-771	RA: 10 56 27.3381 (164.1139088d)	Proper Motion RA: 39.300 mas/yr	
		Dec: -72 59 6.66 (-72.98518d)	Proper Motion Dec: -76.417 mas/yr	
		Equinox: J2000	Parallax: 0.03944672968039077"	
			Epoch of Position: 2016.0	

Comments: Object has been updated manually with Gaia DR3 coordinates, proper motions, parallax, and epoch. Done by T. Baines, checked by M. Alam.
Category=Star
Description=[M dwarfs]
Extended=NO

Template

Subarray
BRIGHTSKY

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	F1500W	FASTR1	39	735	1	None	1	735	25438.367	

Special Requirements

Between Dates 01-AUG-2026:00:00:00 and 03-AUG-2026:00:00:00
Phase 0.918809866672568 to 0.9367249587230001 with period 2.326018376909667 Days and zero-phase 2461111.321141999 HJD
Time Series Observation
No Parallel Attachments
On Hold On hold until Checkpoint 1 analysis is complete.

4 After 3 by 30 Days to <None specified>