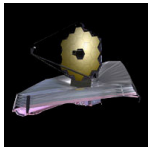

3942 - Probing the volcanic outgassing activity of a warm sub-Earth planet

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1		NIRSpec Bright Object Time Series	(1) L-98-59
	2		NIRSpec Bright Object Time Series	(1) L-98-59
	3		NIRSpec Bright Object Time Series	(1) L-98-59
	4		NIRSpec Bright Object Time Series	(1) L-98-59

ABSTRACT

Among the main sequence stars, the sub-group comprising smaller and cooler stars than theSun, e.g. M-dwarfs, represents the ideal environment to discover and characterize terrestrial planets. With an equilibrium temperature <650K L98-59b is an important target to expand the knowledge on the volcanic outgassing of warm small planets. The measured mass and radius of L98-59b are compatible with a rocky core with an envelope. The radius (0.85 Rearth) places the planet in the Mars-sized regime and given its TSM of ~50, L98-59b is one of the best small planet for transmission spectroscopy characterization. HST observations have ruled out on the possibility of a H2-dominated envelope with the presence of H2O. However, the data is not enough to rule out H2O- or CO2- dominated atmospheric scenarios.

We propose to use NIRSpec/G395H to measure the planet's transmission spectrum at 2.8 – 5.2 microns, and we expect the precision achieved (~17 ppm) to shed light onto the nature of L98-59b possible high mean molecular mass atmosphere.

OBSERVING DESCRIPTION

We will acquire the transmission spectrum of the warm Mars-size L98-59b, using NIRSpec/BOTS/G395H to cover the wavelength range 2.9 – 5.2 microns. We propose to obtain four transits with NIRSpec/G395H to achieve a precision of 17 ppm per spectral element on average at the resolution of R=100. We choose the number of groups to keep the saturation level within 65%, to make sure that the observations would be well within the detector's linear regime and maximize the efficiency of the observations. 2902 integrations will be collected to cover the entire transit event (~2.9 hours). We perform target acquisition (TA) on the target itself.

As is recommended for exoplanet transit observations, we include an out-of-transit portion of the light curve that lasts 1.5 times the transit duration and splits evenly before and after the transit. This is necessary to establish a baseline from which the transit depth can be determined and using which instrumental systematics can be modeled. Additionally, since any timing constraint narrower than 1 hour is considered "tight" and incurs a 1-hour scheduling overhead penalty, we use a timing window of exactly 1 hour, centered at 30 + out-of-transit-duration/2 minutes before the predicted start of the transit. The extra baseline also gives the instrument time to stabilize and thus reduce systematics.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	L-98-59	RA: 08 18 7.8865 (124.5328604d) Dec: -68 18 52.08 (-68.31447d) Equinox: J2000	Proper Motion RA: 0.017102549351990327 sec of time/yr Proper Motion Dec: -0.34008400002676353 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 stars]*				
(2)	ACQ-STAR-FOR-L98-59	RA: 08 18 18.2248 (124.5759367d) Dec: -68 18 42.85 (-68.31190d) Equinox: J2000	Proper Motion RA: -14.046 mas/yr Proper Motion Dec: 13.134 mas/yr Parallax: 0.0020161" Epoch of Position: 2016.0	
Comments: DR3Name Gaia DR3 5271055208803899520 *RAdeg 124.57593675211* *DEdeg -68.31190324582* *Plx 2.0161* *pmRA -14.046* *pmDE 13.134* *Gmag 16.147158* *Teff 4140.3* *2MASS 08181825-6818430* *RAJ2000 124.576056* *DEJ2000 -68.311951* *Jmag 13.844* *Hmag 13.128* *Kmag 12.998* *Category=Star* *Description=[K stars]* *Extended=NO*				

Observation

Proposal 3942, Observation 1

Wed Dec 13 17:01:55 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)	L-98-59	RA: 08 18 7.8865 (124.5328604d) Dec: -68 18 52.08 (-68.31447d) Equinox: J2000	Proper Motion RA: 0.017102549351990327 sec of time/yr Proper Motion Dec: -0.34008400002676353 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 stars]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 ACQ-STAR-FOR-L98-59	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	109288.59

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	3	2822	1	1	2822	10239.571	133350

Special Requirements

Phase 0.9601689082058191 to 0.9786618358001786 with period 2.2531136 Days and zero-phase 2458366.17067 HJD
Time Series Observation
No Parallel Attachments

Observation

Proposal 3942, Observation 2 Wed Dec 13 17:01:55 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Observation 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)	L-98-59	RA: 08 18 7.8865 (124.5328604d) Dec: -68 18 52.08 (-68.31447d) Equinox: J2000	Proper Motion RA: 0.017102549351990327 sec of time/yr Proper Motion Dec: -0.34008400002676353 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 stars]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 ACQ-STAR-FOR-L98-59	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	109288.59

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	3	2822	1	1	2822	10239.571	133350

Special Requirements

Phase 0.9601689082058191 to 0.9786618358001786 with period 2.2531136 Days and zero-phase 2458366.17067 HJD
Time Series Observation
No Parallel Attachments

Observation

Proposal 3942, Observation 3 Wed Dec 13 17:01:55 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Observation 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)	L-98-59	RA: 08 18 7.8865 (124.5328604d) Dec: -68 18 52.08 (-68.31447d) Equinox: J2000	Proper Motion RA: 0.017102549351990327 sec of time/yr Proper Motion Dec: -0.34008400002676353 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 stars]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 ACQ-STAR-FOR-L98-59	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	109288.59

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	3	2822	1	1	2822	10239.571	133350

Special Requirements

Phase 0.9601689082058191 to 0.9786618358001786 with period 2.2531136 Days and zero-phase 2458366.17067 HJD
Time Series Observation
No Parallel Attachments

Observation

Proposal 3942, Observation 4

Wed Dec 13 17:01:55 GMT 2023

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(Observation 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)	L-98-59	RA: 08 18 7.8865 (124.5328604d) Dec: -68 18 52.08 (-68.31447d) Equinox: J2000	Proper Motion RA: 0.017102549351990327 sec of time/yr Proper Motion Dec: -0.34008400002676353 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 stars]

Acquisition

#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	2 ACQ-STAR-FOR-L98-59	WATA	SUB32	F140X	NRSRAPID	3	1	1	0.08	109288.59

Template

Subarray
SUB2048

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSRAPID	3	2822	1	1	2822	10239.571	133350

Special Requirements

Phase 0.9601689082058191 to 0.9786618358001786 with period 2.2531136 Days and zero-phase 2458366.17067 HJD
Time Series Observation
No Parallel Attachments