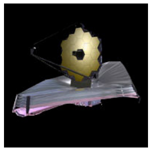

2765 - Contingency exoplanet full-phase transit observations for use during the Artemis 1 mission

Cycle: 1, Proposal Category: SURVEY

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Jeff A. Valenti (PI)	**Space Telescope Science Institute**	**valenti@stsci.edu**
Dr. Nestor Espinoza (CoI)	Space Telescope Science Institute	nespinoza@stsci.edu
Dr. Susan Elizabeth Mullally (CoI)	Space Telescope Science Institute	smullally@stsci.edu
Dr. Klaus M. Pontoppidan (CoI)	Space Telescope Science Institute	pontoppi@stsci.edu
Dr. Massimo Stiavelli (CoI)	Space Telescope Science Institute	mstiavel@stsci.edu

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	TOI-849 b, 1.05 period	NIRSpec Bright Object Time Series	(1) TOI-849
	2	TOI-849 b, 1.57 period	NIRSpec Bright Object Time Series	(1) TOI-849
	3	TOI-849 b, 2.1 period	NIRSpec Bright Object Time Series	(1) TOI-849
	4	TOI-2109 b, 1.05 period	NIRSpec Bright Object Time Series	(2) TOI-2109
	5	TOI-2109 b, 1.57 period	NIRSpec Bright Object Time Series	(2) TOI-2109
	6	TOI-2109 b, 2.1 period	NIRSpec Bright Object Time Series	(2) TOI-2109

ABSTRACT

Contingency science observations with very low data rate (<0.25 MB/s) and no scheduling contraints beyond field of regard. One or more of these observations may prevent idle time during first Artemis mission, when DSN contact time for JWST is quite limited.

OBSERVING DESCRIPTION

We focus on TSO modes with low data rate (subarray using one amplifier per detector, one or two detectors) and no roll constraints (slit). In practice, this means NIRSpec BOTS.

Given the dynamic nature of scheduling during the Artemis mission, period and phase constraints are impractical, so each observation covers at least one full orbit of the exoplanet. Beginning and ending with an eclipse or transit is not practical in this situation, but the data will still provide full phase coverage. Orbital periods longer than 2 days would be impractical from a scheduling perspective.

We found 72 transiting exoplanets with orbital periods less than 2 days that are visible during the nominal Artemis mission. The top two candidates in order of priority are:

TOI-849b (P=0.766 day): Hot Neptune in the "Neptune desert" thought to be the remnant of a giant planetary core (https://arxiv.org/abs/2003.10314). Terrestrial density suggests an atmosphere enriched in volatiles, not made of H/He. We typically think of secondary atmospheres as happening in terrestial planets, but it also likely happens in this more massive planet. This regime has not been studied before. It's such an unknown regime, that no one has published atmospheric models/predictions for this planet. High risk, high reward observation. J = 10.832, so just faint enough to use NIRSpec/Prism without saturating in the second group. Target is visible until Sep 9.

TOI-2109b (P=0.672 day): Massive ultra-hot Jupiter that is among the top emission spectroscopy objects.The nightside flux should give a beautiful set of features, from H2O everywehre to CO (https://arxiv.org/pdf/2111.12074.pdf, Fig 16). One of the best (if not the best) candidate to search for atmospheric variability. J=9.4, so bright enough to saturate NIRSpec/Prism in the second group, so use NIRSpec/G395H to map CO emission variations on the night side of the planet. Very like to yield seminal papers. Target is visible until Sep 7.

Proposal 2765 - Targets - Contingency exoplanet full-phase transit observations for use during the Artemis 1 mission

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TOI-849	RA: 01 54 51.7910 (28.7157958d) Dec: -29 25 18.15 (-29.42171d) Equinox: J2000	Proper Motion RA: 0.005607934598461512 sec of time/yr Proper Motion Dec: 0.020486 arcsec/yr Epoch of Position: 2015.5	
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Exoplanets, G dwarfs]				
(2)	TOI-2109	RA: 16 52 44.7110 (253.1862958d) Dec: +16 34 47.69 (16.57991d) Equinox: J2000	Proper Motion RA: -8.314 mas/yr Proper Motion Dec: -9.351 mas/yr Parallax: 0.0037367" Epoch of Position: 2016.0	
Comments: Data for Gaia DR3 4558177980124887936 from Vizier I/355/gaiadr3. Category=Star Description=[Exoplanets, F dwarfs] Extended=NO				
(3)	TA-STAR-FOR-TOI-2109	RA: 16 52 42.8300 (253.1784583d) Dec: +16 35 6.92 (16.58526d) Equinox: J2000	Proper Motion RA: -1.802 mas/yr Proper Motion Dec: -0.377 mas/yr Parallax: 0.0014690" Epoch of Position: 2016.0	
Comments: Data for Gaia DR3 4558178186282579328 from Vizier I/355/gaiadr3. Category=Star Description=[G stars]				

Observation

Proposal 2765, Observation 1: TOI-849 b, 1.05 period

Tue Aug 30 15:02:39 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Comments: For TA exposure, ETC reports: Partial saturation: There are 1 pixels saturated at the end of a ramp. Partial ramps may still be used in some cases. For science, ETC reports group 3 is saturated from 1-1.5 microns, but group 2 is not, so we can still measure the count rate.

Diagnostics

(TOI-849 b, 1.05 period (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-849	RA: 01 54 51.7910 (28.7157958d) Dec: -29 25 18.15 (-29.42171d) Equinox: J2000	Proper Motion RA: 0.005607934598461512 sec of time/yr Proper Motion Dec: 0.020486 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanets, G dwarfs]

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	120998.2

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	3	37500	2	1	75000	69384.0	120998.1

Special Requirements

Time Series Observation
No Parallel

Observation

Proposal 2765, Observation 2: TOI-849 b, 1.57 period

Tue Aug 30 15:02:39 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Comments: For TA exposure, ETC reports: Partial saturation: There are 1 pixels saturated at the end of a ramp. Partial ramps may still be used in some cases.
For science, ETC reports group 3 is saturated from 1-1.5 microns, but group 2 is not, so we can still measure the count rate.

Diagnostics

(TOI-849 b, 1.57 period (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-849	RA: 01 54 51.7910 (28.7157958d) Dec: -29 25 18.15 (-29.42171d) Equinox: J2000	Proper Motion RA: 0.005607934598461512 sec of time/yr Proper Motion Dec: 0.020486 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanets, G dwarfs]

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	120998.2

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	3	37500	3	1	112500	104076.0	120998.1

Special Requirements

Time Series Observation
No Parallel

Observation

Proposal 2765, Observation 3: TOI-849 b, 2.1 period Tue Aug 30 15:02:39 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Comments: For TA exposure, ETC reports: Partial saturation: There are 1 pixels saturated at the end of a ramp. Partial ramps may still be used in some cases.
For science, ETC reports group 3 is saturated from 1-1.5 microns, but group 2 is not, so we can still measure the count rate.

Diagnostics

(TOI-849 b, 2.1 period (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-849	RA: 01 54 51.7910 (28.7157958d) Dec: -29 25 18.15 (-29.42171d) Equinox: J2000	Proper Motion RA: 0.005607934598461512 sec of time/yr Proper Motion Dec: 0.020486 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Exoplanets, G dwarfs]

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	120998.2

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	3	37500	4	1	150000	138768.0	120998.1

Special Requirements

Time Series Observation
No Parallel

Observation

Proposal 2765, Observation 4: TOI-2109 b, 1.05 period

Tue Aug 30 15:02:39 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(TOI-2109 b, 1.05 period (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
(2)	TOI-2109	RA: 16 52 44.7110 (253.1862958d) Dec: +16 34 47.69 (16.57991d) Equinox: J2000	Proper Motion RA: -8.314 mas/yr Proper Motion Dec: -9.351 mas/yr Parallax: 0.0037367" Epoch of Position: 2016.0	

Comments: Data for Gaia DR3 4558177980124887936 from Vizier I/355/gaiadr3.
Category=Star
Description=[Exoplanets, F 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	3 TA-STAR-FOR-TOI-2109	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	121001.2

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	23	2819	1	1	2819	61083.445	121001.1

Special Requirements

Time Series Observation
No Parallel

Observation

Proposal 2765, Observation 5: TOI-2109 b, 1.57 period

Tue Aug 30 15:02:39 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(TOI-2109 b, 1.57 period (Obs 5)) 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 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	TOI-2109	RA: 16 52 44.7110 (253.1862958d) Dec: +16 34 47.69 (16.57991d) Equinox: J2000	Proper Motion RA: -8.314 mas/yr Proper Motion Dec: -9.351 mas/yr Parallax: 0.0037367" Epoch of Position: 2016.0	

Comments: Data for Gaia DR3 4558177980124887936 from Vizier I/355/gaiadr3.
Category=Star
Description=[Exoplanets, F 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	3 TA-STAR-FOR-TOI-2109	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	121001.2

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	23	4214	1	1	4214	91310.975	121001.1

Special Requirements

Time Series Observation
No Parallel

Observation

Proposal 2765, Observation 6: TOI-2109 b, 2.1 period

Tue Aug 30 15:02:39 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec Bright Object Time Series

Diagnostics

(TOI-2109 b, 2.1 period (Obs 6)) 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 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	TOI-2109	RA: 16 52 44.7110 (253.1862958d) Dec: +16 34 47.69 (16.57991d) Equinox: J2000	Proper Motion RA: -8.314 mas/yr Proper Motion Dec: -9.351 mas/yr Parallax: 0.0037367" Epoch of Position: 2016.0	

Comments: Data for Gaia DR3 4558177980124887936 from Vizier I/355/gaiadr3.
Category=Star
Description=[Exoplanets, F 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	3 TA-STAR-FOR-TOI-2109	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	121001.2

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	23	5637	1	1	5637	122145.222	121001.1

Special Requirements

Time Series Observation
No Parallel