



12739 - Science Verification of TSOs with Parallels — TSO

Cycle: 4, Proposal Category: ENG

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Dr. Nestor Espinoza (PI)	Space Telescope Science Institute

OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
Observation Folder				
	1	Transit event	NIRSpec Fixed Slit Spectroscopy	(1) WASP-18

ABSTRACT

In this Science Verification observations, we perform a Time Series Observation (TSO) on WASP-18 b using NIRSpec/G395H in order to measure its transmission spectrum. The objective is to study the stability of this TSO against expectations in the presence of a pure parallel observation (PID 12741), which might inform whether TSOs can be paired up to parallels.

OBSERVING DESCRIPTION

This proposals mimicks the TSO template for NIRSpec/BOTS for G395 H. This 7 groups per integration will go halfway through saturation, which for this instrument/mode and stellar type/magnitude happens at 15 groups. The 2440 integrations are used to cover the transit event, which should last about an hour, and enough out-of-transit baseline to remove systematic trends.

Target acquisition can't be done on the target (too bright), so chose a nearby star from Gaia DR3 with a visit splitting distance of ~40 arcsecs. Star (PSS = 0.999, RUWE = 1.242) is Gaia DR3 4931352153572401152 which has colors (BP-RP = 2.594, G-RP = 1.55, G-J = 4.53) and absolute magnitudes (distance~110.7 pc; $M_{\text{gaia}} = 15.6$) consistent with a very red, faint object. From a color perspective, this points to > 3000 K M-dwarf, but the absolute magnitude is too high. From the analysis made in Sarro et al. (2023; <https://www.aanda.org/articles/aa/pdf/2023/01/aa44507-22.pdf>),

JWST Proposal 12739 (Created: Thursday, May 28, 2026, 4:00:20PM Eastern Standard Time) - Overview

the colors and absolute magnitude are very consistent with a ~ 2300 K ultracool dwarf. Using Phoenix BT-Settl MLT models from Baraffe+2015 in the JWST ETC with $G = 20.82$, we find that for WATA with the F140X filter, and the SUB32 subarray with a NRSRAPIDD6 readout pattern, a single 3-group integration gives SNRs from 114 for a 1500 K L6 substellar object to a SNR of 20.75 for a M2.5 3500 K M-dwarf. For a 2300 K ultracool dwarf, the predicted SNR is 84. All of these are > 20 . So we went with this setup for the TA.

Proposal 12739 - Targets - Science Verification of TSOs with Parallels — TSO

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	WASP-18	RA: 01 37 25.0333 (24.3543054d) Dec: -45 40 40.37 (-45.67788d) Equinox: J2000	Proper Motion RA: 25.404 mas/yr Proper Motion Dec: 20.479 mas/yr Parallax: 0.0081443" Epoch of Position: 2000	
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM. Category=Star Description=[Exoplanet Systems, F dwarfs]				
Fixed Targets	(2)	GaiaDR3-4931352153572401152	RA: 01 37 24.1800 (24.3507500d) Dec: -45 41 5.08 (-45.68474d) Equinox: J2000	Proper Motion RA: 24.375124643169144 mas/yr Proper Motion Dec: 21.592598346180814 mas/yr Parallax: 0.0090323221" Epoch of Position: 2016	
	Comments: Information obtained directly from the Gaia DR3 Archive: https://gea.esac.esa.int/archive/. Gaia DR3 4931352153572401152. Note that Gaia doesn't list a temperature for this (low magnitude) object, but RUWE and colors (BP-RP = 2.59) strongly suggest this is a M3-M4 dwarf. For this TA target, used a BT-Settl model of a M3.5 star with logg = 5 to estimate SNR with the target acq properties in Obs1. This gives a SNR of 111.4 for F140X and SUB2048, NRSRAPID and 3 groups. Category=Star Description=[M dwarfs, M stars] Extended=NO				

Proposal 12739 - Observation 1 - Science Verification of TSOs with Parallels — TSO

Observation	Proposal 12739, Observation 1: Transit event										Thu May 28 21:00:20 GMT 2026	
	Diagnostic Status: Error											
	Observing Template: NIRSpec Fixed Slit Spectroscopy											
Diagnostics	(Transit event (Obs 1)) Error (Form): Exposure Duration: 17727 is too large. It must be <= 10000.0.											
	(Transit event (Obs 1)) Warning (Form): Observers are responsible for checking that target acquisition is feasible.											
	(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)	WASP-18	RA: 01 37 25.0333 (24.3543054d) Dec: -45 40 40.37 (-45.67788d) Equinox: J2000			Proper Motion RA: 25.404 mas/yr Proper Motion Dec: 20.479 mas/yr Parallax: 0.0081443" Epoch of Position: 2000						
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.											
	SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.											
	Category=Star											
	Description=[Exoplanet Systems, F dwarfs]											
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID	
	1	2 GaiaDR3-4931352153572401152	WATA	SUB32	F140X	NRSRAPIDD6	3	1	1	0.26		
Template	HFF Readout Mode			Slit				Subarray				
	false			S1600A1				SUB2048				
Dithers	#	Primary Dither Positions						Sub-Pixel Pattern				
	1	NONE						NONE				
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	G395H/F290LP	S1600A1	NRSRAPID	7	2440	1	NONE	1	2440	17657.011	

Proposal 12739 - Observation 1 - Science Verification of TSOs with Parallels — TSO

Special Requirements	Phase 0.8276740322058967 to 0.8719318982334345 with period 0.94145223 Days and zero-phase 2458501.324483 HJD
----------------------	--