



2589 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Cycle: 1, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

<i>Folder</i>	<i>Observation</i>	<i>Label</i>	<i>Observing Template</i>	<i>Science Target</i>
TRAPPIST-1				
	1	TRAPPIST-1b	NIRISS Single-Object Slitless Spectroscopy	(1) TRAPPIST-1
	2	TRAPPIST-1b	NIRISS Single-Object Slitless Spectroscopy	(1) TRAPPIST-1
	3	TRAPPIST-1c	NIRISS Single-Object Slitless Spectroscopy	(1) TRAPPIST-1
	4	TRAPPIST-1c	NIRISS Single-Object Slitless Spectroscopy	(1) TRAPPIST-1
	5	TRAPPIST-1g	NIRSpec Bright Object Time Series	(1) TRAPPIST-1
	6	TRAPPIST-1g	NIRSpec Bright Object Time Series	(1) TRAPPIST-1

ABSTRACT

We propose a medium, early-release program to secure 8 transits of the Earth-sized exoplanets TRAPPIST-1 (T-1) b, c, g, and h using NIRSpec and NIRISS, that is, 2 transits of each of the planets b and c with NIRISS, and 2 transits of each of the planets g, and h with NIRSpec. We aim to 1) provide the community with the earliest possible data set for the atmospheric reconnaissance of all T-1 planets by complementing the GTO to prepare

JWST Proposal 2589 (Created: Thursday, September 9, 2021 at 1:00:23 PM Eastern Standard Time) - Overview

for a more ambitious legacy T-1 program, 2) characterize and assess the level of stellar contamination caused by the transit light source effect associated with unocculted spots, and 3) quantitatively compare the performance of NIRSpec and NIRISS for relatively faint targets like T-1. Considering state-of-the-art atmospheric models of T-1 planets, the proposed observations should detect/rule out several baseline model atmospheres for all planets and may enable the detection of CO₂ and H₂O on T-1b and c and CO₂ and O₃ on T-1g and h, given some specific atmospheric compositions. The wavelength coverage of NIRISS and NIRSpec can determine the nature of the stellar contamination if present (cold/hot spots). We will also take advantage of NIRISS' higher spectral resolution (and non-saturation) to probe temperature-sensitive stellar lines to further quantify the nature and level of contamination. The two-instrument strategy will provide a balanced data set of the T-1 planets to assess the relative performance of both instruments in terms of non-linearity, intra-pixel sensitivity, and slit loss/finite subarray effects. No proprietary period is requested for this program, the bulk of which can be scheduled early in Cycle 1.

OBSERVING DESCRIPTION

We propose to observe the following events.

2 transits of TRAPPIST-1b (4.39 h/visit) with NIRISS SOSS, substrip 256, readout mode NISRAPID, Ngroup = 24, Nint = 115

2 transits of TRAPPIST-1c (4.62 h/visit) with NIRISS SOSS, substrip 256, readout mode NISRAPID, Ngroup = 24, Nint = 121

2 transits of TRAPPIST-1g (4.95 h/visit) with NIRSpec BOTS Prism/Clear, subarray 512, readout mode NRSRAPID, Ngroup = 6, Nint = 11117

2 transits of TRAPPIST-1h (5.09 h/visit) with NIRSpec BOTS Prism/Clear, subarray 512, readout mode NRSRAPID, Ngroup = 6, Nint = 11417

Special requirements:

- For all observations:

-- All observations are transits, and are thus time series observations that require No Parallel. We also provide the timing requirement "phase" for each planet, based on the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour.

- For NIRISS observations:

-- For the special requirements "Aperture PA range", we used the ExoCTK Contamination & Visibility Calculator and constrained the PA to have 0% contamination in orders 1 and 2. We only provided PA ranges where the target is visible. In some cases, the PA range that we provided slightly

exceeds (by ~1 degree) the target visibility range. We do this to avoid further constraining the overall visibility range; in the end, observations will only be possible at the *intersection* of all constraints and therefore our ~1 degree excess will not count as a visible range.

Comments:

- For all observations:

-- For the special requirement "phase", the zero-phase may have to be adjusted depending on the year and month when the observations will be scheduled. This is because TRAPPIST-1 planets interact with each other and thus induce transit timing variations. These variations have an amplitude of ~10-75 minutes over a year, depending on the planet, but over the very short observability windows of TRAPPIST-1 in October-December and in June-July, those transit timing variations are smaller. We used the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour.

-- Some transits may have to be avoided due to a simultaneous transit of another planet in the system. We can compute when these types of events are expected to occur and provide a list of transits to avoid.

- For NIRSpec observations:

-- The Target Acquisition partially saturates 1 pixel. This pixel saturates after 2 groups while the TA records 3 groups. We expect this partial saturation not to affect the TA too much; it should not change the centroid.

-- The Science observations partially saturate 39 pixels. The goal of using Ngroup=6 is to increase the precision of the transit spectrum. This is explained in Batalha et al. (2018) and in the scientific justification.

- For NIRISS observations:

-- For each observation, we programmed an F277W exposure to isolate order 1. We used the same number of groups per integration as for the GR700XD/Clear exposure and 10 integrations, following JDox recommendations. We linked an ETC Workbook calculation although that calculation is with the Clear filter: JDox says the SNR for the F277W filter can be estimated from that of the Clear filter as $SNR_{F277W} = 0.95 SNR_{Clear}$.

Proposal 2589 - Targets - Atmospheric reconnaissance of the TRAPPIST-1 planets

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	TRAPPIST-1	RA: 23 06 30.3341 (346.6263921d)	Proper Motion RA: 0.062299806210057845 sec of time/yr	
			Dec: -05 02 36.46 (-5.04346d)	Proper Motion Dec: -0.479402999985723 arcsec/yr	
			Equinox: J2000	Epoch of Position: 2015.5	
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Exoplanet Systems, M dwarfs] Extended=NO				

Proposal 2589 - Observation 1 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Observation	Proposal 2589, Observation 1: TRAPPIST-1b							Thu Sep 09 18:00:23 GMT 2021		
	Diagnostic Status: Warning									
	Observing Template: NIRISS Single-Object Slitless Spectroscopy									
	Comments: We programmed an F277W exposure to isolate order 1. We used the same number of groups per integration as for the GR700XD/Clear exposure and 10 integrations, following JDox recommendations. We linked an ETC Workbook calculation although that calculation is with the Clear filter: JDox says the SNR for the F277W filter can be estimated from that of the Clear filter as SNR_F277W = 0.95 SNR_Clear.									
	For the special requirement "phase", the zero-phase may have to be adjusted depending on the year and month in which the observations will be scheduled. This is because TRAPPIST-1 planets interact with each other and thus induce transit timing variations. These variations have an amplitude of ~10-75 minutes over a year, depending on the planet, but over the very short observability windows of TRAPPIST-1 in Oct-Dec and in Jun-Jul, those transit timing variations are smaller. We used the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour.									
Diagnostics	Some transits may have to be avoided due to a simultaneous transit of another planet in the system. We can compute when these types of events are expected to occur and provide a list of transits to avoid.									
	For the special requirements "Aperture PA range", we used the ExoCTK Contamination & Visibility Calculator and constrained the PA to have 0% contamination in orders 1 and 2. We only provided PA ranges where the target is visible. In some cases, the PA range that we provided slightly exceeds (by ~1 degree) the target visibility range. We do this to avoid further constraining the overall visibility range; in the end, observations will only be possible at the *intersection* of all constraints and therefore our ~1 degree excess will not count as a visible range.									
	(TRAPPIST-1b (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.									
	(Exposure) 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)	TRAPPIST-1	RA: 23 06 30.3341 (346.6263921d) Dec: -05 02 36.46 (-5.04346d) Equinox: J2000		Proper Motion RA: 0.062299806210057845 sec of time/yr Proper Motion Dec: -0.479402999985723 arcsec/yr Epoch of Position: 2015.5					
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=Star Description=[Exoplanet Systems, M dwarfs] Extended=NO									
Acquisition	#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	SAME	SOSSFAINT	F480M	NISRAPID	19	1	1	1.024	87242.2
Template	Subarray					Include F277W Exposure?				
	SUBSTRIP256					true				
Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID		
	1	NISRAPID	18	153	1	153	15974.191	87242.1		
	2	NISRAPID	18	10	1	10	1044.065	87242.17		

Proposal 2589 - Observation 1 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Special Requirements

Between Dates 14-JUL-2022:01:12:41 and 14-JUL-2022:02:12:41
Between Dates 15-JUL-2022:13:28:01 and 15-JUL-2022:14:28:01
Between Dates 17-JUL-2022:01:43:33 and 17-JUL-2022:02:43:33
Between Dates 18-JUL-2022:14:00:06 and 18-JUL-2022:15:00:06
Between Dates 20-JUL-2022:02:15:42 and 20-JUL-2022:03:15:42
Between Dates 21-JUL-2022:14:31:03 and 21-JUL-2022:15:31:03
Between Dates 23-JUL-2022:02:46:35 and 23-JUL-2022:03:46:35
Aperture PA Range 239.5 to 241 Degrees (V3 238.93012982 to 240.43012982)
Time Series Observation
No Parallel

Proposal 2589 - Observation 2 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Observation	Proposal 2589, Observation 2: TRAPPIST-1b						Thu Sep 09 18:00:23 GMT 2021			
	Diagnostic Status: Warning									
	Observing Template: NIRISS Single-Object Slitless Spectroscopy									
	Comments: We programmed an F277W exposure to isolate order 1. We used the same number of groups per integration as for the GR700XD/Clear exposure and 10 integrations, following JDox recommendations. We linked an ETC Workbook calculation although that calculation is with the Clear filter: JDox says the SNR for the F277W filter can be estimated from that of the Clear filter as $SNR_{F277W} = 0.95 SNR_{Clear}$.									
	For the special requirement "phase", the zero-phase may have to be adjusted depending on the year and month in which the observations will be scheduled. This is because TRAPPIST-1 planets interact with each other and thus induce transit timing variations. These variations have an amplitude of ~10-75 minutes over a year, depending on the planet, but over the very short observability windows of TRAPPIST-1 in Oct-Dec and in Jun-Jul, those transit timing variations are smaller. We used the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour.									
Diagnostics	Some transits may have to be avoided due to a simultaneous transit of another planet in the system. We can compute when these types of events are expected to occur and provide a list of transits to avoid.									
	For the special requirements "Aperture PA range", we used the ExoCTK Contamination & Visibility Calculator and constrained the PA to have 0% contamination in orders 1 and 2. We only provided PA ranges where the target is visible. In some cases, the PA range that we provided slightly exceeds (by ~1 degree) the target visibility range. We do this to avoid further constraining the overall visibility range; in the end, observations will only be possible at the *intersection* of all constraints and therefore our ~1 degree excess will not count as a visible range.									
	(TRAPPIST-1b (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.									
	(Exposure) 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)	TRAPPIST-1	RA: 23 06 30.3341 (346.6263921d) Dec: -05 02 36.46 (-5.04346d) Equinox: J2000		Proper Motion RA: 0.062299806210057845 sec of time/yr Proper Motion Dec: -0.479402999985723 arcsec/yr Epoch of Position: 2015.5					
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=Star									
	Description=[Exoplanet Systems, M dwarfs] Extended=NO									
Acquisition	#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	SAME	SOSSFAINT	F480M	NISRAPID	19	1	1	1.024	87242.2
Template	Subarray					Include F277W Exposure?				
	SUBSTRIP256					true				
Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID		
	1	NISRAPID	18	153	1	153	15974.191	87242.1		
	2	NISRAPID	18	10	1	10	1044.065	87242.17		

Proposal 2589 - Observation 2 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Special Requirements

Between Dates 14-JUL-2022:01:12:41 and 14-JUL-2022:02:12:41
Between Dates 15-JUL-2022:13:28:01 and 15-JUL-2022:14:28:01
Between Dates 17-JUL-2022:01:43:33 and 17-JUL-2022:02:43:33
Between Dates 18-JUL-2022:14:00:06 and 18-JUL-2022:15:00:06
Between Dates 20-JUL-2022:02:15:42 and 20-JUL-2022:03:15:42
Between Dates 21-JUL-2022:14:31:03 and 21-JUL-2022:15:31:03
Between Dates 23-JUL-2022:02:46:35 and 23-JUL-2022:03:46:35
Aperture PA Range 239.5 to 241 Degrees (V3 238.93012982 to 240.43012982)
Time Series Observation
No Parallel

Proposal 2589 - Observation 3 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Observation	Proposal 2589, Observation 3: TRAPPIST-1c									Thu Sep 09 18:00:23 GMT 2021
	Diagnostic Status: Warning									
	Observing Template: NIRISS Single-Object Slitless Spectroscopy									
	Comments: We programmed an F277W exposure to isolate order 1. We used the same number of groups per integration as for the GR700XD/Clear exposure and 10 integrations, following JDox recommendations. We linked an ETC Workbook calculation although that calculation is with the Clear filter: JDox says the SNR for the F277W filter can be estimated from that of the Clear filter as SNR_F277W = 0.95 SNR_Clear.									
	For the special requirement "phase", the zero-phase may have to be adjusted depending on the year and month in which the observations will be scheduled. This is because TRAPPIST-1 planets interact with each other and thus induce transit timing variations. These variations have an amplitude of ~10-75 minutes over a year, depending on the planet, but over the very short observability windows of TRAPPIST-1 in Oct-Dec and in Jun-Jul, those transit timing variations are smaller. We used the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour.									
Diagnostics	Some transits may have to be avoided due to a simultaneous transit of another planet in the system. We can compute when these types of events are expected to occur and provide a list of transits to avoid.									
	For the special requirements "Aperture PA range", we used the ExoCTK Contamination & Visibility Calculator and constrained the PA to have 0% contamination in orders 1 and 2. We only provided PA ranges where the target is visible. In some cases, the PA range that we provided slightly exceeds (by ~1 degree) the target visibility range. We do this to avoid further constraining the overall visibility range; in the end, observations will only be possible at the *intersection* of all constraints and therefore our ~1 degree excess will not count as a visible range.									
	(TRAPPIST-1c (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.									
	(Exposure) 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)	TRAPPIST-1	RA: 23 06 30.3341 (346.6263921d) Dec: -05 02 36.46 (-5.04346d) Equinox: J2000			Proper Motion RA: 0.062299806210057845 sec of time/yr Proper Motion Dec: -0.479402999985723 arcsec/yr Epoch of Position: 2015.5				
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=Star									
	Description=[Exoplanet Systems, M dwarfs] Extended=NO									
Acquisition	#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	SAME	SOSSFAINT	F480M	NISRAPID	19	1	1	1.024	87242.8
Template	Subarray					Include F277W Exposure?				
	SUBSTRIP256					true				
Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID		
	1	NISRAPID	18	159	1	159	16600.63	87242.3		
	2	NISRAPID	18	10	1	10	1044.065	87242.17		

Proposal 2589 - Observation 3 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Special Requirements

Between Dates 14-JUL-2022:05:07:55 and 14-JUL-2022:06:07:55
Between Dates 16-JUL-2022:15:15:31 and 16-JUL-2022:16:15:31
Between Dates 21-JUL-2022:11:29:16 and 21-JUL-2022:12:29:16
Between Dates 23-JUL-2022:21:36:59 and 23-JUL-2022:22:36:59
Between Dates 26-JUL-2022:07:44:48 and 26-JUL-2022:08:44:48
Aperture PA Range 239.5 to 242 Degrees (V3 238.93012982 to 241.43012982)
Time Series Observation
No Parallel

Proposal 2589 - Observation 4 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Proposal 2589, Observation 4: TRAPPIST-1c										Thu Sep 09 18:00:23 GMT 2021
Observation	Diagnostic Status: Warning									
	Observing Template: NIRISS Single-Object Slitless Spectroscopy									
	Comments: We programmed an F277W exposure to isolate order 1. We used the same number of groups per integration as for the GR700XD/Clear exposure and 10 integrations, following JDox recommendations. We linked an ETC Workbook calculation although that calculation is with the Clear filter: JDox says the SNR for the F277W filter can be estimated from that of the Clear filter as SNR_F277W = 0.95 SNR_Clear.									
	For the special requirement "phase", the zero-phase may have to be adjusted depending on the year and month in which the observations will be scheduled. This is because TRAPPIST-1 planets interact with each other and thus induce transit timing variations. These variations have an amplitude of ~10-75 minutes over a year, depending on the planet, but over the very short observability windows of TRAPPIST-1 in Oct-Dec and in Jun-Jul, those transit timing variations are smaller. We used the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour.									
Some transits may have to be avoided due to a simultaneous transit of another planet in the system. We can compute when these types of events are expected to occur and provide a list of transits to avoid.										
For the special requirements "Aperture PA range", we used the ExoCTK Contamination & Visibility Calculator and constrained the PA to have 0% contamination in orders 1 and 2. We only provided PA ranges where the target is visible. In some cases, the PA range that we provided slightly exceeds (by ~1 degree) the target visibility range. We do this to avoid further constraining the overall visibility range; in the end, observations will only be possible at the *intersection* of all constraints and therefore our ~1 degree excess will not count as a visible range.										
Diagnostics	(TRAPPIST-1c (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.									
	(Exposure) 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)	TRAPPIST-1	RA: 23 06 30.3341 (346.6263921d) Dec: -05 02 36.46 (-5.04346d) Equinox: J2000		Proper Motion RA: 0.062299806210057845 sec of time/yr Proper Motion Dec: -0.479402999985723 arcsec/yr Epoch of Position: 2015.5					
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Exoplanet Systems, M dwarfs] Extended=NO										
Acquisition	#	Target	Acquisition Mode	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
	1	SAME	SOSSFAINT	F480M	NISRAPID	19	1	1	1.024	87242.8
Template	Subarray					Include F277W Exposure?				
	SUBSTRIP256					true				
Spectral Elements	#	Readout Pattern	Groups/Int	Integrations/Exp	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID		
	1	NISRAPID	18	159	1	159	16600.63	87242.3		
	2	NISRAPID	18	10	1	10	1044.065	87242.17		

Proposal 2589 - Observation 4 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Special Requirements	Between Dates 14-JUL-2022:05:07:55 and 14-JUL-2022:06:07:55 Between Dates 16-JUL-2022:15:15:31 and 16-JUL-2022:16:15:31 Between Dates 21-JUL-2022:11:29:16 and 21-JUL-2022:12:29:16 Between Dates 23-JUL-2022:21:36:59 and 23-JUL-2022:22:36:59 Between Dates 26-JUL-2022:07:44:48 and 26-JUL-2022:08:44:48 Aperture PA Range 239.5 to 242 Degrees (V3 238.93012982 to 241.43012982) Time Series Observation No Parallel
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Proposal 2589 - Observation 5 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Observation	Proposal 2589, Observation 5: TRAPPIST-1g										Thu Sep 09 18:00:23 GMT 2021
	Diagnostic Status: Warning										
	Observing Template: NIRSpec Bright Object Time Series										
	Comments: The Target Acquisition partially saturates 1 pixel. This pixel saturates after 2 groups while the TA records 3 groups. We expect this partial saturation not to affect the TA too much; it should not change the centroid. The Science observations partially saturate 39 pixels. The goal of using Ngroup=6 is to increase the precision of the transit spectrum. This is explained in Batalha et al. (2018) and in the scientific justification. For the special requirement "phase", the zero-phase may have to be adjusted depending on the year and month in which the observations will be scheduled. This is because TRAPPIST-1 planets interact with each other and thus induce transit timing variations. These variations have an amplitude of ~10-75 minutes over a year, depending on the planet, but over the very short observability windows of TRAPPIST-1 in Oct-Dec and in Jun-Jul, those transit timing variations are smaller. We used the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour. Some transits may have to be avoided due to a simultaneous transit of another planet in the system. We can compute when these types of events are expected to occur and provide a list of transits to avoid.										
Diagnostics	(TRAPPIST-1g (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		
	(1)	TRAPPIST-1	RA: 23 06 30.3341 (346.6263921d) Dec: -05 02 36.46 (-5.04346d) Equinox: J2000			Proper Motion RA: 0.062299806210057845 sec of time/yr Proper Motion Dec: -0.479402999985723 arcsec/yr Epoch of Position: 2015.5					
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Exoplanet Systems, M 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	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	87242.12
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	6	11117	1	1	11117	17827.221	87242.11	

Proposal 2589 - Observation 5 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Special Requirements

Between Dates 28-MAY-2022:18:43:39 and 28-MAY-2022:19:43:39
Between Dates 10-JUN-2022:03:15:39 and 10-JUN-2022:04:15:39
Between Dates 04-JUL-2022:20:09:33 and 04-JUL-2022:21:09:33
Between Dates 17-JUL-2022:04:41:12 and 17-JUL-2022:05:41:12
Between Dates 29-JUL-2022:12:57:50 and 29-JUL-2022:13:57:50
Between Dates 11-OCT-2022:15:33:42 and 11-OCT-2022:16:33:42
Between Dates 05-NOV-2022:08:36:40 and 05-NOV-2022:09:36:40
Between Dates 12-DEC-2022:09:55:32 and 12-DEC-2022:10:55:32
Between Dates 24-DEC-2022:18:14:59 and 24-DEC-2022:19:14:59
Time Series Observation
No Parallel

Proposal 2589 - Observation 6 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Observation	Proposal 2589, Observation 6: TRAPPIST-1g										Thu Sep 09 18:00:23 GMT 2021
	Diagnostic Status: Warning										
	Observing Template: NIRSpec Bright Object Time Series										
	Comments: The Target Acquisition partially saturates 1 pixel. This pixel saturates after 2 groups while the TA records 3 groups. We expect this partial saturation not to affect the TA too much; it should not change the centroid. The Science observations partially saturate 39 pixels. The goal of using Ngroup=6 is to increase the precision of the transit spectrum. This is explained in Batalha et al. (2018) and in the scientific justification. For the special requirement "phase", the zero-phase may have to be adjusted depending on the year and month in which the observations will be scheduled. This is because TRAPPIST-1 planets interact with each other and thus induce transit timing variations. These variations have an amplitude of ~10-75 minutes over a year, depending on the planet, but over the very short observability windows of TRAPPIST-1 in Oct-Dec and in Jun-Jul, those transit timing variations are smaller. We used the parameters given by the ExoCTK Phase Constraint Calculator, with planetary parameters from Agol et al. (2020) and the default window size of 1 hour. Some transits may have to be avoided due to a simultaneous transit of another planet in the system. We can compute when these types of events are expected to occur and provide a list of transits to avoid.										
Diagnostics	(TRAPPIST-1g (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		
	(1)	TRAPPIST-1	RA: 23 06 30.3341 (346.6263921d) Dec: -05 02 36.46 (-5.04346d) Equinox: J2000			Proper Motion RA: 0.062299806210057845 sec of time/yr Proper Motion Dec: -0.479402999985723 arcsec/yr Epoch of Position: 2015.5					
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.This object was generated by the targetselector and retrieved from the SIMBAD database. Category=Star Description=[Exoplanet Systems, M 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	SAME	WATA	SUB32	F110W	NRSRAPID	3	1	1	0.08	87242.12
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	6	11117	1	1	11117	17827.221	87242.11	

Proposal 2589 - Observation 6 - Atmospheric reconnaissance of the TRAPPIST-1 planets

Special Requirements

Between Dates 28-MAY-2022:18:43:39 and 28-MAY-2022:19:43:39
Between Dates 10-JUN-2022:03:15:39 and 10-JUN-2022:04:15:39
Between Dates 04-JUL-2022:20:09:33 and 04-JUL-2022:21:09:33
Between Dates 17-JUL-2022:04:41:12 and 17-JUL-2022:05:41:12
Between Dates 29-JUL-2022:12:57:50 and 29-JUL-2022:13:57:50
Between Dates 11-OCT-2022:15:33:42 and 11-OCT-2022:16:33:42
Between Dates 05-NOV-2022:08:36:40 and 05-NOV-2022:09:36:40
Between Dates 12-DEC-2022:09:55:32 and 12-DEC-2022:10:55:32
Between Dates 24-DEC-2022:18:14:59 and 24-DEC-2022:19:14:59
Time Series Observation
No Parallel