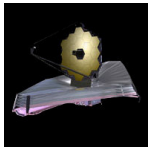

1270 - Characterizing the TWA 27 system

Cycle: 1, Proposal Category: GTO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	TWA-27-MIRI-MRS	MIRI Medium Resolution Spectroscopy	(2) TWA-27-AB
	2	TWA-27-MIRI-Imaging	MIRI Imaging	(1) TWA-27
	3	TWA-27	NIRSpec IFU Spectroscopy	(2) TWA-27-AB
	4	TWA-28	NIRSpec IFU Spectroscopy	(3) TWA-28

ABSTRACT

TWA 27 (2MASSW J1207334-393254, 2M1207) is a brown dwarf that is being orbited by a giant planet candiate (2M1207b) with an apparent separation of about 0.77 arcsec. In this program, we will characterize the TWA 27 system and planet candidate.

The observations in this proposal correspond to the following GTO observation IDs:
Observations 1 and 2: WRIGHT_0001 and WRIGHT_0002
Observations 3 and 4: FERRUIT_5501 and FERRUIT_5502

Time charged to

WRIGHT: 2.33 hours
FERRUIT: 6.02 hours

OBSERVING DESCRIPTION

NIRSpec:
Although NIRSpec has an oversized fixed slit that is optimized for high contrast transit observations, it does not have a coronagraph. In this project, we will explore the practicality of obtaining spectroscopy of a directly imaged exoplanet (TWA-27b) with the NIRSpec IFU. Data will be taken with the three high resolution gratings (G140H/F100LP, G235H/F170LP, and G395H/F290LP) in order to obtain a continous spectrum/data cube from ~1.0 through 5.2 microns. In order to be able to subtract the signal of the bright host star (TWA-27), we will observe a nearby reference target of similar brightness and spectral type (TWA-28). Alternatively, we could explore the possibility to perform observations at a different roll angle in order to substract out the host star.

MIRI:
We plan to characterise spectroscopically in the MIRI wavelength range both the brown dwarf and its low mass companion. Given that it is not schedulable to have both the star and its companion aligned in the LRS slit, we will use MRS observations. We will use a 4 point dither to well sampling the PSF at short wavelengths. To remove the contribution of the host star and get the companion spectrum, we will use the signal from the star itself (part without companion contribution extrapolated to the part with companion contribution; the extrapolation will be done with or without the use of a PSF reference star, which for example could be taken from our MIRi brown dwarf program). We have chosen not to use coronagraphic observations because the contrast between the companion and the star is relatively low (a factor 10). In addition, we plan to perform an imaging observation with the F1500W filter to get a better S/N and to put constraints on possible other companions in the field.

Scientific justification for the 'non-interruptible sequence':
We are aiming to get spectra of TWA-27 and its planetary mass companion from 1 through 28 micron using the NIRSpec and MIRI IFUs. Because these kind of objects can show variability over time (see e.g. Zhou et al. 2019), the NIRSpec and MIRI observations should be as close as possible in time in order to ensure that spectra can be 'stitched together' in an optimal way. We use a non-interruptible group/sequence special requirement to achieve that.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TWA-27	RA: 12 07 33.3790 (181.8890792d) Dec: -39 32 54.40 (-39.54844d) Equinox: J2000	Proper Motion RA: -64.040 mas/yr Proper Motion Dec: -23.678 mas/yr Parallax: 0.0154624" Epoch of Position: 2016.0	
Comments: 30 Nov 2022: Updated using Gaia DR3 coordinates and proper motion with 2016 Epoch *J 12.995 [0.026] C 2003yCat.2246....0C* *H 12.388 [0.027] C 2003yCat.2246....0C* *K 11.945 [0.026] C 2003yCat.2246....0C* *M8Ve C* *Category=Star* *Description=[Exoplanets, M dwarfs]* *Extended=NO*				
(2)	TWA-27-AB	RA: 12 07 33.3950 (181.8891458d) Dec: -39 32 54.61 (-39.54850d) Equinox: J2000	Proper Motion RA: -64.040 mas/yr Proper Motion Dec: -23.678 mas/yr Parallax: 0.0154624" Epoch of Position: 2016.0	
Comments: 30 Nov 2022: Updated coordinates for Gaia DR3 of TWA-27, still keeping the delta from 27A as before (see below). Epoch 2016. Changed EXTENDED field to NO from UNKNOWN. *Position intermediate between TWA 27 and its low companion located 770 mas from the BD and at position angle of 135.5.* *Centering on this position is needed to have both objects in the fieldwhen dithering* *Category=Star* *Description=[Brown dwarfs, M dwarfs]* *Extended=NO*				
(3)	TWA-28	RA: 11 02 9.7479 (165.5406162d) Dec: -34 30 35.79 (-34.50994d) Equinox: J2000	Proper Motion RA: -69.490 mas/yr Proper Motion Dec: -14.521 mas/yr Parallax: 0.0168794" Epoch of Position: 2016.0	
Comments: 30 Nov 2022: Updated using Gaia DR3 coordinates and proper motion with 2016 Epoch *J 13.034 [0.024] C 2003yCat.2246....0C* *H 12.356 [0.022] C 2003yCat.2246....0C* *K 11.887 [0.024] C 2003yCat.2246....0C* *M8.5p D* *Category=Star* *Description=[M dwarfs]* *Extended=NO*				

Observation

Proposal 1270, Observation 1: TWA-27-MIRI-MRS Wed Dec 21 21:00:28 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(TWA-27-MIRI-MRS (Obs 1)) Warning (Form): Imager Filter overlap.

(TWA-27-MIRI-MRS (Obs 1)) Warning (Form): Imager Filter overlap.

(TWA-27-MIRI-MRS (Obs 1)) Warning (Form): Imager Filter overlap.

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	TWA-27-AB	RA: 12 07 33.3950 (181.8891458d)	Proper Motion RA: -64.040 mas/yr	
		Dec: -39 32 54.61 (-39.54850d)	Proper Motion Dec: -23.678 mas/yr	
		Equinox: J2000	Parallax: 0.0154624"	
			Epoch of Position: 2016.0	

Comments: 30 Nov 2022: Updated coordinates for Gaia DR3 of TWA-27, still keeping the delta from 27A as before (see below). Epoch 2016. Changed EXTENDED field to NO from UNKNOWN.
Position intermediate between TWA 27 and its low companion located 770 mas from the BD and at position angle of 135.5.
Centering on this position is needed to have both objects in the fieldwhen dithering
Category=Star
Description=[Brown dwarfs, M dwarfs]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray
F1000W	ALL	YES	FULL

Dithers

#	Dither Type	Optimized For	Direction
1	4-Point	EXTENDED SOURCE	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1		IMAGER	F1280W	FASTR1	11	6	1	Dither 1	4	24	788.111	
1	SHORT(A)	MRSLONG		FASTR1	76	1	1	Dither 1	4	4	843.612	25095.3
1	SHORT(A)	MRSSHORT		FASTR1	76	1	1	Dither 1	4	4	843.612	25095.1
2		IMAGER	F1280W	FASTR1	11	6	1	Dither 1	4	24	788.111	
2	MEDIUM(B)	MRSLONG		FASTR1	76	1	1	Dither 1	4	4	843.612	25095.11
2	MEDIUM(B)	MRSSHORT		FASTR1	76	1	1	Dither 1	4	4	843.612	25095.9
3		IMAGER	F1280W	FASTR1	11	6	1	Dither 1	4	24	788.111	
3	LONG(C)	MRSLONG		FASTR1	76	1	1	Dither 1	4	4	843.612	25095.7
3	LONG(C)	MRSSHORT		FASTR1	76	1	1	Dither 1	4	4	843.612	25095.5

Special Requirements	Group Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 1270, Observation 2: TWA-27-MIRI-Imaging Wed Dec 21 21:00:28 GMT 2022

Diagnostic Status: Warning

Observing Template: MIRI Imaging

Diagnostics

(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)	TWA-27	RA: 12 07 33.3790 (181.8890792d)	Proper Motion RA: -64.040 mas/yr	
		Dec: -39 32 54.40 (-39.54844d)	Proper Motion Dec: -23.678 mas/yr	
		Equinox: J2000	Parallax: 0.0154624"	
			Epoch of Position: 2016.0	

Comments: 30 Nov 2022: Updated using Gaia DR3 coordinates and proper motion with 2016 Epoch
J 12.995 [0.026] C 2003yCat.2246....0C
H 12.388 [0.027] C 2003yCat.2246....0C
K 11.945 [0.026] C 2003yCat.2246....0C
M8Ve C
Category=Star
Description=[Exoplanets, M dwarfs]
Extended=NO

Template

Subarray
FULL

Dithers

#	Dither Type	Starting Point	Number of Points	Points	Starting Set	Number of Sets	Optimized For	Direction	Pattern Size
1	4-Point-Sets				5	1	EXTENDED SOURCE	POSITIVE	DEFAULT

Spectral Elements

#	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	F1500W	FASTR1	9	1	1	Dither 1	4	4	99.901	25095.13
2	F1000W	FASTR1	5	2	1	Dither 1	4	8	122.102	25095.15

Special Requirements	Group Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 1270, Observation 3: TWA-27 Wed Dec 21 21:00:28 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: PA constraints are to avoid bright sources in MSA field of view.

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(2)	TWA-27-AB	RA: 12 07 33.3950 (181.8891458d)	Proper Motion RA: -64.040 mas/yr	
		Dec: -39 32 54.61 (-39.54850d)	Proper Motion Dec: -23.678 mas/yr	
		Equinox: J2000	Parallax: 0.0154624"	
			Epoch of Position: 2016.0	

Comments: 30 Nov 2022: Updated coordinates for Gaia DR3 of TWA-27, still keeping the delta from 27A as before (see below). Epoch 2016. Changed EXTENDED field to NO from UNKNOWN.
Position intermediate between TWA 27 and its low companion located 770 mas from the BD and at position angle of 135.5.
Centering on this position is needed to have both objects in the fieldwhen dithering
Category=Star
Description=[Brown dwarfs, M dwarfs]
Extended=NO

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSIRS2RAPID	32	1	false	true	NONE	4	4	1925.733	
2	G235H/F170LP	NRSIRS2RAPID	31	1	false	true	NONE	4	4	1867.378	
3	G140H/F100LP	NRSIRS2RAPID	32	1	false	true	NONE	4	4	1925.733	

Special Requirements	
	Aperture PA Range 68.892975 to 128.892975 Degrees (V3 289.92044082 to 349.92044082) Aperture PA Range 210.892975 to 224.892975 Degrees (V3 71.92044082 to 85.92044082) Aperture PA Range 243.892975 to 256.892975 Degrees (V3 104.92044082 to 117.92044082) Group Observations 1, 2, 3, 4, Non-interruptible

Observation

Proposal 1270, Observation 4: TWA-28 Wed Dec 21 21:00:28 GMT 2022

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: PA constraints are to avoid bright sources in MSA field of view.

Diagnostics

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

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(3)	TWA-28	RA: 11 02 9.7479 (165.5406162d) Dec: -34 30 35.79 (-34.50994d) Equinox: J2000	Proper Motion RA: -69.490 mas/yr Proper Motion Dec: -14.521 mas/yr Parallax: 0.0168794" Epoch of Position: 2016.0	

Comments: 30 Nov 2022: Updated using Gaia DR3 coordinates and proper motion with 2016 Epoch
J 13.034 [0.024] C 2003yCat.2246....0C
H 12.356 [0.022] C 2003yCat.2246....0C
K 11.887 [0.024] C 2003yCat.2246....0C
M8.5p D
Category=Star
Description=[M dwarfs]
Extended=NO

Template

TA Method
NONE

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	4-POINT-DITHER				

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	ETC Wkbk.Calc ID
1	G395H/F290LP	NRSIRS2RAPID	32	1	false	true	NONE	4	4	1925.733	
2	G235H/F170LP	NRSIRS2RAPID	31	1	false	true	NONE	4	4	1867.378	
3	G140H/F100LP	NRSIRS2RAPID	32	1	false	true	NONE	4	4	1925.733	

Special Requirements	
	Aperture PA Range 81.892975 to 113.892975 Degrees (V3 302.92044082 to 334.92044082) Aperture PA Range 210.892975 to 268.892975 Degrees (V3 71.92044082 to 129.92044082) Group Observations 1, 2, 3, 4, Non-interruptible