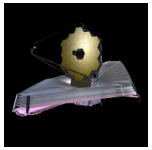

11799 - Tracing Saturn’s elusive evolution with interior and atmospheric clues from its young analog TWA 7 b

Cycle: 5, Proposal Category: GO

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	Science A	MIRI Medium Resolution Spectroscopy	(1) TWA7
	2	Bkg A	MIRI Medium Resolution Spectroscopy	(1) TWA7

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
	4	Science B	MIRI Medium Resolution Spectroscopy	(1) TWA7
	5	Bkg B	MIRI Medium Resolution Spectroscopy	(1) TWA7
	7	Science C	MIRI Medium Resolution Spectroscopy	(1) TWA7
	8	Bkg C	MIRI Medium Resolution Spectroscopy	(1) TWA7

ABSTRACT

The discovery of TWA7b offers an unprecedented opportunity to directly characterize the lowest-mass giant exoplanets ever imaged. This young, Saturn-mass planet (0.3 MJup; 6Myr) orbits at 52AU within the gap of a debris disk, making it a unique and groundbreaking target for atmospheric spectroscopy. We propose MIRI-MRS observations to obtain its 5–18 microns spectrum, near the peak of its thermal emission, enabling the simultaneous detection and precise measurement of multiple molecular features. These observations will probe the atmospheric chemistry and disequilibrium processes of a cold exoplanet in a previously unexplored regime of mass and age, bridging the gap between Solar System giants and directly imaged exoplanets. They will also allow the first direct comparison of the mass–metallicity relationship in this low-mass range, providing a direct link to the population of transiting planets, and offer a unique opportunity to study a Saturn-like planet at an early stage of its evolution. Atmospheric–interior models will enable measurement of the planet's core mass, directly testing interior structure scenarios (fully adiabatic versus layered convection) and offering insight into the processes shaping Saturn-like planet evolution, including the long-standing mystery of Saturn's present-day luminosity. MIRI-MRS observations will also capture the spectrum of the central star and its unresolved inner disk, revealing the inner disk's composition and structure. Together, these measurements represent a major step toward understanding the formation, structure, and early evolution of low-mass gas giants.

OBSERVING DESCRIPTION

The program target the system TWA 7 with the MIRI-MRS using all three grating sets to obtain the mid-infrared spectrum of TWA 7 b, near the expected peak of its thermal emission at about 300 K.

Because of the target's faintness and the need for deep integrations, observations will be conducted in SLOWR1 mode to remain within data volume limits, with individual integration times kept below 1000 s to minimize the impact of cosmic rays. Dedicated MRS background exposures will be acquired to correct for detector and sky background effects, and simultaneous imaging will be performed during the background observations.

This setup will also yield MIRI imaging of the system at no additional cost, using the F560W, F770W, and F1280W filters, providing valuable complementary photometry for TWA 7 b and the inner disk.

All observations will be executed as a non-interruptible sequence, grouping science and background exposures, and repeated independently for each spectral band (SHORT, MEDIUM, and LONG) to ensure compliance with data volume constraints.The stability of JWST and the low expected

intrinsic variability of the target allow us splitting the observations into multiple visits, scheduled within two days to reduce the likelihood of unexpected temporal variations.

Proposal 11799 - Targets - Tracing Saturn’s elusive evolution with interior and atmospheric clues from its young analog TWA 7 b

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TWA7	RA: 10 42 29.9544 (160.6248100d) Dec: -33 40 16.53 (-33.67126d) Equinox: J2000	Proper Motion RA: -0.00951264807897104 sec of time/yr Proper Motion Dec: -0.019647999988592346 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Disk stars, Exoplanet Systems, Exoplanets, M stars]
Extended=NO

Observation

Proposal 11799, Observation 1: Science A

Mon Apr 13 09:00:35 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(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)	TWA7	RA: 10 42 29.9544 (160.6248100d) Dec: -33 40 16.53 (-33.67126d) Equinox: J2000	Proper Motion RA: -0.00951264807897104 sec of time/yr Proper Motion Dec: -0.019647999988592346 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Disk stars, Exoplanet Systems, Exoplanets, M stars]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
FND	All MRS	NO	FULL	Allow Auto Reorder

Dithers

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

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	SHORT(A)	MRSLONG		SLOWR1	43	7	1	Dither 1	4	28	29336.822	
1	SHORT(A)	MRSSHORT		SLOWR1	43	7	1	Dither 1	4	28	29336.822	

Special Requirements	
	Group Observations 1, 2, Non-interruptible Group Observations 1, 4, 7 within 2 Days

Observation

Proposal 11799, Observation 2: Bkg A

Mon Apr 13 09:00:35 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

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)	TWA7	RA: 10 42 29.9544 (160.6248100d) Dec: -33 40 16.53 (-33.67126d) Equinox: J2000	Proper Motion RA: -0.00951264807897104 sec of time/yr Proper Motion Dec: -0.019647999988592346 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Disk stars, Exoplanet Systems, Exoplanets, M stars]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
FND	Imager	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	2-Point	BACKGROUND	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1		IMAGER	F560W	FASTR1	130	2	1	Dither 1	2	4	1448.571	
1	SHORT(A)	MRSLONG		SLOWR1	43	1	1	Dither 1	2	2	2054.533	
1	SHORT(A)	MRSSHORT		SLOWR1	43	1	1	Dither 1	2	2	2054.533	

Special Requirements	Group Observations 1, 2, Non-interruptible

Observation

Proposal 11799, Observation 4: Science B

Mon Apr 13 09:00:35 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

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
(1)	TWA7	RA: 10 42 29.9544 (160.6248100d) Dec: -33 40 16.53 (-33.67126d) Equinox: J2000	Proper Motion RA: -0.00951264807897104 sec of time/yr Proper Motion Dec: -0.019647999988592346 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Disk stars, Exoplanet Systems, Exoplanets, M stars]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
FND	All MRS	NO	FULL	Allow Auto Reorder

Dithers

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

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	MEDIUM(B)	MRSLONG		SLOWR1	43	7	1	Dither 1	4	28	29336.822	
1	MEDIUM(B)	MRSSHORT		SLOWR1	43	7	1	Dither 1	4	28	29336.822	

Special Requirements	Group Observations 1, 4, 7 within 2 Days Group Observations 4, 5, Non-interruptible

Observation

Proposal 11799, Observation 5: Bkg B

Mon Apr 13 09:00:35 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(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)	TWA7	RA: 10 42 29.9544 (160.6248100d) Dec: -33 40 16.53 (-33.67126d) Equinox: J2000	Proper Motion RA: -0.00951264807897104 sec of time/yr Proper Motion Dec: -0.019647999988592346 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Disk stars, Exoplanet Systems, Exoplanets, M stars]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
FND	Imager	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	2-Point	BACKGROUND	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1		IMAGER	F770W	FASTR1	130	2	1	Dither 1	2	4	1448.571	
1	MEDIUM(B)	MRSLONG		SLOWR1	43	1	1	Dither 1	2	2	2054.533	
1	MEDIUM(B)	MRSSHORT		SLOWR1	43	1	1	Dither 1	2	2	2054.533	

Special Requirements	Group Observations 4, 5, Non-interruptible

Observation

Proposal 11799, Observation 7: Science C

Mon Apr 13 09:00:35 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TWA7	RA: 10 42 29.9544 (160.6248100d) Dec: -33 40 16.53 (-33.67126d) Equinox: J2000	Proper Motion RA: -0.00951264807897104 sec of time/yr Proper Motion Dec: -0.019647999988592346 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Disk stars, Exoplanet Systems, Exoplanets, M stars]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
FND	All MRS	NO	FULL	Allow Auto Reorder

Dithers

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

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	MEDIUM(B)	MRSLONG		SLOWR1	43	7	1	Dither 1	4	28	29336.822	
1	MEDIUM(B)	MRSSHORT		SLOWR1	43	7	1	Dither 1	4	28	29336.822	

Special Requirements	Group Observations 1, 4, 7 within 2 Days Group Observations 7, 8, Non-interruptible

Observation

Proposal 11799, Observation 8: Bkg C

Mon Apr 13 09:00:35 GMT 2026

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
(1)	TWA7	RA: 10 42 29.9544 (160.6248100d) Dec: -33 40 16.53 (-33.67126d) Equinox: J2000	Proper Motion RA: -0.00951264807897104 sec of time/yr Proper Motion Dec: -0.019647999988592346 arcsec/yr Epoch of Position: 2015.5	

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=Star
Description=[Disk stars, Exoplanet Systems, Exoplanets, M stars]
Extended=NO

Acquisition

#	Target
1	NONE

Template

AcqFilter	Primary Channel	Simultaneous Imaging	Imager Subarray	Grating Wheel Direction
FND	Imager	YES	FULL	Allow Auto Reorder

Dithers

#	Dither Type	Optimized For	Direction
1	2-Point	BACKGROUND	NEGATIVE

Spectral Elements

#	Wavelength Range	Detector	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Exposures/Dith	Dither	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1		IMAGER	F1280W	FASTR1	130	2	1	Dither 1	2	4	1448.571	
1	MEDIUM(B)	MRSLONG		SLOWR1	43	1	1	Dither 1	2	2	2054.533	
1	MEDIUM(B)	MRSSHORT		SLOWR1	43	1	1	Dither 1	2	2	2054.533	

Special Requirements	Group Observations 7, 8, Non-interruptible