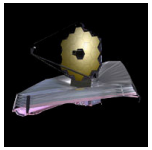

2760 - Titan Surface and Atmosphere - JWST Cycle 2 GTO Project

Cycle: 2, Proposal Category: GTO

INVESTIGATORS

Name	*Institution*
Prof. Jonathan I. Lunine (PI)	**Cornell University**
Dr. Conor Nixon (CoI)	NASA Goddard Space Flight Center
Dr. Samantha Trumbo (CoI) (CoPI) (Contact)	University of California - San Diego

OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	2	Titan45	NIRSpec IFU Spectroscopy	(7) TITAN-NIRSPEC
	3	Titan135	NIRSpec IFU Spectroscopy	(7) TITAN-NIRSPEC
	4	Titan225	NIRSpec IFU Spectroscopy	(7) TITAN-NIRSPEC
	5	Titan315	NIRSpec IFU Spectroscopy	(7) TITAN-NIRSPEC
	6	Titan MIRI	MIRI Medium Resolution Spectroscopy	(5) TITAN-MIRI
	7	Titan MIRI BG	MIRI Medium Resolution Spectroscopy	(6) TITAN-MIRI-BG

ABSTRACT

Titan's atmosphere is time variable, and characterizing that variability in stratospheric gases (MIRI) and haze (NIRSpec) is a major goal of these observations. We will also look at four hemispheres of Titan from JWST, at wavelengths corresponding to both surface and atmosphere, to compare with Cassini observations, provide new data for surface composition identification, and establish a baseline for possible future JWST observations of temporal changes.

Science objectives:

1) NIRSpec IFU spectral imaging of 4 hemispheres of Titan (longitude =45, 135, 225, 315) primarily for surface composition mapping. Additional science for Titan atmosphere, including clouds, PAHs, methane humidity, dayside fluoresence.

2) MIRI-MRS spectral imaging of Titan atmosphere to derive seasonal changes in the stratospheric gas composition.

OBSERVING DESCRIPTION

NIRSPEC IFU: Four hemispheres of Titan (longitude =45, 135, 225, 315)

MIRI MRS: Titan leading hemisphere only for atmosphere. Background observation of 'mirror image' empty position opposite side of Saturn to get stray light.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(5)	TITAN-MIRI	STD=SATURN	STD=TITAN	
Comments: Background required for Titan target. Background should be symmetric mirror location to Titan but on opposite side of Saturn. Extended=YES				
(6)	TITAN-MIRI-BG	STD=SATURN	TYPE=TORUS,LONG=90,LAT=0,RAD=1221870,POLE_LONG=0,POLE_LAT=90,O_LONG=0,O_LAT=0,O_RAD=0	
Comments: Background required for Titan target. Background should be symmetric mirror location to Titan but on opposite side of Saturn. Extended=YES				
(7)	TITAN-NIRSPEC	STD=SATURN	STD=TITAN	
Comments: Titan fior NIRSPEC - no linked background Extended=YES				

Observation

Proposal 2760, Observation 2: Titan45

Thu May 01 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Titan45 (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(7)	TITAN-NIRSPEC	STD=SATURN	STD=TITAN	

Comments: Titan fior NIRSPEC - no linked background
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G140H/F070LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
2	G140H/F100LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
3	G235H/F170LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
4	G395H/F290LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	

Special Requirements

Between Dates 03-NOV-2025:00:00:00 and 22-DEC-2025:00:00:00
Between Dates 16-NOV-2026:00:00:00 and 04-JAN-2027:00:00:00

Group Observations 2, 3, 6, 7 within 16 Days

CENTRAL MERIDIAN LONGITUDE OF TITAN FROM JWST BETWEEN 40 50
DEFAULT WINDOW: NOT OCCULTATION OF TITAN-NIRSPEC BY SATURN FROM JWST
DEFAULT WINDOW: SEPARATION OF TITAN-NIRSPEC RHEA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE TITAN-NIRSPEC FROM JWST LESS THAN 0.03

Observation

Proposal 2760, Observation 3: Titan135

Thu May 01 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

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

(Titan135 (Obs 3)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(7)	TITAN-NIRSPEC	STD=SATURN	STD=TITAN	

Comments: Titan fior NIRSPEC - no linked background
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G140H/F070LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
2	G140H/F100LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
3	G235H/F170LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
4	G395H/F290LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	

Special Requirements

Between Dates 03-NOV-2025:00:00:00 and 22-DEC-2025:00:00:00
Between Dates 16-NOV-2026:00:00:00 and 04-JAN-2027:00:00:00

Group Observations 2, 3, 6, 7 within 16 Days

CENTRAL MERIDIAN LONGITUDE OF TITAN FROM JWST BETWEEN 130 140
DEFAULT WINDOW: NOT OCCULTATION OF TITAN-NIRSPEC BY SATURN FROM JWST
DEFAULT WINDOW: SEPARATION OF TITAN-NIRSPEC RHEA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE TITAN-NIRSPEC FROM JWST LESS THAN 0.03

Observation

Proposal 2760, Observation 4: Titan225

Thu May 01 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

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

(Titan225 (Obs 4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

(Visit 4:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(7)	TITAN-NIRSPEC	STD=SATURN	STD=TITAN	

Comments: Titan fior NIRSPEC - no linked background
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G140H/F070LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
2	G140H/F100LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
3	G235H/F170LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
4	G395H/F290LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	

Special Requirements

Between Dates 18-JUN-2025:00:00:00 and 09-AUG-2025:00:00:00
Between Dates 02-JUL-2026:00:00:00 and 22-AUG-2026:00:00:00

Group Observations 4, 5 within 16 Days

CENTRAL MERIDIAN LONGITUDE OF TITAN FROM JWST BETWEEN 220 230
DEFAULT WINDOW: NOT OCCULTATION OF TITAN-NIRSPEC BY SATURN FROM JWST
DEFAULT WINDOW: SEPARATION OF TITAN-NIRSPEC RHEA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE TITAN-NIRSPEC FROM JWST LESS THAN 0.03

Observation

Proposal 2760, Observation 5: Titan315

Thu May 01 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Titan315 (Obs 5)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

(Visit 5:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(7)	TITAN-NIRSPEC	STD=SATURN	STD=TITAN	

Comments: Titan fior NIRSPEC - no linked background
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	CYCLING	SMALL	1	4	

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	G140H/F070LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
2	G140H/F100LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
3	G235H/F170LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	
4	G395H/F290LP	NRSRAPID	5	1	false	true	NONE	4	4	257.682	

Special Requirements

Between Dates 18-JUN-2025:00:00:00 and 09-AUG-2025:00:00:00
Between Dates 02-JUL-2026:00:00:00 and 22-AUG-2026:00:00:00

Group Observations 4, 5 within 16 Days

CENTRAL MERIDIAN LONGITUDE OF TITAN FROM JWST BETWEEN 310 320
DEFAULT WINDOW: NOT OCCULTATION OF TITAN-NIRSPEC BY SATURN FROM JWST
DEFAULT WINDOW: SEPARATION OF TITAN-NIRSPEC RHEA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE TITAN-NIRSPEC FROM JWST LESS THAN 0.03

Observation

Proposal 2760, Observation 6: Titan MIRI Thu May 01 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[Titan MIRI BG (Obs 7)]

Comments: See ticket INC0165672, approved by Dean Hines 2021-02-23 10:57 for approval of NGROUPS=2 for the MIRI MRS observations of Titan.

Diagnostics

(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

(Titan MIRI (Obs 6)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(5)	TITAN-MIRI	STD=SATURN	STD=TITAN	

Comments: Background required for Titan target. Background should be symmetric mirror location to Titan but on opposite side of Saturn.
Extended=YES

Acquisition

#	Target
1	NONE

Template

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

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	SHORT(A)	MRSLONG		FASTR1	2	25	1	Dither 1	4	100	821.412	
1	SHORT(A)	MRSSHORT		FASTR1	5	13	1	Dither 1	4	52	854.712	
2	MEDIUM(B)	MRSLONG		FASTR1	2	25	1	Dither 1	4	100	821.412	
2	MEDIUM(B)	MRSSHORT		FASTR1	5	13	1	Dither 1	4	52	854.712	
3	LONG(C)	MRSLONG		FASTR1	2	25	1	Dither 1	4	100	821.412	
3	LONG(C)	MRSSHORT		FASTR1	5	13	1	Dither 1	4	52	854.712	

Special Requirements

Sequence Observations 6, 7, Non-interruptible
Group Observations 2, 3, 6, 7 within 16 Days

SEPARATION OF TITAN-MIRI SATURN FROM JWST GREATER THAN 1.8'
DEFAULT WINDOW: NOT OCCULTATION OF TITAN-MIRI BY SATURN FROM JWST
DEFAULT WINDOW: SEPARATION OF TITAN-MIRI RHEA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE TITAN FROM JWST LESS THAN 0.03
CENTRAL MERIDIAN LONGITUDE OF TITAN-MIRI FROM JWST BETWEEN 85 95

Observation

Proposal 2760, Observation 7: Titan MIRI BG Thu May 01 23:00:10 GMT 2025

Diagnostic Status: Warning

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [Titan MIRI (Obs 6)]

Comments: See ticket INC0165672, approved by Dean Hines 2021-02-23 10:57 for approval of NGROUPS=2 for the MIRI MRS observations of Titan.

Diagnostics

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

(Titan MIRI BG (Obs 7)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(6)	TITAN-MIRI-BG	STD=SATURN	TYPE=TORUS,LONG=90,LAT=0,RAD=1221870,POLE_LONG=0,POLE_LAT=90,O_LONG=0,O_LAT=0,O_RAD=0	

Comments: Background required for Titan target. Background should be symmetric mirror location to Titan but on opposite side of Saturn. Extended=YES

Acquisition

#	Target
1	NONE

Template

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

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	SHORT(A)	MRSLONG		FASTR1	2	25	1	None	1	25	205.353	
1	SHORT(A)	MRSSHORT		FASTR1	5	13	1	None	1	13	213.678	
2	MEDIUM(B)	MRSLONG		FASTR1	2	25	1	None	1	25	205.353	
2	MEDIUM(B)	MRSSHORT		FASTR1	5	13	1	None	1	13	213.678	
3	LONG(C)	MRSLONG		FASTR1	2	25	1	None	1	25	205.353	
3	LONG(C)	MRSSHORT		FASTR1	5	13	1	None	1	13	213.678	

Special Requirements

Sequence Observations 6, 7, Non-interruptible
Group Observations 2, 3, 6, 7 within 16 Days

NOT OCCULTATION OF TITAN-MIRI-BG BY TITAN-MIRI FROM JWST
DEFAULT WINDOW: NOT OCCULTATION OF TITAN-MIRI-BG BY SATURN FROM JWST
DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF TITAN-MIRI-BG BY TITAN FROM JWST
DEFAULT WINDOW: SEPARATION OF TITAN-MIRI-BG RHEA FROM JWST GREATER THAN 10"
DEFAULT WINDOW: SEPARATION OF TITAN-MIRI-BG TITAN FROM JWST GREATER THAN 10"
DEFAULT WINDOW: ANGULAR RATE TITAN-MIRI-BG FROM JWST LESS THAN 0.03