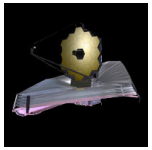

7847 - Saturn's E ring in 2025: A rare opportunity to observe material from inside Enceladus

Cycle: 4, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	NIRSpec Ansa 1	NIRSpec IFU Spectroscopy	(3) Ansa
	3	NIRSpec Ansa 1	NIRSpec IFU Spectroscopy	(3) Ansa
	2	NIRCAM 1	NIRCam Imaging	(1) Saturn
	22	Residual Persistence Check		
	4	NIRCAM 2	NIRCam Imaging	(1) Saturn
	44	Residual Persistence Check		

ABSTRACT

Saturn's faint and diffuse E ring is composed primarily of particles erupted from Saturn's moon Enceladus. This ring material therefore consists of tiny samples of the interior of an ocean world, making the composition of these particles of high astrobiological interest. During Cycle 4, JWST has the rare opportunity to observe this ring almost exactly edge-on, enabling both NIRSpec and NIRCam to obtain data with the highest possible signal-to-noise ratio (SNR) for the next 15 years. NIRSpec IFU spectra of the brightest part of the E ring will clarify the carbon content of the particles erupted by Enceladus. Meanwhile, deep NIRCam images of the entire E ring at multiple wavelengths will constrain how efficiently material from Enceladus is transported throughout the Saturn system.

OBSERVING DESCRIPTION

We propose to observe Saturn's E ring with NIRSpec and NIRCam when the opening angle to the rings during two different times in November/December 2025 when each ansa of the E ring is completely free of bright moons (Mimas, Enceladus, Tethys, Dione, Rhea, Hyperion, Iapetus and Phoebe) and can be viewed at a very low opening angle.

We propose to target each ansa of the brightest part of the E ring (i.e. the ansa of Enceladus' orbit) with NIRSpec IFU using the PRISM configuration and four-point dithers. Integration times were chosen based on ETC calculations using Earth-based measurements of the ring's brightness. Each ansa will be observed for an exposure time of 11672 seconds or 3.3 hours, yielding a charge time of 5.2 hours apiece.

We also propose to observe the entire ring system during both of the above time periods using FULL NIRCam frames with four dithers. Each observation will target Saturn, which will ensure that both ansa of the E ring will be captured in the NIRCam FOV. Images will be taken with the following three filter pairs: F070W/F277W, F115W/F356W and F200W/F444W. Exposure times are based on ETC calculations using earth-based measurements of the ring's brightness. Each image will use a total exposure time of 3392 seconds, yielding a charge time per ansa of 5 hours.

Proposal 7847 - Targets - Saturn's E ring in 2025: A rare opportunity to observe material from inside Enceladus

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	Saturn	STD=SATURN		
Comments: Extended=YES				
(3)	Ansa	STD=SATURN	TYPE=TORUS,LONG=270,LAT=0,RAD=239000,POLE_LONG=0,POLE_LAT=90	
Comments: This targets the East Ansa to minimize Saturn contamination Extended=YES				

Observation

Proposal 7847, Observation 1: NIRSpec Ansa 1

Wed Sep 17 22:00:19 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Diagnostics

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

(NIRSpec Ansa 1 (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(3)	Ansa	STD=SATURN	TYPE=TORUS,LONG=270,LAT=0,RAD=239000,POLE_LONG=0,POLE_LAT=90	

Comments: This targets the East Ansa to minimize Saturn contamination
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

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	Optional ETC ID
1	PRISM/CLEAR	NRSIRS2	10	4	false	true	NONE	4	16	11904.534	

Special Requirements	
	Between Dates 31-OCT-2025:00:00:00 and 01-JAN-2026:00:00:00 NOT ORBITAL LONGITUDE OF DIONE FROM JWST BETWEEN 9.2 170.8 NOT ORBITAL LONGITUDE OF MIMAS FROM JWST BETWEEN 19.0 161.0 NOT ORBITAL LONGITUDE OF ENCELADUS FROM JWST BETWEEN 14.6 165.3 NOT ORBITAL LONGITUDE OF TETHYS FROM JWST BETWEEN 11.8 168.2 NOT ORBITAL LONGITUDE OF RHEA FROM JWST BETWEEN 6.6 173.4 NOT ORBITAL LONGITUDE OF TITAN FROM JWST BETWEEN 2.8 177.2 SEPARATION OF IAPETUS Saturn FROM JWST GREATER THAN 100" NOT ORBITAL LONGITUDE OF HYPERION FROM JWST BETWEEN 2.3 177.7 DEFAULT WINDOW: NOT OCCULTATION OF Ansa BY SATURN FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF Ansa BY TITAN FROM JWST DEFAULT WINDOW: SEPARATION OF Ansa RHEA FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF Ansa TITAN FROM JWST GREATER THAN 10" DEFAULT WINDOW: ANGULAR RATE Ansa FROM JWST LESS THAN 0.075

Observation

Proposal 7847, Observation 3: NIRSpec Ansa 1

Wed Sep 17 22:00:19 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.

(NIRSpec Ansa 1 (Obs 3)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(3)	Ansa	STD=SATURN	TYPE=TORUS,LONG=270,LAT=0,RAD=239000,POLE_LONG=0,POLE_LAT=90	

Comments: This targets the East Ansa to minimize Saturn contamination
Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

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	Optional ETC ID
1	PRISM/CLEAR	NRSIRS2	10	4	false	true	NONE	4	16	11904.534	

Special Requirements	
	Between Dates 31-OCT-2025:00:00:00 and 01-JAN-2026:00:00:00 NOT ORBITAL LONGITUDE OF DIONE FROM JWST BETWEEN 9.2 170.8 NOT ORBITAL LONGITUDE OF MIMAS FROM JWST BETWEEN 19.0 161.0 NOT ORBITAL LONGITUDE OF ENCELADUS FROM JWST BETWEEN 14.6 165.3 NOT ORBITAL LONGITUDE OF TETHYS FROM JWST BETWEEN 11.8 168.2 NOT ORBITAL LONGITUDE OF RHEA FROM JWST BETWEEN 6.6 173.4 NOT ORBITAL LONGITUDE OF TITAN FROM JWST BETWEEN 2.8 177.2 SEPARATION OF IAPETUS Saturn FROM JWST GREATER THAN 100" NOT ORBITAL LONGITUDE OF HYPERION FROM JWST BETWEEN 2.3 177.7 DEFAULT WINDOW: NOT OCCULTATION OF Ansa BY SATURN FROM JWST DEFAULT WINDOW: NOT ECLIPSE PENUMBRAL PARTIAL OF Ansa BY TITAN FROM JWST DEFAULT WINDOW: SEPARATION OF Ansa RHEA FROM JWST GREATER THAN 10" DEFAULT WINDOW: SEPARATION OF Ansa TITAN FROM JWST GREATER THAN 10" DEFAULT WINDOW: ANGULAR RATE Ansa FROM JWST LESS THAN 0.075

Observation

Proposal 7847, Observation 2: NIRCAM 1

Wed Sep 17 22:00:19 GMT 2025

Diagnostic Status: Error

Observing Template: NIRCam Imaging

Diagnostics

(NIRCAM 1 (Obs 2)) Error (Form): Permission has not been granted for this program to use Special Requirement 'Persistence Risk'.

(NIRCAM 1 (Obs 2)) Warning (Form): An Observation with Persistence Risk special requirement should have a NIRCam Dark Observation linked to come after it as a residual persistence check.

(Visit 2:1) Warning (Form): Data Excess over lower threshold

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

(NIRCAM 1 (Obs 2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	Saturn	STD=SATURN		

Comments: Extended=YES

Template

Module	Subarray
B	FULL

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	4	STANDARD		1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
1	F070W	F277W	BRIGHT1	4	10	40	4	3392.819	
2	F115W	F356W	BRIGHT1	4	10	40	4	3392.819	
3	F200W	F444W	BRIGHT1	4	10	40	4	3392.819	

Special Requirements	
	Between Dates 31-OCT-2025:00:00:00 and 01-JAN-2026:00:00:00 Offset 4.6 arcsec, 4.5 arcsec Persistence Risk 22 After 2 by 17 Hours to 2 Days, Exclusive Use Of Instrument Aperture PA Offset 2 from 4 by 8 to 12 Degrees (Same offsets in V3) DEFAULT WINDOW: ANGULAR RATE Saturn FROM JWST LESS THAN 0.075 NOT ORBITAL LONGITUDE OF DIONE FROM JWST BETWEEN 9.2 170.8 NOT ORBITAL LONGITUDE OF MIMAS FROM JWST BETWEEN 19.0 161.0 NOT ORBITAL LONGITUDE OF ENCELADUS FROM JWST BETWEEN 14.6 165.3 NOT ORBITAL LONGITUDE OF TETHYS FROM JWST BETWEEN 11.8 168.2 NOT ORBITAL LONGITUDE OF RHEA FROM JWST BETWEEN 6.6 173.4 NOT ORBITAL LONGITUDE OF TITAN FROM JWST BETWEEN 2.8 177.2 SEPARATION OF IAPETUS Saturn FROM JWST GREATER THAN 100" NOT ORBITAL LONGITUDE OF HYPERION FROM JWST BETWEEN 2.3 177.7

Observation	**Proposal 7847, Observation 22: Residual Persistence Check** Wed Sep 17 22:00:19 GMT 2025 **Diagnostic Status: Error**
Diagnostics	(Residual Persistence Check (Obs 22)) Error (Form): Couldn't identify "NIRCam Dark" as a legal selection. (Residual Persistence Check (Obs 22)) Error (Form): Couldn't identify "NONE" as a legal selection.
Template	
Special Requirements	22 After 2 by 17 Hours to 2 Days, Exclusive Use Of Instrument

Observation

Proposal 7847, Observation 4: NIRCAM 2

Wed Sep 17 22:00:19 GMT 2025

Diagnostic Status: Error

Observing Template: NIRCam Imaging

Diagnostics

(NIRCAM 2 (Obs 4)) Error (Form): Permission has not been granted for this program to use Special Requirement 'Persistence Risk'.

(NIRCAM 2 (Obs 4)) Warning (Form): An Observation with Persistence Risk special requirement should have a NIRCam Dark Observation linked to come after it as a residual persistence check.

(Visit 4:1) Warning (Form): Data Excess over lower threshold

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

(NIRCAM 2 (Obs 4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	Saturn	STD=SATURN		

Comments: Extended=YES

Template

Module	Subarray
B	FULL

Dithers

#	Primary Dither Type	Primary Dithers	Subpixel Dither Type	Dither Size	Subpixel Positions
1	INTRAMODULEBOX	4	STANDARD		1

Spectral Elements

#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
1	F070W	F277W	BRIGHT1	4	10	40	4	3392.819	
2	F115W	F356W	BRIGHT1	4	10	40	4	3392.819	
3	F200W	F444W	BRIGHT1	4	10	40	4	3392.819	

Special Requirements	
	Between Dates 31-OCT-2025:00:00:00 and 01-JAN-2026:00:00:00 Offset 4.6 arcsec, 4.5 arcsec Persistence Risk 44 After 4 by 17 Hours to 2 Days, Exclusive Use Of Instrument Aperture PA Offset 2 from 4 by 8 to 12 Degrees (Same offsets in V3) DEFAULT WINDOW: ANGULAR RATE Saturn FROM JWST LESS THAN 0.075 NOT ORBITAL LONGITUDE OF DIONE FROM JWST BETWEEN 189.2 350.8 NOT ORBITAL LONGITUDE OF MIMAS FROM JWST BETWEEN 199 341 NOT ORBITAL LONGITUDE OF ENCELADUS FROM JWST BETWEEN 194.6 345.3 NOT ORBITAL LONGITUDE OF TETHYS FROM JWST BETWEEN 191.8 348.2 NOT ORBITAL LONGITUDE OF RHEA FROM JWST BETWEEN 186.6 353.4 NOT ORBITAL LONGITUDE OF TITAN FROM JWST BETWEEN 182.8 357.2 SEPARATION OF IAPETUS Saturn FROM JWST GREATER THAN 100" NOT ORBITAL LONGITUDE OF HYPERION FROM JWST BETWEEN 182.3 357.7

Observation	**Proposal 7847, Observation 44: Residual Persistence Check** Wed Sep 17 22:00:19 GMT 2025 **Diagnostic Status: Error**
Diagnostics	(Residual Persistence Check (Obs 44)) Error (Form): Couldn't identify "NIRCam Dark" as a legal selection. (Residual Persistence Check (Obs 44)) Error (Form): Couldn't identify "NONE" as a legal selection.
Template	
Special Requirements	44 After 4 by 17 Hours to 2 Days, Exclusive Use Of Instrument