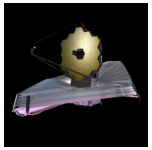

8857 - Io's Auroral Emissions as a Tool to Investigate Atmosphere-Plasma Torus Interactions

Cycle: 4, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

Folder	*Observation*	*Label*	*Observing Template*	*Science Target*
Observation Folder				
	1	Io in Eclipse	NIRSpec IFU Spectroscopy	(1) IO
	2	Io in Eclipse	NIRSpec IFU Spectroscopy	(1) IO
	3	Io in Eclipse	NIRSpec IFU Spectroscopy	(1) IO
	4	Io in Eclipse	NIRSpec IFU Spectroscopy	(1) IO

ABSTRACT

JWST ERS data of Io in eclipse have demonstrated NIRSpec's remarkable ability to spatially resolve emissions from both S and SO. This first look showed an unexpected co-location between the atomic and molecular emissions, suggesting they may be excited by the same processes. If the SO emissions are electron excited, we will have discovered a new type of aurora which would represent a fundamental shift in our understanding of Io's atmosphere. Observationally, if the SO emissions excited by torus electrons like the S emissions, they will show systematic north-south variation with Jupiter's magnetic field geometry. Consequently, we propose to observe Io in eclipse on four occasions, sampling across the range of magnetic

latitudes Io experiences to determine the excitation mechanism of the SO emissions. Additionally, we propose to use the spatially-resolved S emissions to map for the first time the precipitation of the torus into Io's atmosphere and determine how it varies with Io's position within Jupiter's magnetosphere.

OBSERVING DESCRIPTION

We propose to observe Io in eclipse by Jupiter on four occasions, sampling the range of magnetic latitudes it experiences within Jupiter's rotating magnetosphere. These observations are time and date constrained due to (1) the ingress time of the eclipses and their observability from JWST, and (2) the magnetic latitudes traversed by Io during the particular eclipse. Answering the science questions posed in our proposal require the science exposures to start as close as possible to (but not before) the start of the windows provided.

Io in Eclipse (Obs 1-4): NIRSpec IFU High Res 0.97–1.89 micron (G140H/F100LP)

This is nearly the same NIRSpec setup as was used for the Io eclipse observations in PID 1373, though we modified the integrations and groups to increase the temporal resolution and fit the four dithers into the umbral eclipse window.

Proposal 8857 - Targets - Io's Auroral Emissions as a Tool to Investigate Atmosphere-Plasma Torus Interactions

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	IO	STD=JUPITER	STD=IO	

Comments: Extended=YES

Observation

Proposal 8857, Observation 1: Io in Eclipse Wed Dec 10 21:00:29 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: These are time-specific eclipses of Io by Jupiter and need to be scheduled as close as possible to the start of the umbral eclipse, but not before due to stray light contamination. The full 4200 seconds of the eclipses are key to answering this proposal's science questions.

Diagnostics

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

(Io in Eclipse (Obs 1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	IO	STD=JUPITER	STD=IO	

Comments: Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	SPARSE-CYCLING	SMALL			1,2,3,4

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	G140H/F100LP	NRSIRS2RAPID	10	4	false	true	NONE	4	16	2567.645	

Special Requirements

Between Dates 17-OCT-2025:13:26:17 and 17-OCT-2025:14:37:07

DEFAULT WINDOW: ANGULAR RATE IO FROM JWST LESS THAN 0.075

Observation

Proposal 8857, Observation 2: Io in Eclipse Wed Dec 10 21:00:29 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: These are time-specific eclipses of Io by Jupiter and need to be scheduled as close as possible to the start of the umbral eclipse, but not before due to stray light contamination. The full 4200 seconds of the eclipses are key to answering this proposal's science questions.

Diagnostics

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

(Io in Eclipse (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)	IO	STD=JUPITER	STD=IO	

Comments: Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	SPARSE-CYCLING	SMALL			1,2,3

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	G140H/F100LP	NRSIRS2RAPID	10	5	false	true	NONE	3	15	2407.167	

Special Requirements

Between Dates 02-NOV-2025:11:42:24 and 02-NOV-2025:12:49:53

DEFAULT WINDOW: ANGULAR RATE IO FROM JWST LESS THAN 0.075

Observation

Proposal 8857, Observation 3: Io in Eclipse Wed Dec 10 21:00:29 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: These are time-specific eclipses of Io by Jupiter and need to be scheduled as close as possible to the start of the umbral eclipse, but not before due to stray light contamination. The full 4200 seconds of the eclipses are key to answering this proposal's science questions.

Diagnostics

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

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

Solar System Targets

#	Name	Level 1	Level 2	Level 3
(1)	IO	STD=JUPITER	STD=IO	

Comments: Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	SPARSE-CYCLING	SMALL			1,2,3

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	G140H/F100LP	NRSIRS2RAPID	10	5	false	true	NONE	3	15	2407.167	

Special Requirements

Between Dates 22-MAR-2026:08:19:25 and 22-MAR-2026:08:24:25

DEFAULT WINDOW: ANGULAR RATE IO FROM JWST LESS THAN 0.075

Observation

Proposal 8857, Observation 4: Io in Eclipse Wed Dec 10 21:00:29 GMT 2025

Diagnostic Status: Warning

Observing Template: NIRSpec IFU Spectroscopy

Comments: These are time-specific eclipses of Io by Jupiter and need to be scheduled as close as possible to the start of the umbral eclipse, but not before due to stray light contamination. The full 4200 seconds of the eclipses are key to answering this proposal's science questions.

Diagnostics

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

(Io in Eclipse (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)	IO	STD=JUPITER	STD=IO	

Comments: Extended=YES

Template

TA Method	HFF Readout Mode
NONE	false

Dithers

#	Dither Type	Size	Starting Point	Number of Points	Points
1	SPARSE-CYCLING	SMALL			1,2,3

Spectral Elements

#	Grating/Filter	Readout Pattern	Groups/Int	Integrations/Exp	Leakcal	Dither	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
1	G140H/F100LP	NRSIRS2RAPID	11	5	false	true	NONE	3	15	2626.0	

Special Requirements

Between Dates 07-APR-2026:06:35:56 and 07-APR-2026:06:40:56

DEFAULT WINDOW: ANGULAR RATE IO FROM JWST LESS THAN 0.075