



17825 - Saturn's auroral energetics at equinox: support for JWST observations

Cycle: 32, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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Dr. Chihiro Tao (CoI)	National Institute of Information and Com. Technology (NICT)
Dr. James O'Donoghue (CoI) (ESA Member)	University of Reading

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
N1	(3) SATURN-AURORA-SOUTH WAVE	STIS/FUV-MAMA	1	06-Apr-2025 22:00:14.0	yes
N2	(1) SATURN-AURORA-NORTH WAVE	STIS/FUV-MAMA	1	06-Apr-2025 22:00:15.0	yes
N3	(3) SATURN-AURORA-SOUTH WAVE	STIS/FUV-MAMA	1	06-Apr-2025 22:00:16.0	yes
N4	(1) SATURN-AURORA-NORTH WAVE	STIS/FUV-MAMA	1	06-Apr-2025 22:00:17.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
N5	(3) SATURN-AURORA-SOUTH WAVE	STIS/FUV-MAMA	1	06-Apr-2025 22:00:18.0	yes
N6	(2) SATURN-AURORA-NS	STIS/FUV-MAMA	1	06-Apr-2025 22:00:18.0	yes

6 Total Orbits Used

ABSTRACT

Saturn's aurorae are displays of light in the planet's upper atmosphere, caused by the impact of charged particles funneled along the planet's magnetic field. These powerful displays reveal where energy flows through Saturn's space environment and are a major source of atmospheric heating. In late 2024, JWST will observe Saturn's northern atmosphere in the infrared to identify a hot spot postulated to drive Saturn's curious rotating aurora. The characteristics of these rotating aurorae and their control by the atmosphere are currently unique among all planets studied. The JWST observations are therefore extremely important in providing the only way to confirm that temperature controls the generation of the rotating aurora. To fully interpret the JWST observations, we will estimate the auroral electron precipitation energy and flux using spatially-resolved UV spectra from HST/STIS across the auroral oval to determine how much energy is deposited and whether it supports an atmospheric hot spot. We will also identify rotational phases for Saturn's northern and southern auroral ovals to constrain where and when energy is input throughout a planetary rotation. HST provides the only way to obtain the necessary spatially-resolved UV spectra and to precisely track the rotational phase of the aurora. The understanding we gain from studying our solar system planets is valuable for interpreting other systems and interactions with stellar environments, such as how remotely-detected periodic emissions can identify characteristics of exoplanet magnetospheres.

OBSERVING DESCRIPTION

Images and spectra of Saturn's UV aurorae to be taken in support of JWST observations (JWST proposal GO5308). The observations will be as close in time as possible to the JWST observations (end Nov - start Dec) and separated into two sets of three consecutive orbits, with one set ideally simultaneous with JWST.

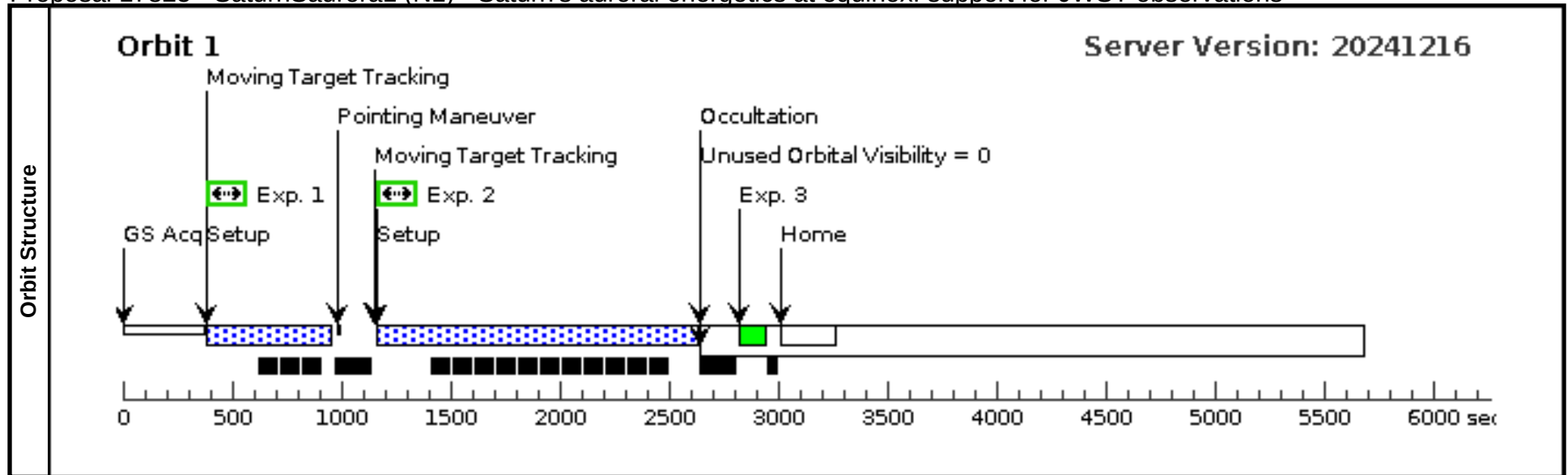
Observations of the northern aurora on five orbits will follow the sequence image-spectra-image using STIS/FUV_MAMA in time-tag mode. Images will use SrF2 filter to reduce geocoronal contamination. Spectra will use the 52x0.5" slit and G140L grating to obtain FUV spectra over 1150-1700 Å at ~12 Å resolution. The field of view should be centered on the northern polar region to allow the slit to cross the northern auroral region.

The sixth orbit will take STIS/FUV-MAMA/SrF2 time-tag imaging of the full planet disk, including northern and southern auroral regions.

Preferably the auto wavecal will be performed in occultation.

Proposal 17825 - SaturnSaurora1 (N1) - Saturn's auroral energetics at equinox: support for JWST observations

Visit	Proposal 17825, SaturnSaurora1 (N1), implementation										Mon Apr 07 02:00:19 GMT 2025	
	Diagnostic Status: Warning											
	Scientific Instruments: STIS/FUV-MAMA											
	Special Requirements: GROUP N1,N2,N3 WITHIN 12H											
	Comments: Image and spectra of southern aurora, position offset to southern polar region. 1/3 grouped orbits. Update POS_ANGLE once window confirmed.											
Diagnostics	(SaturnSaurora1 (N1)) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronagraphy with STIS or COS.											
	(S-Image (N1.001)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(S-spec (N1.002)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(SaturnSaurora1 (N1)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.											
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center					
	(3)	SATURN-AURORA-SOUTH	STD=SATURN	TYPE=POS_ANGLE,RAD=7.7,ANG=184,REF=NORTH		NOT ECL P PARTIAL OF SATURN- EARTH AURORA-SOUTH BY TITAN FROM EARTH, SEP OF SATURN-AURORA-SOUTH RHEA FROM EARTH GT 10", SEP OF SATURN-AURORA-SOUTH TITAN FROM EARTH GT 10"						
	Comments: Offset with POS_ANGLE to cover southern auroral region: ~78 deg S planetographic latitude Description=Saturn-aurora-south											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1	S-Image	(3) SATURN-AURO RA-SOUTH	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=100			421 Secs (421 Secs)			
									[>=>]		[1]	
	2	S-spec	(3) SATURN-AURO RA-SOUTH	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=100;			1300 Secs (1300 Secs)			
						WAVECAL=NO			[>=>]		[1]	
	3	WAVECAL WAVE		STIS/FUV-MAMA, ACCUM, 52X0.05	G140L 1425 A				[>=>]		[1]	

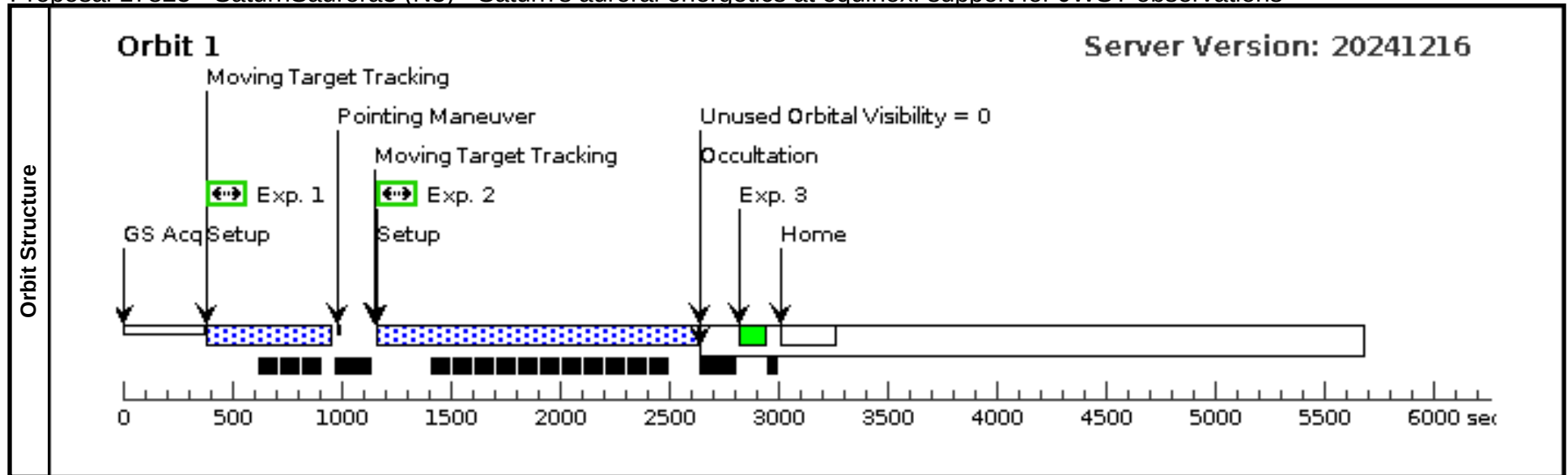


Proposal 17825 - SaturnNaurora2 (N2) - Saturn's auroral energetics at equinox: support for JWST observations

Visit	Proposal 17825, SaturnNaurora2 (N2), implementation										Mon Apr 07 02:00:19 GMT 2025	
	Diagnostic Status: Warning											
	Scientific Instruments: STIS/FUV-MAMA											
	Special Requirements: (none)											
	Comments: Image and spectra of northern aurora, position offset to northern polar region. 2/3 grouped orbits. Update POS_ANGLE once window confirmed.											
Diagnostics	(SaturnNaurora2 (N2)) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronagraphy with STIS or COS.											
	(N-Image (N2.001)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(N-spec (N2.002)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(SaturnNaurora2 (N2)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.											
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center					
	(1)	SATURN-AURORA-NORTH	STD=SATURN	TYPE=POS_ANGLE,RAD=8,ANG=4,REF=NORTH		NOT ECL P PARTIAL OF SATURN- EARTH AURORA-NORTH BY TITAN FROM EARTH, SEP OF SATURN-AURORA-NORTH RHEA FROM EARTH GT 10", SEP OF SATURN-AURORA-NORTH TITAN FROM EARTH GT 10"						
	Comments: Offset with POS_ANGLE to cover northern auroral region Description=Saturn-aurora-north											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1	N-Image	(1) SATURN-AURO RA-NORTH	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=100			421 Secs (421 Secs)			
									[==>]		[1]	
	2	N-spec	(1) SATURN-AURO RA-NORTH	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=100;			1300 Secs (1300 Secs)			
						WAVECAL=NO			[==>]		[1]	
	3	WAVECAL WAVE		STIS/FUV-MAMA, ACCUM, 52X0.05	G140L 1425 A				[==>]		[1]	

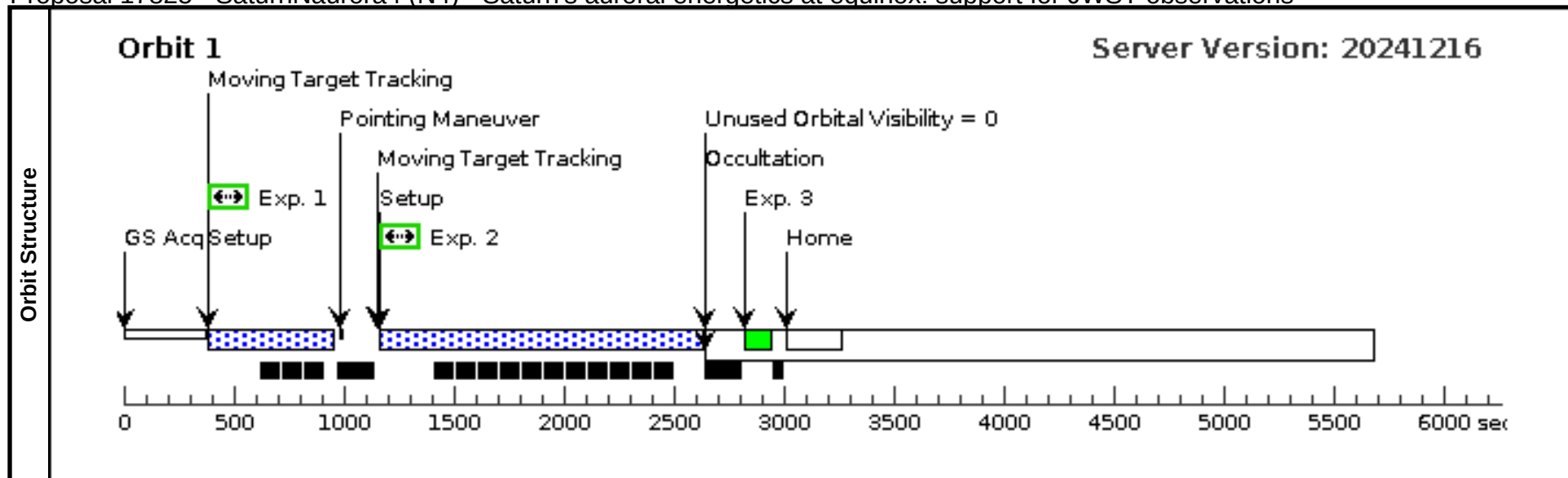
Proposal 17825 - SaturnSaurora3 (N3) - Saturn's auroral energetics at equinox: support for JWST observations

Visit	Proposal 17825, SaturnSaurora3 (N3), implementation										Mon Apr 07 02:00:19 GMT 2025	
	Diagnostic Status: Warning											
	Scientific Instruments: STIS/FUV-MAMA											
	Special Requirements: (none)											
Comments: Image and spectra of southern aurora, position offset to southern polar region. 3/3 grouped orbits. Update POS_ANGLE once window confirmed.												
Diagnostics	(SaturnSaurora3 (N3)) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronagraphy with STIS or COS.											
	(S-Image (N3.001)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(S-spec (N3.002)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(SaturnSaurora3 (N3)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.											
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center					
	(3)	SATURN-AURORA-SOUTH	STD=SATURN	TYPE=POS_ANGLE,RAD=7.7,ANG=184,REF=NORTH		NOT ECL P PARTIAL OF SATURN-AURORA-SOUTH BY TITAN FROM EARTH, SEP OF SATURN-AURORA-SOUTH RHEA FROM EARTH GT 10", SEP OF SATURN-AURORA-SOUTH TITAN FROM EARTH GT 10"	EARTH					
	Comments: Offset with POS_ANGLE to cover southern auroral region: ~78 deg S planetographic latitude Description=Saturn-aurora-south											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit		
	1	S-Image	(3) SATURN-AURO RA-SOUTH	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=100			421 Secs (421 Secs)			
									[>=>]		[1]	
	2	S-spec	(3) SATURN-AURO RA-SOUTH	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=100; WAVECAL=NO			1300 Secs (1300 Secs)			
									[>=>]		[1]	
	3	WAVECAL WAVE		STIS/FUV-MAMA, ACCUM, 52X0.05	G140L 1425 A				[>=>]		[1]	



Proposal 17825 - SaturnNaurora4 (N4) - Saturn's auroral energetics at equinox: support for JWST observations

Visit	Proposal 17825, SaturnNaurora4 (N4), implementation										Mon Apr 07 02:00:19 GMT 2025	
	Diagnostic Status: Warning											
	Scientific Instruments: STIS/FUV-MAMA											
	Special Requirements: GROUP N4,N5,N6 WITHIN 12H											
	Comments: Image and spectra of northern aurora, position offset to northern polar region. 1/3 grouped orbits. Update POS_ANGLE once window confirmed.											
Diagnostics	(SaturnNaurora4 (N4)) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronagraphy with STIS or COS.											
	(N-Image (N4.001)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(N-spec (N4.002)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(SaturnNaurora4 (N4)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.											
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center					
	(1)	SATURN-AURORA-NORTH	STD=SATURN	TYPE=POS_ANGLE,RAD=8,ANG=4,REF=NORTH		NOT ECL P PARTIAL OF SATURN- EARTH AURORA-NORTH BY TITAN FROM EARTH, SEP OF SATURN-AURORA-NORTH RHEA FROM EARTH GT 10", SEP OF SATURN-AURORA-NORTH TITAN FROM EARTH GT 10"						
	Comments: Offset with POS_ANGLE to cover northern auroral region Description=Saturn-aurora-north											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit	
	1	N-Image	(1) SATURN-AURO RA-NORTH	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=100			421 Secs (421 Secs)			
									[==>]		[1]	
	2	N-spec	(1) SATURN-AURO RA-NORTH	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=100;			1300 Secs (1300 Secs)			
						WAVECAL=NO			[==>]		[1]	
	3	WAVECAL WAVE		STIS/FUV-MAMA, ACCUM, 52X0.05	G140L 1425 A				[==>]		[1]	



Proposal 17825 - SaturnSaurora5 (N5) - Saturn's auroral energetics at equinox: support for JWST observations

Visit	Proposal 17825, SaturnSaurora5 (N5), implementation										Mon Apr 07 02:00:19 GMT 2025	
	Diagnostic Status: Warning											
	Scientific Instruments: STIS/FUV-MAMA											
	Special Requirements: (none)											
	Comments: Image and spectra of southern aurora, position offset to southern polar region. 2/3 grouped orbits. Update POS_ANGLE once window confirmed.											
Diagnostics	(SaturnSaurora5 (N5)) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronagraphy with STIS or COS.											
	(S-Image (N5.001)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(S-spec (N5.002)) Warning (Form): Sensitive exposures should have an ETC run number provided.											
	(SaturnSaurora5 (N5)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.											
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center					
	(3)	SATURN-AURORA-SOUTH	STD=SATURN	TYPE=POS_ANGLE,RAD=7.7,ANG=184,REF=NORTH		NOT ECL P PARTIAL OF SATURN-AURORA-SOUTH BY TITAN FROM EARTH, SEP OF SATURN-AURORA-SOUTH RHEA FROM EARTH GT 10", SEP OF SATURN-AURORA-SOUTH TITAN FROM EARTH GT 10"	EARTH					
	Comments: Offset with POS_ANGLE to cover southern auroral region: ~78 deg S planetographic latitude Description=Saturn-aurora-south											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit		
	1	S-Image	(3) SATURN-AURO RA-SOUTH	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=100			421 Secs (421 Secs)			
									[==>]		[1]	
	2	S-spec	(3) SATURN-AURO RA-SOUTH	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=100;			1300 Secs (1300 Secs)			
						WAVECAL=NO			[==>]		[1]	
	3	WAVECAL WAVE		STIS/FUV-MAMA, ACCUM, 52X0.05	G140L 1425 A				[==>]		[1]	

Proposal 17825 - SaturnNSaurora (N6) - Saturn's auroral energetics at equinox: support for JWST observations

Mon Apr 07 02:00:19 GMT 2025

Visit	Proposal 17825, SaturnNSaurora (N6), implementation										Mon Apr 07 02:00:19 GMT 2025
	Diagnostic Status: Warning										
	Scientific Instruments: STIS/FUV-MAMA										
	Special Requirements: (none)										
Comments: Imaging of Saturns northern and southern aurorae. 3/3 consecutive orbits, close in time to JWST observations.											
Diagnostics	(NS-image (N6.001)) Warning (Form): Sensitive exposures should have an ETC run number provided.										
	(SaturnNSaurora (N6)) Informational (Form): The Visit Planner and Spike may produce different schedulability results.										
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
	(2)	SATURN-AURORA-NS	STD=SATURN			NOT ECL P PARTIAL OF SATURN-AURORA-NS BY TITAN FROM EARTH, SEP OF SATURN-AURORA-NS RHEA FROM EARTH GT 10", SEP OF SATURN-AURORA-NS TITAN FROM EARTH GT 10"	EARTH				
	Comments: Image of full planet disk covering both north and south auroral regions Description=Saturn-aurora-image-NS										
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	NS-image	(2) SATURN-AURO RA-NS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=10 0			2090 Secs (2090 Secs)		
										[==>]	[1]
Orbit Structure	Orbit 1										
	Server Version: 20241216										
Orbit Structure	Moving Target Tracking										
	Setup										
Orbit Structure	GS Acq										
	Exp. 1										
Orbit Structure	Unused Orbital Visibility = 0										
	Occultation										
Orbit Structure	Home										
	