



16193 - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and auroras

Cycle: 28, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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>
01	(1) PJ30-NORTH-AURORA	STIS/FUV-MAMA	1	12-Aug-2022 10:00:17.0	yes
02	(2) PJ35A-NORTH-AURORA	STIS/FUV-MAMA	1	12-Aug-2022 10:00:18.0	yes
03	(3) PJ35B-NORTH-AURORA	STIS/FUV-MAMA	1	12-Aug-2022 10:00:19.0	yes
53	(53) PJ35B-NORTH-AURORA-COPY	STIS/FUV-MAMA	1	12-Aug-2022 10:00:19.0	yes
55	(55) PJ36B-NORTH-AURORA	STIS/FUV-MAMA	1	12-Aug-2022 10:00:20.0	yes
04	(4) PJ35C-NORTH-AURORA	STIS/FUV-MAMA	1	12-Aug-2022 10:00:21.0	yes
54	(54) PJ38-NORTH-AURORA	STIS/FUV-MAMA	1	12-Aug-2022 10:00:21.0	yes
05	(5) PJ36-NORTH-AURORA	STIS/FUV-MAMA	1	12-Aug-2022 10:00:22.0	yes

8 Total Orbits Used

ABSTRACT

Juno and HST form a powerful and unique combination to unravel the processes coupling the Jovian magnetosphere to its atmosphere through its auroras. As an example, context images of the UV auroras offered by HST help making sense out of the Juno in situ measurements and disentangle spatial from temporal effects. As Juno's orbit evolves, new challenges and opportunities emerge during cycle 28. In particular, Juno will fly at lower and lower altitudes over the north pole, potentially accessing the deepest part of the region where the charged particle causing the aurora get accelerated. Unfortunately, Juno's remote sensing instruments will be too close to Jupiter and Juno will fly too fast in the North to offer global images of the auroras associated with the in situ wave, field and particle measurements. Only HST is able to provide the spatially resolved UV images critical to properly interpret the data. Furthermore, Juno will cross the magnetic equator closer and closer to Jupiter, exploring new areas where some key physics for the dynamics of the plasma in Jupiter's magnetosphere takes place. Simultaneous global images with the STIS instrument will allow the identification and classification of the structures crossed by Juno as well as estimates of their spatial range and temporal variability. In return, Juno will unravel the plasma processes giving rise to the auroral feature imaged by HST. Finally, we will take advantage of a rare opportunity for

truly simultaneous imaging of the two polar auroras of Jupiter when Juno is in the southern hemisphere to shed light on the mystery of the conjugate auroral flares in the polar-most region of the Jovian auroras.

OBSERVING DESCRIPTION

Out of the initial 25 requested orbits, the panel only attributed 5 to this campaign. We thus optimized the observation dates to maximize the scientific output (made of three separate goals) with a restricted number of observations. There will be 1) one orbit dedicated to simultaneous measurements of the northern aurora with HST as Juno will operate its in situ instruments in the northern hemisphere (ideally during Juno perijove 30 -PJ30), 2) one orbit dedicated to simultaneous measurements of the northern aurora with HST as Juno will operate its in situ and remote sensing instruments in the southern hemisphere (ideally during Juno PJ36) and 3) a sequence of three orbits (ideally one every jovian rotation (~10 hours)) when Juno will cross the magnetospheric current sheet (ideally during PJ35). For each of these three goals, alternative dates are possible, which are only marginally less favourable.

In practice, the observation strategy for these 5 orbits is similar to the one carried out in past programs dedicated to imaging Jupiter's aurora with STIS (e.g. 15638 lead by Co-I Denis Grodent):

Observations of Jupiter's aurora will be obtained using the STIS/FUV-MAMA instrument using the F25SRF2 filter, in order to observe the H₂ Lyman and Werner emissions whilst removing contamination from the geocoronal Lyman-alpha. Jupiter will be positioned such that only the auroral region and nearby disc will be in the 25x25" field of view, and thus <1/4 of the detector is filled with the planet. We will obtain ~2400 s time-tagged exposures, from which images integrated over smaller intervals (e.g. 10-100 s) will be extracted. POS_ANG parameters will be provided in a timely manner. They depend on the exact observing time (which determines the orientation of the aurora on the planetary disk) and ORIENT angle and are such that STIS MAMA repeller wire does not cross the auroral region.

Similar observations can be and have been carried out with gyro restrictions in the past. These limitations on the orientation of the detector only require some fine-tuning of the pointing to limit the contribution of the planetary disk to the total count rate.

Proposal 16193 - PJ35a (01) - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and a...

Fri Aug 12 14:00:23 GMT 2022

Visit	Proposal 16193, PJ35a (01), completed Diagnostic Status: No Diagnostics Scientific Instruments: STIS/FUV-MAMA Special Requirements: BETWEEN 30-AUG-2021:07:20:00 AND 30-AUG-2021:08:20:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET Comments: Exact time will be decided with CS									
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(1)	PJ30-NORTH-AURORA	STD=JUPITER	TYPE=POS_ANGLE,RAD=26,ANG=-13,REF=NORTH		NOT OCC OF PJ30-NORTH-AURORA BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 120 220	EARTH			
Comments: Description=Jupiter_aurora_North_PJ30										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(1) PJ30-NORTH-AURORA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2500 Secs (2500 Secs) [==>]	[1]
Orbit Structure	Orbit 1 Server Version: 20220516									

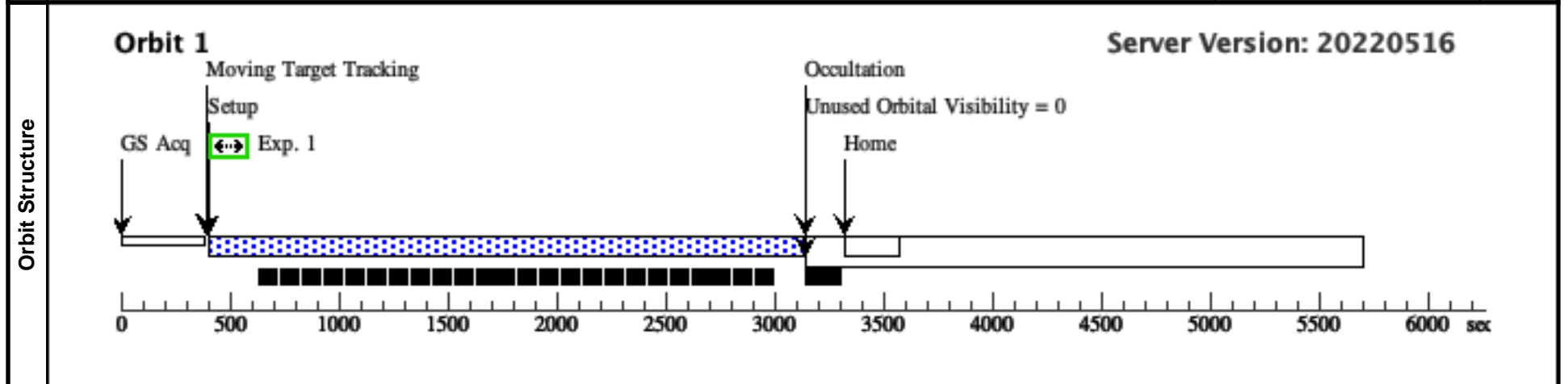
Proposal 16193 - PJ35b (02) - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and a...

Fri Aug 12 14:00:23 GMT 2022

Visit	Proposal 16193, PJ35b (02), completed Diagnostic Status: No Diagnostics Scientific Instruments: STIS/FUV-MAMA Special Requirements: BETWEEN 01-SEP-2021:00:37:00 AND 01-SEP-2021:01:37:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET Comments: Exact time will be decided with CS					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(2)	PJ35A-NORTH-AURORA	STD=JUPITER	TYPE=POS_ANGLE,RAD=25,ANG=-32,REF=NORTH		NOT OCC OF PJ35A-NORTH-AURORA BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 116 220	EARTH
Comments: Description=Jupiter_aurora_North_PJ35a							

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(2) PJ35A-NORTH-AURORA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99				2554 Secs (2574 Secs) [=>2574.0 Secs]



Proposal 16193 - PJ35c (03) - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and a...

Fri Aug 12 14:00:23 GMT 2022

Visit	Proposal 16193, PJ35c (03), failed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: BETWEEN 19-JUL-2021:03:40:00 AND 19-JUL-2021:04:40:00 <i>Comments: Exact time will be decided with CS</i>									
	(PJ35c (03)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN									
Diagnostics										
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(3)	PJ35B-NORTH-AURORA	STD=JUPITER	TYPE=POS_ANGLE,RAD=26,ANG=-22,REF=NORTH		NOT OCC OF PJ35B-NORTH-AURORA BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 120 220	EARTH			
<i>Comments: Description=Jupiter_aurora_North_PJ35b</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(3) PJ35B-NORTH-AURORA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99				2554 Secs (2574 Secs) [=>2574.0 Secs]
Orbit Structure	Orbit 1 Server Version: 20220516									
	<p>Moving Target Tracking</p> <p>GS Acq</p> <p>Setup</p> <p>Exp. 1</p> <p>*** ORBITAL VISIBILITY OVERRUN = 360</p> <p>Occultation Home</p> <p>0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 sec</p>									

Proposal 16193 - PJ35c (53) - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and a...

Fri Aug 12 14:00:23 GMT 2022

Visit	Proposal 16193, PJ35c (53), failed Diagnostic Status: No Diagnostics Scientific Instruments: STIS/FUV-MAMA Special Requirements: BETWEEN 02-SEP-2021:05:13:00 AND 02-SEP-2021:06:13:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET Comments: Exact time will be decided with CS									
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(53)	PJ35B-NORTH-AURORA-COPY	STD=JUPITER	TYPE=POS_ANGLE,RAD=26,ANG=-17,REF=NORTH		NOT OCC OF PJ35B-NORTH-AURORA-COPY BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 120 220	EARTH			
Comments: Description=Jupiter_aurora_North_PJ35b										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(53) PJ35B-NORTH-AURORA-COPY	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2554 Secs (2574 Secs) [=>2574.0 Secs]	[1]
Orbit Structure	Orbit 1 Server Version: 20220516									

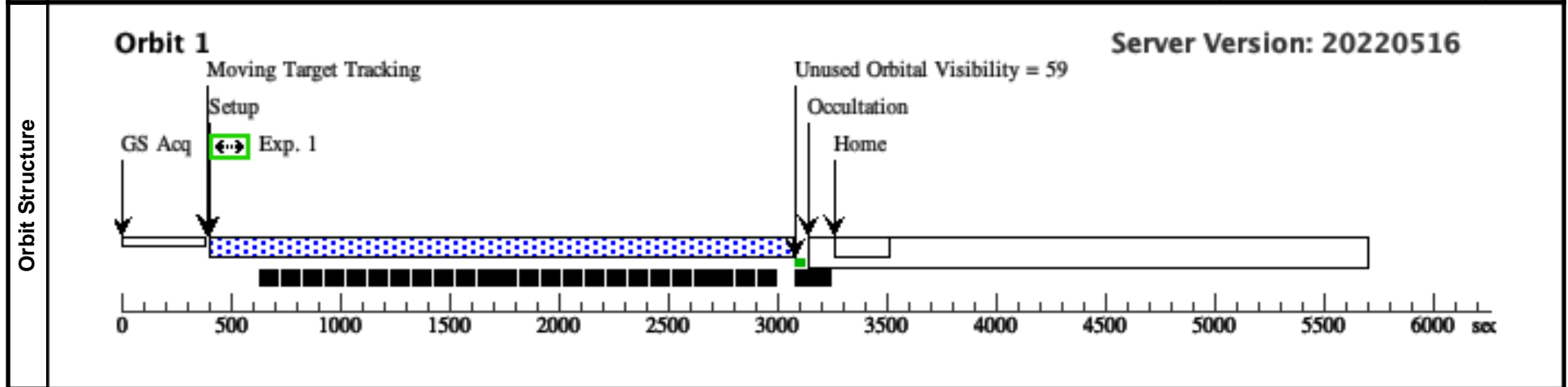
Proposal 16193 - PJ43 (55) - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and au...

Fri Aug 12 14:00:23 GMT 2022

Visit	Proposal 16193, PJ43 (55), scheduled					
	Diagnostic Status: No Diagnostics Scientific Instruments: STIS/FUV-MAMA Special Requirements: BETWEEN 17-AUG-2022:17:30:00 AND 17-AUG-2022:18:30:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET Comments: Exact time will be decided with CS					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(55)	PJ36B-NORTH-AURORA	STD=JUPITER	TYPE=POS_ANGLE,RAD=25,ANG=-30,REF=NORTH		NOT OCC OF PJ36B-NORTH-AURORA BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 120 220	EARTH
	Comments: Description=Jupiter_aurora_North_PJ35b						

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(55) PJ36B-NORTH-AURORA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2515 Secs (2515 Secs)	
									[=>]	[1]



Proposal 16193 - PJ35d (04) - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and a...

Fri Aug 12 14:00:23 GMT 2022

Visit	Proposal 16193, PJ35d (04), failed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: BETWEEN 21-JUL-2021:04:55:00 AND 21-JUL-2021:05:50:00 <i>Comments: Exact time will be decided with CS</i>									
	(PJ35d (04)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN									
Diagnostics										
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(4)	PJ35C-NORTH-AURORA	STD=JUPITER	TYPE=POS_ANGLE,RAD=26,ANG=-18,REF=NORTH		NOT OCC OF PJ35C-NORTH-AURORA BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 120 220	EARTH			
<i>Comments: Description=Jupiter_aurora_North_PJ35_c</i>										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(4) PJ35C-NORTH-AURORA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99				2554 Secs (2574 Secs) [=>2574.0 Secs]
Orbit Structure	Orbit 1 Server Version: 20220516									
	<p>The diagram illustrates the timing of the observation sequence. It starts with 'GS Acq' at approximately 100 seconds, followed by 'Setup' at 400 seconds. The main exposure 'Exp. 1' is marked with a green box and occurs between 450 and 550 seconds. A long period of 'Moving Target Tracking' follows. At approximately 2800 seconds, an 'Occultation' occurs, resulting in an 'ORBITAL VISIBILITY OVERRUN = 360' seconds. The 'Home' position is reached at approximately 3300 seconds. The x-axis represents time in seconds, ranging from 0 to 6000.</p>									

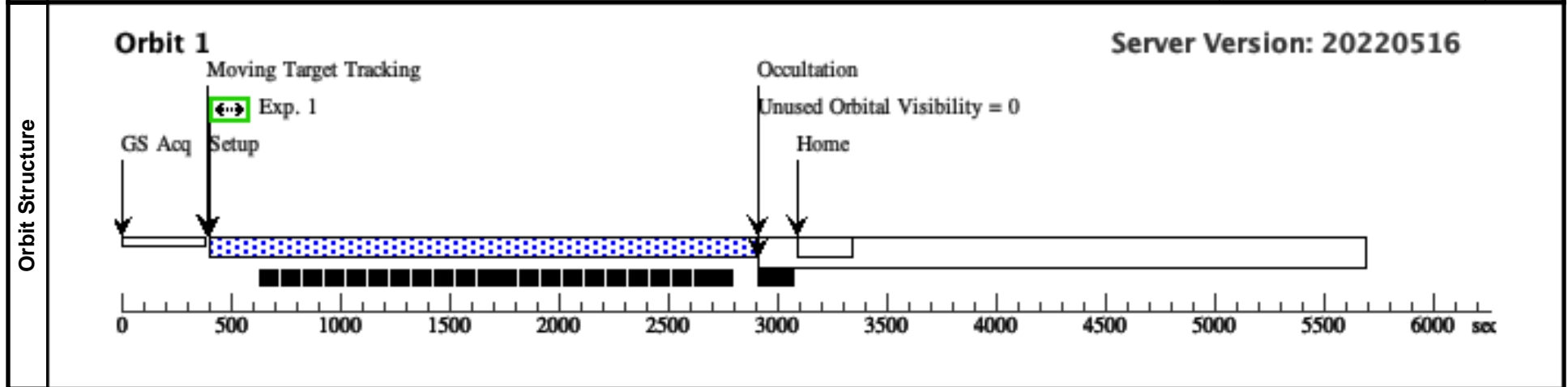
Proposal 16193 - PJ42 (54) - Building connections: Juno and STIS contemporaneous observations of Jupiter's magnetosphere and au...

Fri Aug 12 14:00:23 GMT 2022

Visit	Proposal 16193, PJ42 (54), implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; BETWEEN 29-SEP-2022:17:35:00 AND 29-SEP-2022:18:30:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET Comments: Exact time will be decided with CS					

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(54)	PJ38-NORTH-AURORA	STD=JUPITER	TYPE=POS_ANGLE,RAD=27,ANG=-25,REF=NORTH		NOT OCC OF PJ38-NORTH-AURORA BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 120 220	EARTH
Comments: Description=Jupiter_aurora_North_PJ35_c							

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(54) PJ38-NORTH-AURORA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99				2350 Secs (2350 Secs)
									[=>]	[1]



Visit	Proposal 16193, PJ36 (05), completed Diagnostic Status: No Diagnostics Scientific Instruments: STIS/FUV-MAMA Special Requirements: BETWEEN 02-SEP-2021:22:00:00 AND 03-SEP-2021:03:00:00; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET Comments: Exact time will be decided with CS									
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(5)	PJ36-NORTH-AURORA	STD=JUPITER	TYPE=POS_ANGLE,RAD=26,ANG=-10,REF=NORTH		NOT OCC OF PJ36-NORTH-AURORA BY JUPITER FROM EARTH, CML OF JUPITER FROM EARTH BETWEEN 120 220	EARTH			
Comments: Description=Jupiter_aurora_North_PJ36										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	(STIS.im.73 3411)	(5) PJ36-NORTH-AURORA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99				2554 Secs (2574 Secs) [=>2574.0 Secs]

