



# 13620 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Cycle: 21, Proposal Category: GO/DD

(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) EUROPA-TRANSIT-WFC3	WFC3/UVIS	1	01-Apr-2014 21:50:17.0	yes
02	(1) EUROPA-TRANSIT-WFC3	WFC3/UVIS	1	01-Apr-2014 21:50:27.0	yes
03	(3) EUROPA-3	STIS/FUV-MAMA	1	01-Apr-2014 21:50:35.0	yes
04	(7) EUROPA-4	STIS/FUV-MAMA	1	01-Apr-2014 21:50:43.0	yes
05	(8) EUROPA-5	STIS/FUV-MAMA	1	01-Apr-2014 21:50:50.0	yes
06	(9) EUROPA-6	STIS/FUV-MAMA	1	01-Apr-2014 21:50:57.0	yes
07	(10) EUROPA-7	STIS/FUV-MAMA	1	01-Apr-2014 21:51:04.0	yes
08	(12) EUROPA-4-SECOND	STIS/FUV-MAMA	1	01-Apr-2014 21:51:10.0	yes
09	(4) EUROPA-NOTRAN	STIS/FUV-MAMA	1	01-Apr-2014 21:51:17.0	yes

9 Total Orbits Used

## **ABSTRACT**

It is of extreme interest to NASA and the scientific community to confirm the presence of plumes of water ice venting from the polar regions of Europa. Roth et al 2014 presented evidence, based on line emission imaging of the dissociation products of water, that such plumes exist. We were awarded three orbits in Cycle 21 to pursue a completely independent approach to imaging the Europa exosphere, including a search for Enceladus-like plumes. In the FUV, Jupiter provides a uniformly illuminating backlight screen against which absorption by Europa's exosphere can be imaged as it transits Jupiter. The spatial resolution of HST is high in the FUV and molecular cross-sections are high. We request six additional STIS orbits, and two WFC3 orbits to provide sensitive limits on the absorbing column density and on entrained dusty particulates. Roth et al seek line emission at apoapsis and periapsis. We will span a range between these limits, closer to apoapsis where plumes are predicted. With the additional orbits we double our S/N and gain a factor of two in detectable column density, seek the scientific gold standard of reproducibility with multiple datasets, and provide a completely independent, contemporaneous (crucial when probing a transient phenomenon) validation of the line-emission approach. Our observations so far provide fascinating hints, but require confirmation through repeats and improved S/N. With a concerted effort, we have the opportunity to conclusively and unequivocally establish the presence of ice fountains on Europa. If they arise from the deep ocean, we have gained access to probably the most astrobiologically interesting location in the Solar System.

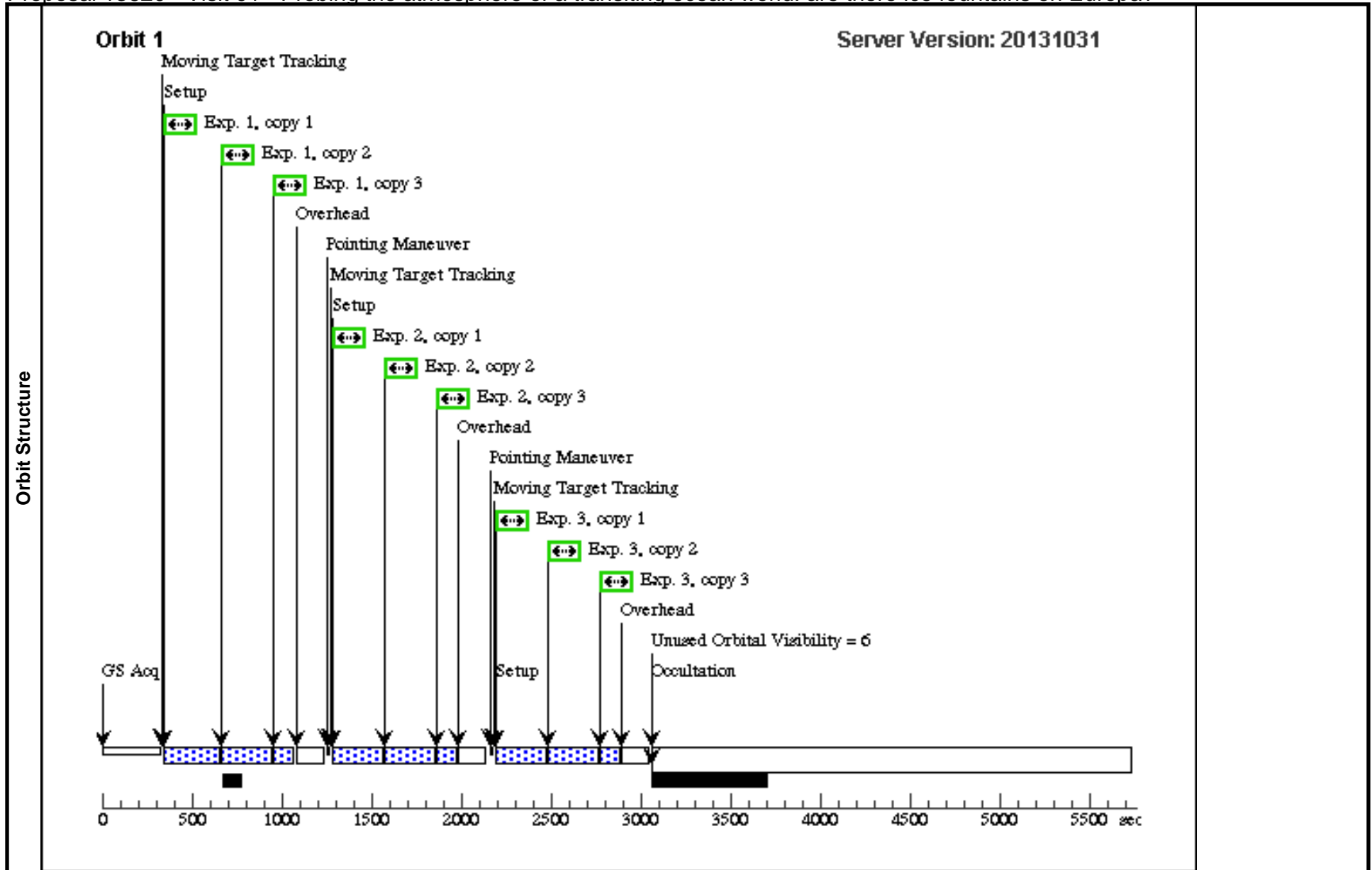
## **OBSERVING DESCRIPTION**

We will obtain a single ACS/SBC prism observation inside and outside eclipse. We will obtain one orbit that sweeps through all filters outside eclipse and the remaining four orbits will be inside eclipse. Three use broad filters and one uses the narrow band optical filters to seek auroral emission.

Proposal 13620 - Visit 01 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

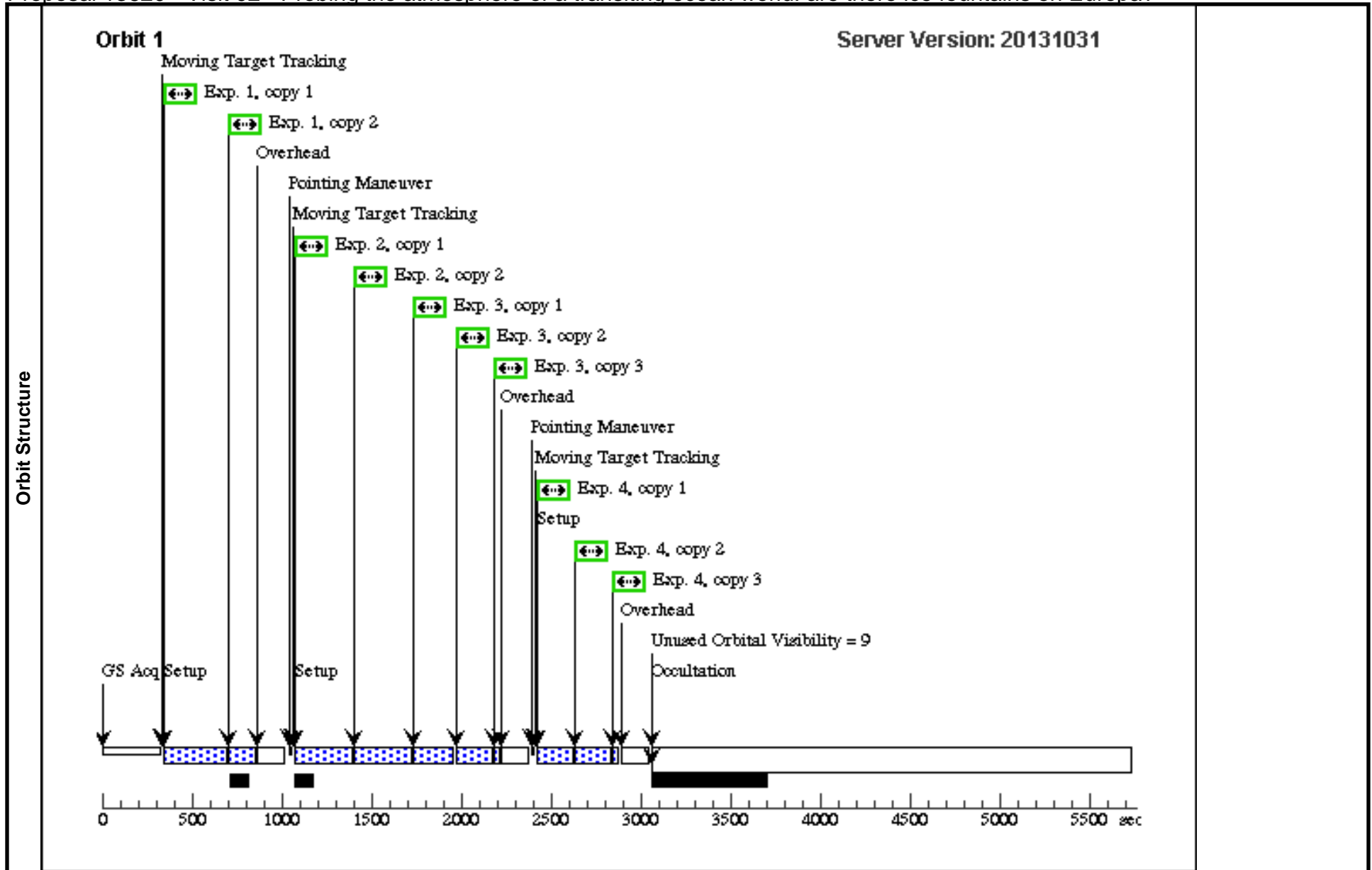
Wed Apr 02 01:51:28 GMT 2014

Visit	Proposal 13620, Visit 01, completed Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 80%: ORIENT 95D TO 95 D: BETWEEN 27-JAN-2014:12:00:00 AND 01-MAR-2014:12:00:00										
	Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(1)	EUROPA-TRANSIT-WFC3	STD=JUPITER	STD=EUROPA			TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH, SEP OF EUROPA JUPITER FROM EARTH LT -10", SEP OF EUROPA-TRANSIT-WFC3 GRSAPPROX FROM EARTH GT 8.0" MOSS Show Windows: true	EARTH			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1		(1) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W				150 Secs X 3 (330 Secs)		
									[==>110.0 Secs (Copy 1)]	[1]	
									[==>110.0 Secs (Copy 2)]		
									[==>110.0 Secs (Copy 3)]		
	2		(1) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W		POS TARG 1.67,1.8 6			150 Secs X 3 (330 Secs)	
									[==>110.0 Secs (Copy 1)]	[1]	
									[==>110.0 Secs (Copy 2)]		
									[==>110.0 Secs (Copy 3)]		
3		(1) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W		POS TARG -1.67,-1.86			150 Secs X 3 (330 Secs)		
								[==>110.0 Secs (Copy 1)]	[1]		
								[==>110.0 Secs (Copy 2)]			
								[==>110.0 Secs (Copy 3)]			



Proposal 13620 - Visit 02 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Visit		Proposal 13620, Visit 02, completed <span style="float: right;">Wed Apr 02 01:51:31 GMT 2014</span> Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 80%: ORIENT 95D TO 95 D: BETWEEN 27-JAN-2014:12:00:00 AND 08-MAR-2014:12:00:00									
Solar System Targets		#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
Exposures		#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
		1	(1) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W	POS TARG 1.67,1.8 6				150 Secs X 2 (300 Secs) [==>(Copy 1)] [==>(Copy 2)]	[1]
		2	(1) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W					150 Secs X 2 (300 Secs) [==>(Copy 1)] [==>(Copy 2)]	[1]
		3	(1) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F275W					29.4 Secs X 3 (88.2 Secs) [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]
		4	(1) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F275W	POS TARG -1.67,-1. 86				29.4 Secs X 3 (88.2 Secs) [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]



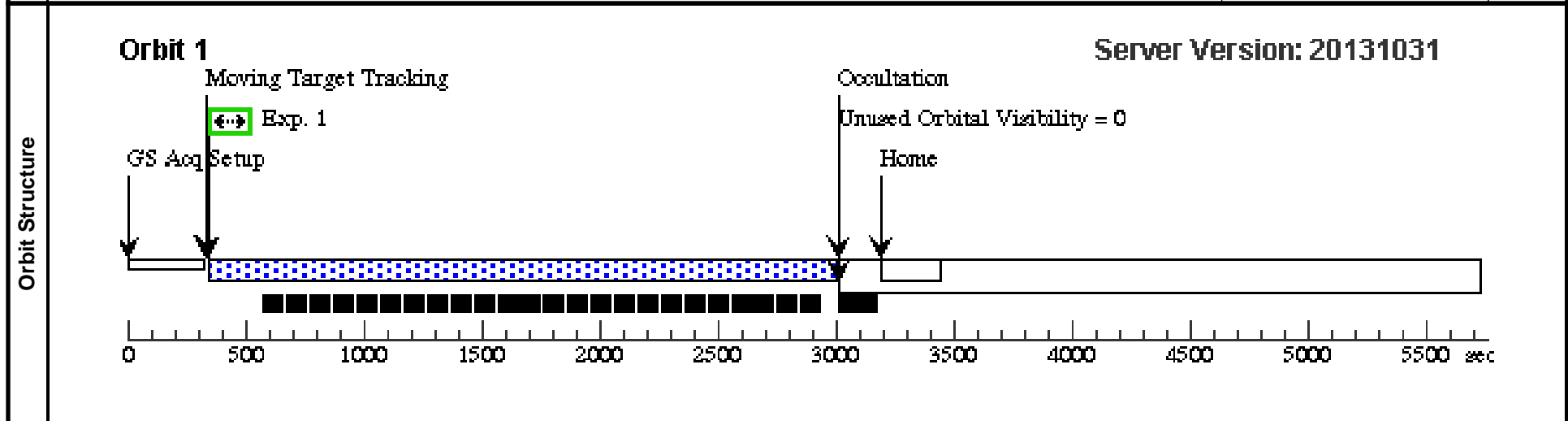
Proposal 13620 - Visit 03 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Wed Apr 02 01:51:32 GMT 2014

<b>Visit</b>	Proposal 13620, Visit 03, completed <b>Diagnostic Status: Warning</b> Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; ORIENT 90D TO 100 D; BETWEEN 17-MAR-2014:08:00:00 AND 17-MAR-2014:15:00:00
	(Exposure 1 (Visit 03)) Warning (Form): Sensitive exposures should have an ETC run number provided.

<b>Solar System Targets</b>	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(3)	EUROPA-3	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-211.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=17-MAR-2014:11:56:30,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH MOSS Show Windows: true	EARTH

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(3) EUROPA-3	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2507 Secs) [=>2507.0 Secs ]	[1]



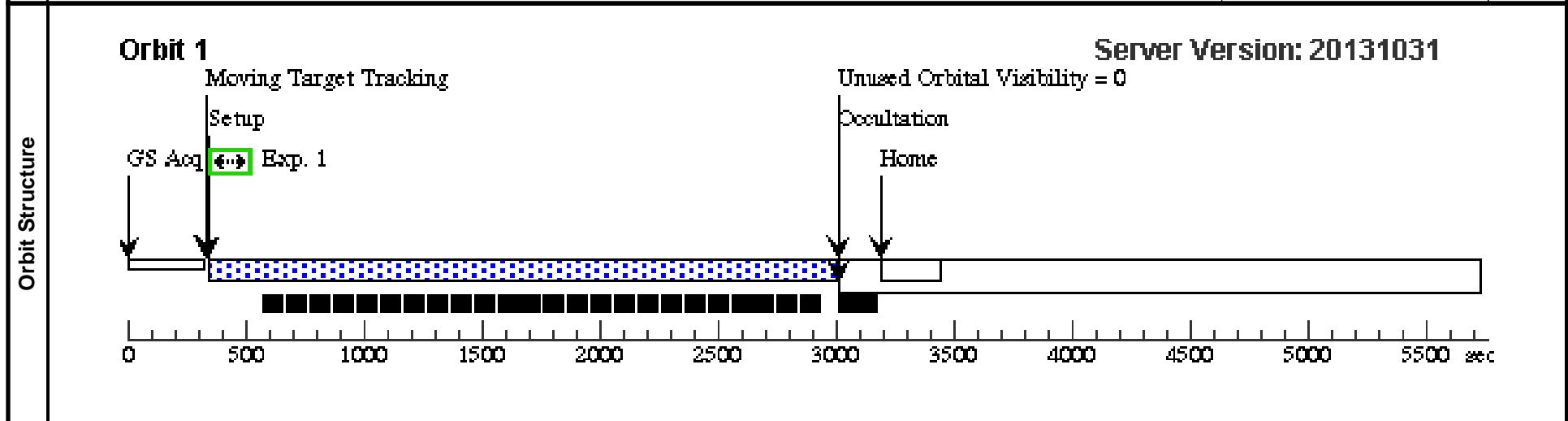
Proposal 13620 - Visit 04 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Wed Apr 02 01:51:33 GMT 2014

<b>Visit</b>	Proposal 13620, Visit 04, completed <b>Diagnostic Status: Warning</b> Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; ORIENT 90D TO 100 D; BETWEEN 24-MAR-2014:10:00:00 AND 24-MAR-2014:17:00:00
	(Exposure 1 (Visit 04)) Warning (Form): Sensitive exposures should have an ETC run number provided.

<b>Solar System Targets</b>	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(7)	EUROPA-4	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-211.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=24-MAR-2014:12:52:00,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH MOSS Show Windows: true	EARTH

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(7) EUROPA-4	STIS/FUV-MAMA, TIME-TAG, F2SSRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2507 Secs) [=>2507.0 Secs ]	[1]





Proposal 13620 - Visit 05 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

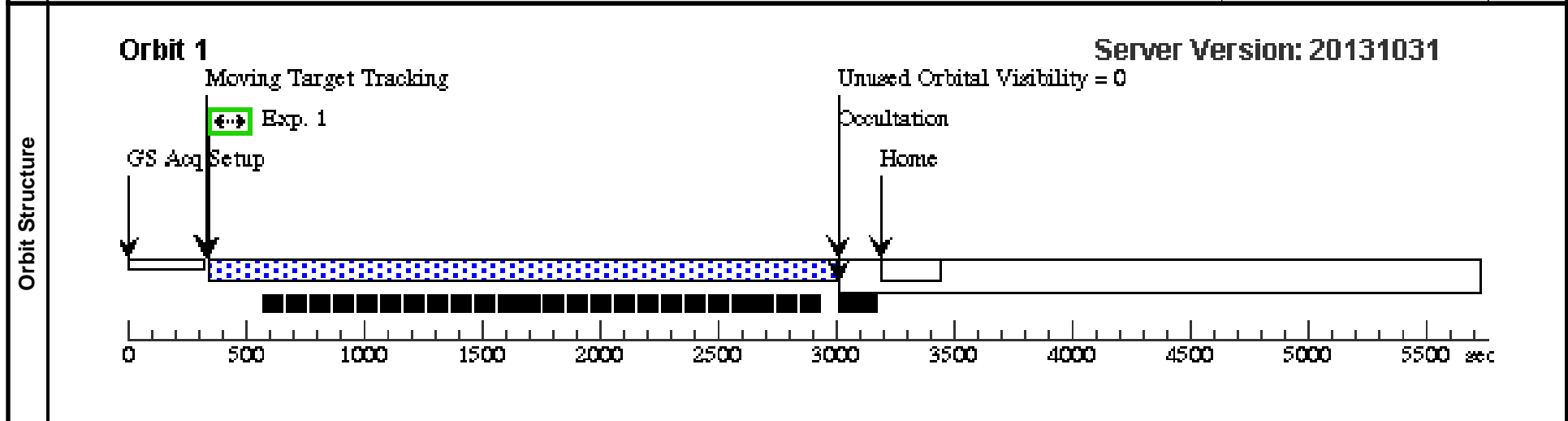
Wed Apr 02 01:51:34 GMT 2014

<b>Visit</b>	Proposal 13620, Visit 05, scheduled <b>Diagnostic Status: Warning</b> Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; ORIENT 90D TO 100 D; BETWEEN 04-APR-2014:02:00:00 AND 04-APR-2014:10:00:00
	(Exposure 1 (Visit 05)) Warning (Form): Sensitive exposures should have an ETC run number provided.

<b>Diagnostics</b>	(Exposure 1 (Visit 05)) Warning (Form): Sensitive exposures should have an ETC run number provided.
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<b>Solar System Targets</b>	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(8)	EUROPA-5	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-211.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=04-APR-2014:05:28:00,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH MOSS Show Windows: true	EARTH

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(8) EUROPA-5	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2507 Secs) [=>2507.0 Secs ]	[1]



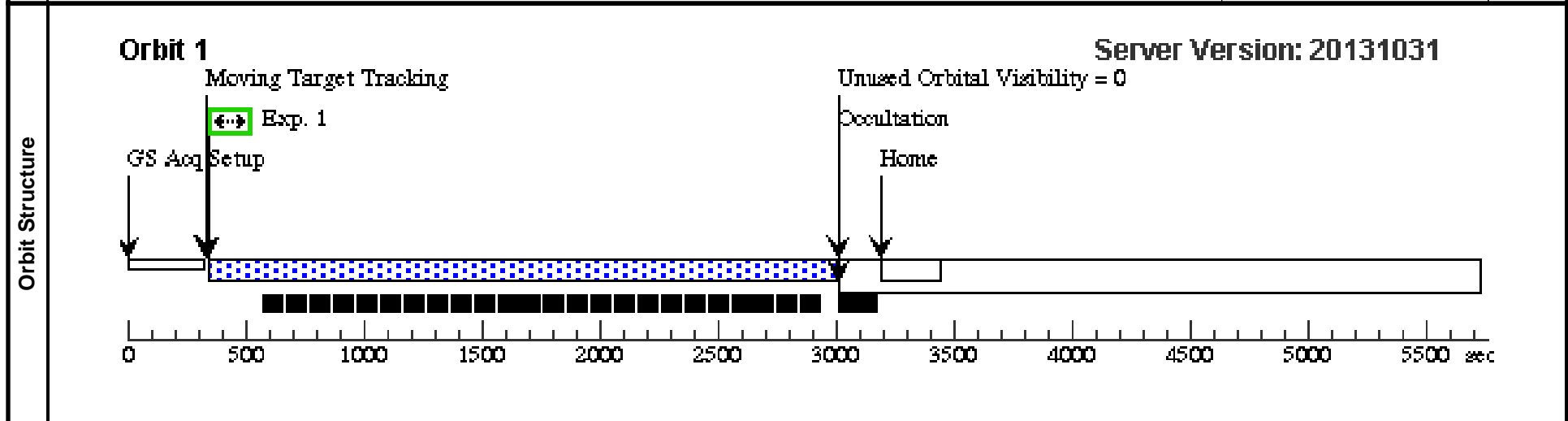
Proposal 13620 - Visit 06 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Wed Apr 02 01:51:34 GMT 2014

<b>Visit</b>	Proposal 13620, Visit 06, scheduling <b>Diagnostic Status: Warning</b> Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; ORIENT 90D TO 100 D; BETWEEN 14-APR-2014:18:00:00 AND 15-APR-2014:01:00:00
	(Exposure 1 (Visit 06)) Warning (Form): Sensitive exposures should have an ETC run number provided.

<b>Solar System Targets</b>	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(9)	EUROPA-6	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-211.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=14-APR-2014:22:02:00,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH MOSS Show Windows: true	EARTH

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(9) EUROPA-6		STIS/FUV-MAMA, TIME-TAG, F2SSRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2507 Secs) [=>2507.0 Secs ]



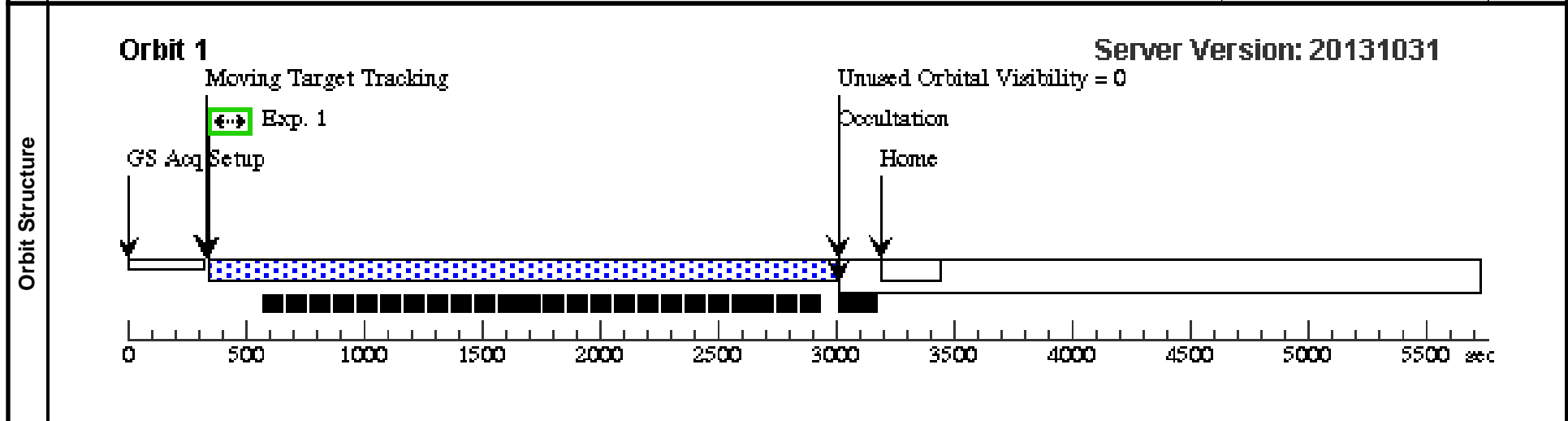
Proposal 13620 - Visit 07 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Wed Apr 02 01:51:35 GMT 2014

<b>Visit</b>	<b>Proposal 13620, Visit 07, implementation</b> <b>Diagnostic Status: Warning</b> Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; ORIENT 90D TO 100 D; BETWEEN 02-MAY-2014:12:00:00 AND 02-MAY-2014:20:00:00
	(Exposure 1 (Visit 07)) Warning (Form): Sensitive exposures should have an ETC run number provided.

<b>Solar System Targets</b>	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(10)	EUROPA-7	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-211.0,REF=NORTH,R_RAD=-51.,R_ANG=0.0,EPOCH=02-MAY-2014:15:24:30,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH MOSS Show Windows: true	EARTH

<b>Exposures</b>	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(10) EUROPA-7	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2507 Secs) [=>2507.0 Secs ]	[1]



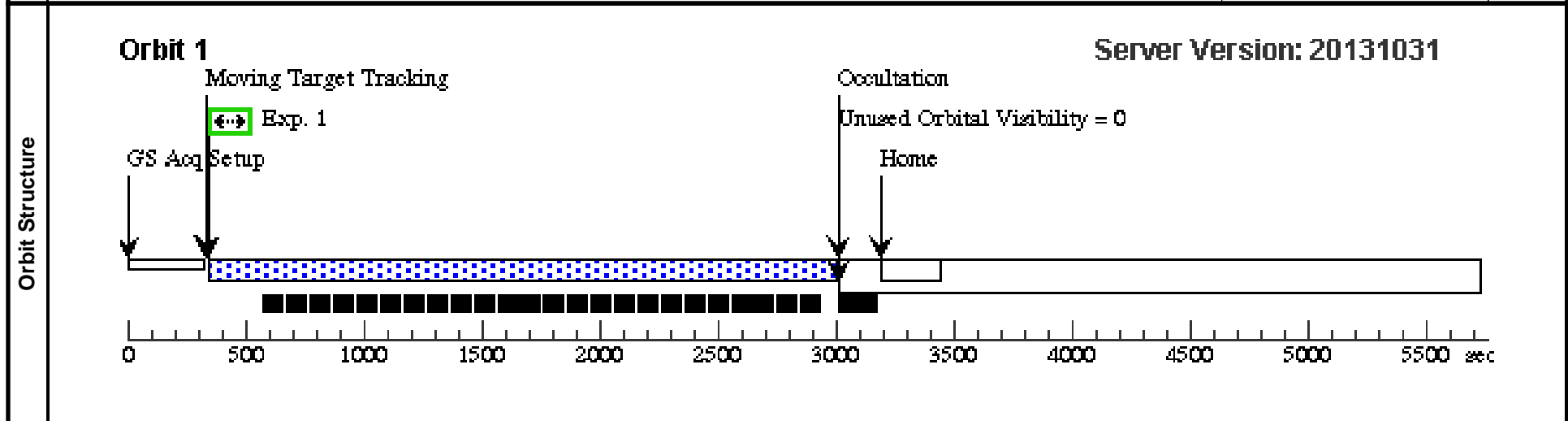
Proposal 13620 - Visit 08 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Wed Apr 02 01:51:36 GMT 2014

<b>Visit</b>	Proposal 13620, Visit 08, implementation <b>Diagnostic Status: Warning</b> Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; ORIENT 90D TO 100 D; BETWEEN 21-APR-2014:22:00:00 AND 22-APR-2014:12:00:00
	(Exposure 1 (Visit 08)) Warning (Form): Sensitive exposures should have an ETC run number provided.

<b>Solar System Targets</b>	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(12)	EUROPA-4-SECOND	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-211.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=22-APR-2014:00:28:30,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH MOSS Show Windows: true	EARTH

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(12) EUROPA-4-SE COND	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2507 Secs) [=>2507.0 Secs ]	[1]



Proposal 13620 - Visit 09 - Probing the atmosphere of a transiting ocean world: are there ice fountains on Europa?

Wed Apr 02 01:51:36 GMT 2014

<b>Visit</b>	Proposal 13620, Visit 09, completed <b>Diagnostic Status: Warning</b> Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 100%; ORIENT 90D TO 100 D; BETWEEN 26-JAN-2014:16:00:00 AND 01-JUL-2014:21:00:00
	(Exposure 1 (Visit 09)) Warning (Form): Sensitive exposures should have an ETC run number provided.

<b>Solar System Targets</b>	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(4)	EUROPA-NOTRAN	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.0,ANG=180.0,REF=NORTH,R_RAD=8.5,R_ANG=0.0,EPOCH=27-FEB-2014:20:30:00,EpochTimeScale=UTC	SEP OF EUROPA JUPITER FROM EARTH GT 15", SEP OF EUROPA JUPITER FROM EARTH LT 30" MOSS Show Windows: true	EARTH

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) EUROPA-NOTRAN	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2507 Secs) [=>2507.0 Secs ]	[1]

