



13829 - The ice plumes of Europa

Cycle: 22, 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) EUROPA-NOTRANSIT-12	STIS/FUV-MAMA	1	13-Feb-2015 21:03:36.0	yes
51	(51) EUROPA-NOTRANSIT-12-COPY	STIS/FUV-MAMA	1	13-Feb-2015 21:03:37.0	yes
02	(2) EUROPA-NOTRANSIT-90	STIS/FUV-MAMA	1	13-Feb-2015 21:03:39.0	yes
03	(3) EUROPA-NOTRANSIT-168	STIS/FUV-MAMA	1	13-Feb-2015 21:03:40.0	yes
04	(4) EUROPA-NOTRANSIT-192	STIS/FUV-MAMA	1	13-Feb-2015 21:03:41.0	yes
05	(5) EUROPA-NOTRANSIT-270	STIS/FUV-MAMA	1	13-Feb-2015 21:03:42.0	yes
06	(6) EUROPA-NOTRANSIT-348	STIS/FUV-MAMA	1	13-Feb-2015 21:03:43.0	yes
07	(7) EUROPA-TRANSITA	STIS/FUV-MAMA	1	13-Feb-2015 21:03:45.0	yes
08	(8) EUROPA-TRANSITB	STIS/FUV-MAMA	1	13-Feb-2015 21:03:46.0	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>
09	(9) EUROPA-TRANSIT-WFC3	WFC3/UVIS	1	13-Feb-2015 21:03:47.0	yes
10	(9) EUROPA-TRANSIT-WFC3	WFC3/UVIS	1	13-Feb-2015 21:03:48.0	yes

11 Total Orbits Used

ABSTRACT

It is of extreme interest to NASA and the scientific community that evidence has been found for plumes of water ice venting from the polar regions of Europa (Roth et al 2014) - spectroscopic detection of off-limb line emission from the dissociation products of water. We were awarded Cycle 21 time to seek direct images of the Europa exosphere, including Enceladus-like plumes if present, basing our study on FUV images of Europa as it transits the smooth face of Jupiter. We also obtained a necessary FUV image of Europa out of transit. These observations provide additional evidence for the presence of ice plumes on Europa. Here, we propose to augment our previous imaging work and to seek an initial, efficient characterization of off-limb emission as Europa orbits Jupiter. Such images provide sensitive flux and column density limits, with exceptional spatial resolution. In transit, our strategy can place firm limits on, or measurements of, absorbing columns, their distribution with altitude above the surface of Europa, and constrain their wavelength dependence and hence composition. Out of transit, geometrical and surface brightness considerations can help us distinguish between continuum FUV emission from forward- or back-scattering, from line emission, or, though we might prefer otherwise, from more subtle instrumental artifacts than hitherto understood. If the ice fountains of Europa 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 six out-of-transit FUV images of Europa using the F25SRF2 long pass filter, spaced around the Europa orbit. We will also obtain two transit observations with STIS and two with WFC3 using the F218W and F225W filters for WFC3.

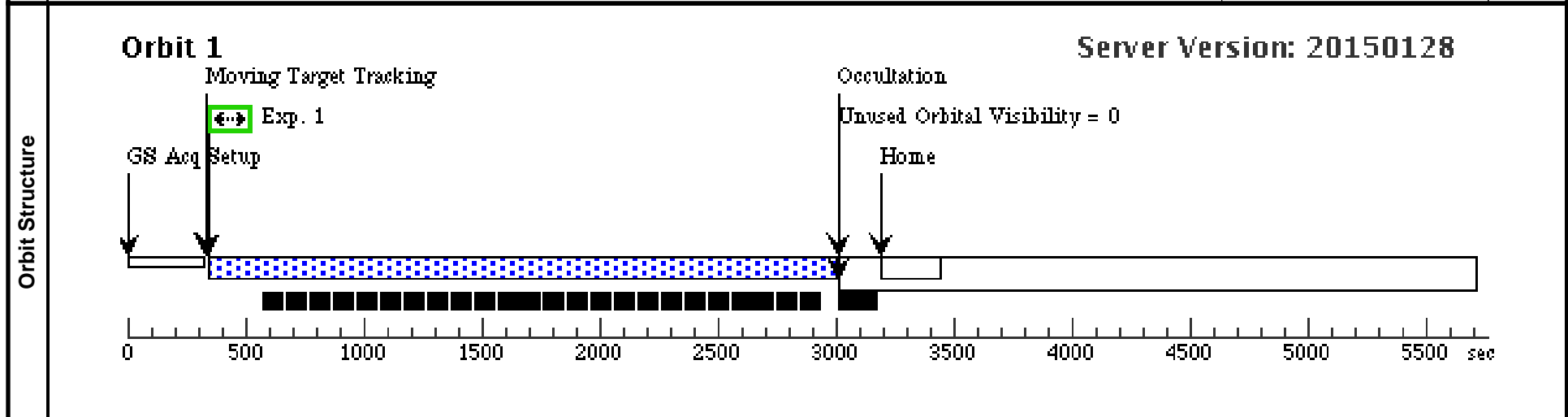
Proposal 13829 - Visit 01 - The ice plumes of Europa

Sat Feb 14 02:03:50 GMT 2015

Visit	Proposal 13829, Visit 01, failed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%: BETWEEN 28-DEC-2014:00:00:00 AND 19-MAR-2015:00:00:00
	(Exposure 1 (Visit 01)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(1)	EUROPA-NOTRANSIT-12	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=44,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=2015.029:1 8:33:00,EpochTimeScale=UTC	OLG OF EUROPA BETWEEN 10 16	EARTH

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) EUROPA-NOTRANSIT-12		STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2508 Secs) [=>2508.0 Secs]



Proposal 13829 - Visit 51 - The ice plumes of Europa

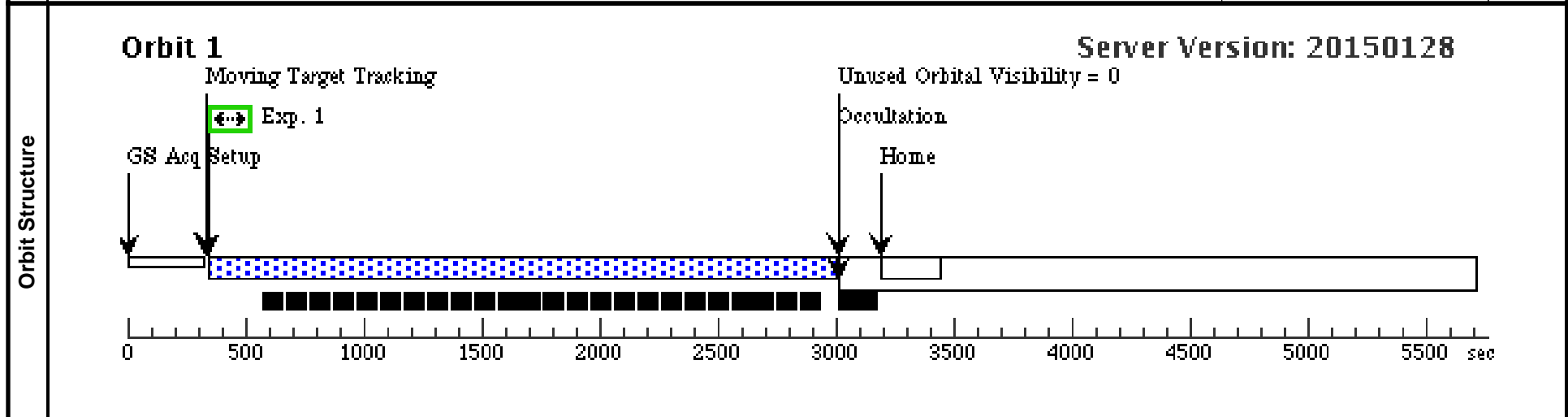
Sat Feb 14 02:03:50 GMT 2015

Visit	Proposal 13829, Visit 51, implementation Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%
	(Exposure 1 (Visit 51)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Diagnostics	(Exposure 1 (Visit 51)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(51)	EUROPA-NOTRANSIT-12-COPY	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=224,REF=NORTH,R_RAD=51,R_ANG=0,EPOCH=2015.065:06:03:00,EpochTimeScale=UTC	OLG OF EUROPA BETWEEN 10 16	EARTH

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(51) EUROPA-NOTRANSIT-12-COPY	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2508 Secs) [=>2508.0 Secs]	[1]



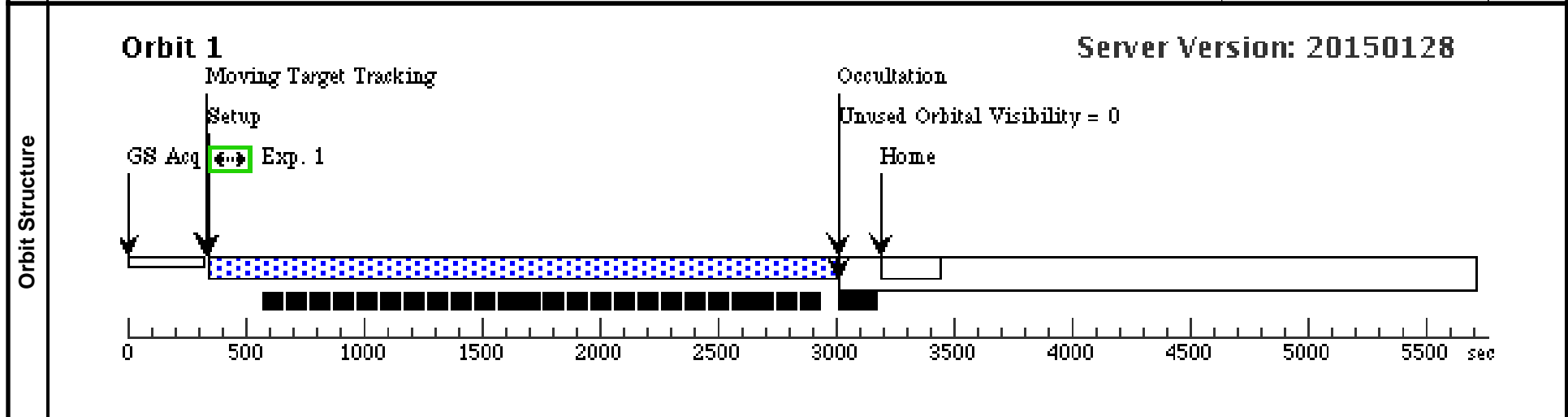
Proposal 13829 - Visit 02 - The ice plumes of Europa

Sat Feb 14 02:03:50 GMT 2015

Visit	Proposal 13829, Visit 02, completed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%: BETWEEN 2015.009:00:00:00 AND 2015.009:10:00:00
	(Exposure 1 (Visit 02)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(2)	EUROPA- NOTRANSIT-90	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG =44.0,REF=NORTH,R_RAD=- 51.0,R_ANG=0.0,EPOCH=2015.009:0 5:07:00,EpochTimeScale=UTC	OLG OF EUROPA BETWEEN 80 100	EARTH

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(2) EUROPA-NOTR ANSIT-90	STIS/FUV-MAMA, TIME-TAG, F2SSRF2	MIRROR	BUFFER-TIME=99	GS ACQ SCENARI O BASE1B3		2700 Secs (2508 Secs) [=>2508.0 Secs]	[1]



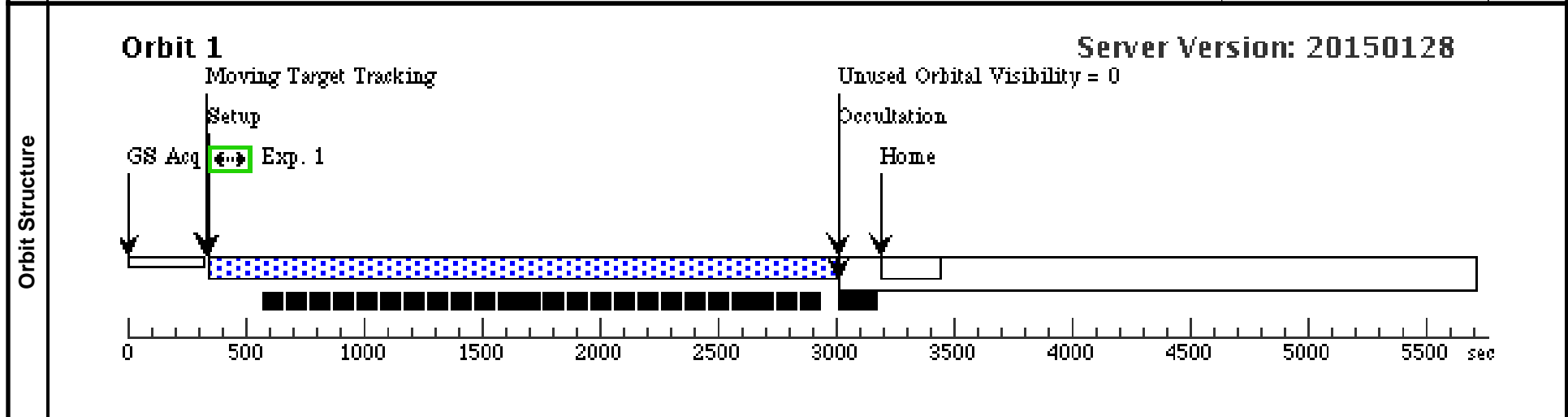
Proposal 13829 - Visit 03 - The ice plumes of Europa

Sat Feb 14 02:03:50 GMT 2015

Visit	Proposal 13829, Visit 03, completed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%: BETWEEN 2015.017:00:00:00 AND 2015.017:10:00:00
	(Exposure 1 (Visit 03)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(3)	EUROPA- NOTRANSIT-168	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG =44.0,REF=NORTH,R_RAD=- 51.0,R_ANG=0.0,EPOCH=2015.017:0 2:30:30,EpochTimeScale=UTC	OLG OF EUROPA BETWEEN 164 170	EARTH

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(3) EUROPA-NOTR ANSIT-168	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2508 Secs) [=>2508.0 Secs]	[1]



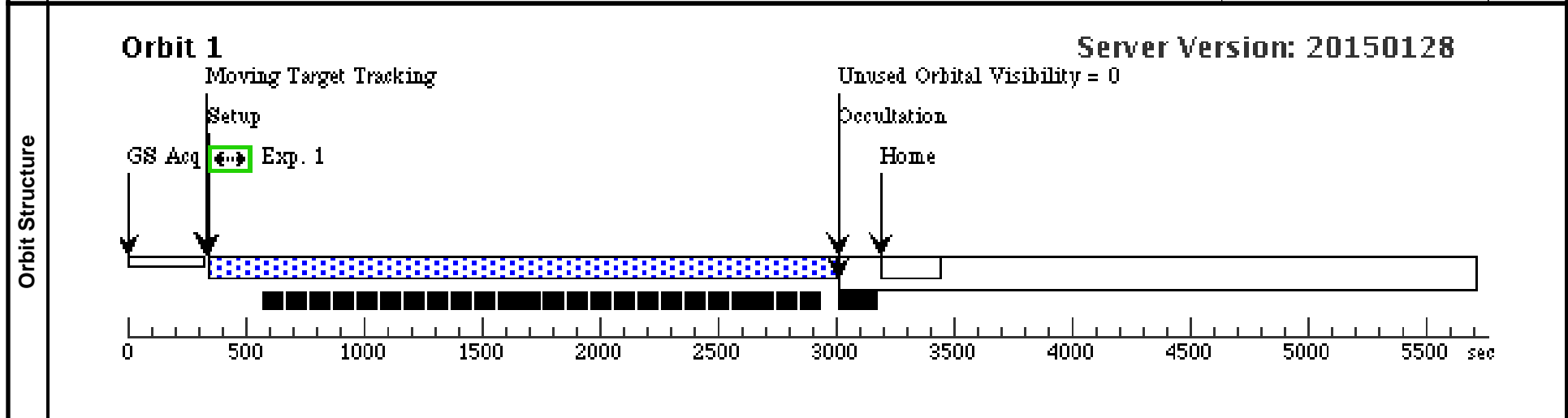
Proposal 13829 - Visit 04 - The ice plumes of Europa

Sat Feb 14 02:03:50 GMT 2015

Visit	Proposal 13829, Visit 04, completed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%: BETWEEN 2015.010:00:00:00 AND 2015.010:16:00:00
	(Exposure 1 (Visit 04)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(4)	EUROPA-NOTRANSIT-192	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=44.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=2015.010:06:35:00,EpochTimeScale=UTC	OLG OF EUROPA BETWEEN 190 196	EARTH

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(4) EUROPA-NOTRANSIT-192	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2508 Secs) [=>2508.0 Secs]	[1]



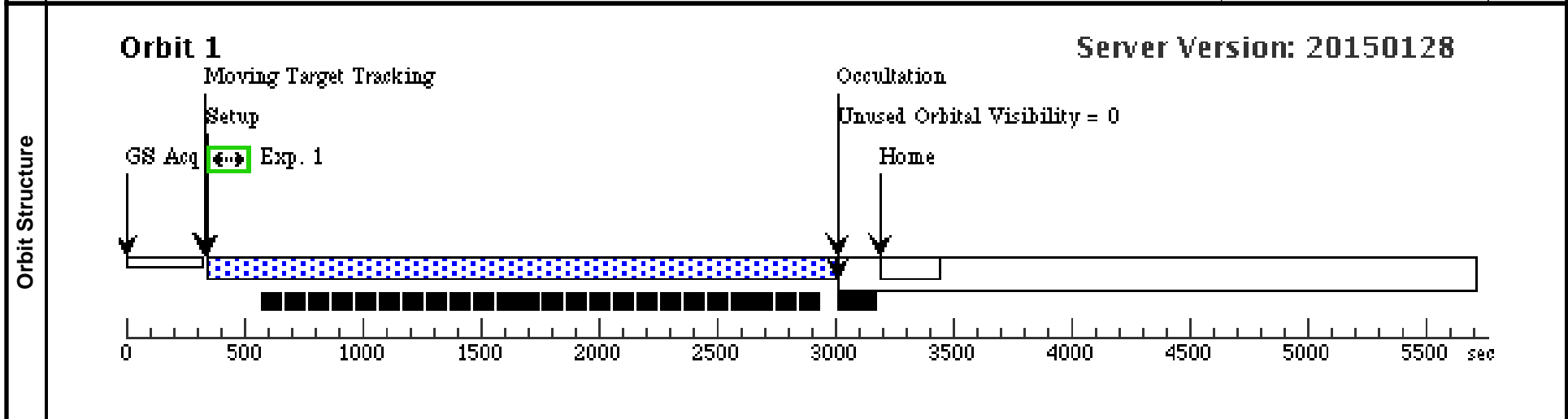
Proposal 13829 - Visit 05 - The ice plumes of Europa

Sat Feb 14 02:03:50 GMT 2015

Visit	Proposal 13829, Visit 05, scheduled Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%: BETWEEN 2015.046:00:00:00 AND 2015.046:23:00:00
	(Exposure 1 (Visit 05)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(5)	EUROPA-NOTRANSIT-270	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-224.0,REF=NORTH,R_RAD=51.0,R_ANG=0.0,EPOCH=2015.046:11:37:00,EpochTimeScale=UTC	OLG OF EUROPA BETWEEN 260 280	EARTH

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(5) EUROPA-NOTRANSIT-270	STIS/FUV-MAMA, TIME-TAG, F2SSRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2508 Secs) [=>2508.0 Secs]	[1]



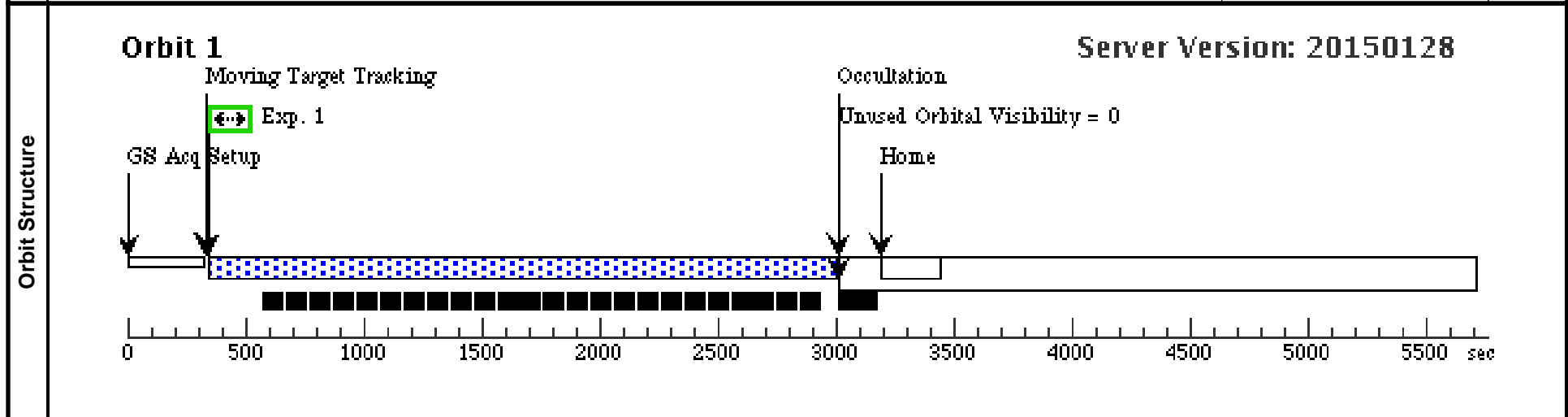
Proposal 13829 - Visit 06 - The ice plumes of Europa

Sat Feb 14 02:03:51 GMT 2015

Visit	Proposal 13829, Visit 06, completed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%: BETWEEN 2014.362:14:00:00 AND 2014.362:20:00:00
	(Exposure 1 (Visit 06)) Warning (Form): Sensitive exposures should have an ETC run number provided.

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(6)	EUROPA-NOTRANSIT-348	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-44.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=2014.362:14:34:00,EpochTimeScale=UTC	OLG OF EUROPA BETWEEN 344 350	EARTH

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(6) EUROPA-NOTRANSIT-348	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99				2700 Secs (2508 Secs) [=>2508.0 Secs]



Proposal 13829 - Visit 07 - The ice plumes of Europa

Sat Feb 14 02:03:51 GMT 2015

Visit	Proposal 13829, Visit 07, completed Diagnostic Status: Warning Scientific Instruments: STIS/FUV-MAMA Special Requirements: SCHED 90%; BETWEEN 2015.006:10:00:00 AND 2015.006:23:00:00 <i>Comments: Time constraints are so that Sun-Target-Observer angle is greater than 0.6 deg (latter to avoid shadow behind target) and Europa diameter is >0.95 arcsec</i>									
	(Exposure 1 (Visit 07)) Warning (Form): Sensitive exposures should have an ETC run number provided.									
Diagnostics										
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center			
	(7)	EUROPA-TRANSITA	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=44.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=2015.006:15:03:00,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH, SEP OF EUROPA JUPITER FROM EARTH LT -5" 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		(7) EUROPA-TRAN SITA	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2508 Secs) [=>2508.0 Secs]	[1]
Orbit Structure	Orbit 1 Server Version: 20150128									
	<p>The diagram illustrates the orbit structure over a 5500-second period. Key events are marked with arrows: GS Acq Setup at approximately 100 seconds, Moving Target Tracking starting at 300 seconds and ending at 3000 seconds, an exposure (Exp. 1) occurring at 300 seconds, Occultation at 3000 seconds, and Home at 3200 seconds. A blue checkered bar represents the observation period from 300 to 3000 seconds. A note indicates 'Unused Orbital Visibility = 0' during the occultation phase.</p>									

Proposal 13829 - Visit 08 - The ice plumes of Europa

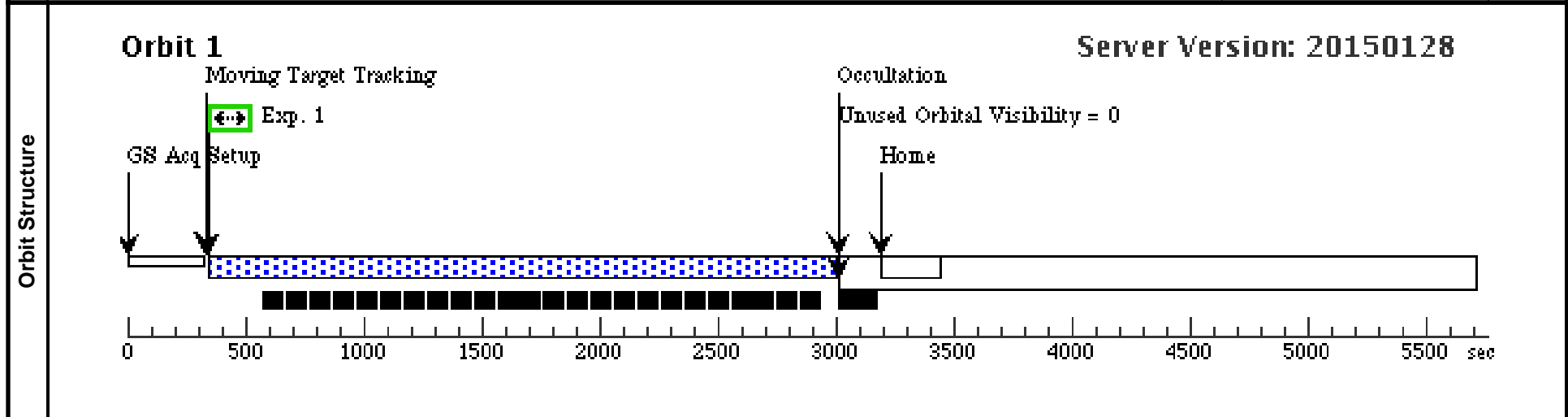
Sat Feb 14 02:03:51 GMT 2015

Visit	<p>Proposal 13829, Visit 08, implementation</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: STIS/FUV-MAMA</p> <p>Special Requirements: SCHED 90%; BETWEEN 2015.033:00:00:00 AND 2015.082:00:00:00</p> <p><i>Comments: Time constraints are so that Sun-Target-Observer angle is greater than 0.6 deg (latter to avoid shadow behind target) and Europa diameter is >0.95 arcsec</i></p>
	<p>(Exposure 1 (Visit 08)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p>

Diagnosics	<p>(Exposure 1 (Visit 08)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p>

Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
	(8)	EUROPA-TRANSITB	STD=JUPITER	STD=EUROPA	TYPE=POS_ANGLE,RAD=6.5,ANG=-224.0,REF=NORTH,R_RAD=-51.0,R_ANG=0.0,EPOCH=2015.063:07:57:00,EpochTimeScale=UTC	TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH, SEP OF EUROPA JUPITER FROM EARTH LT -5" MOSS Show Windows: true	EARTH

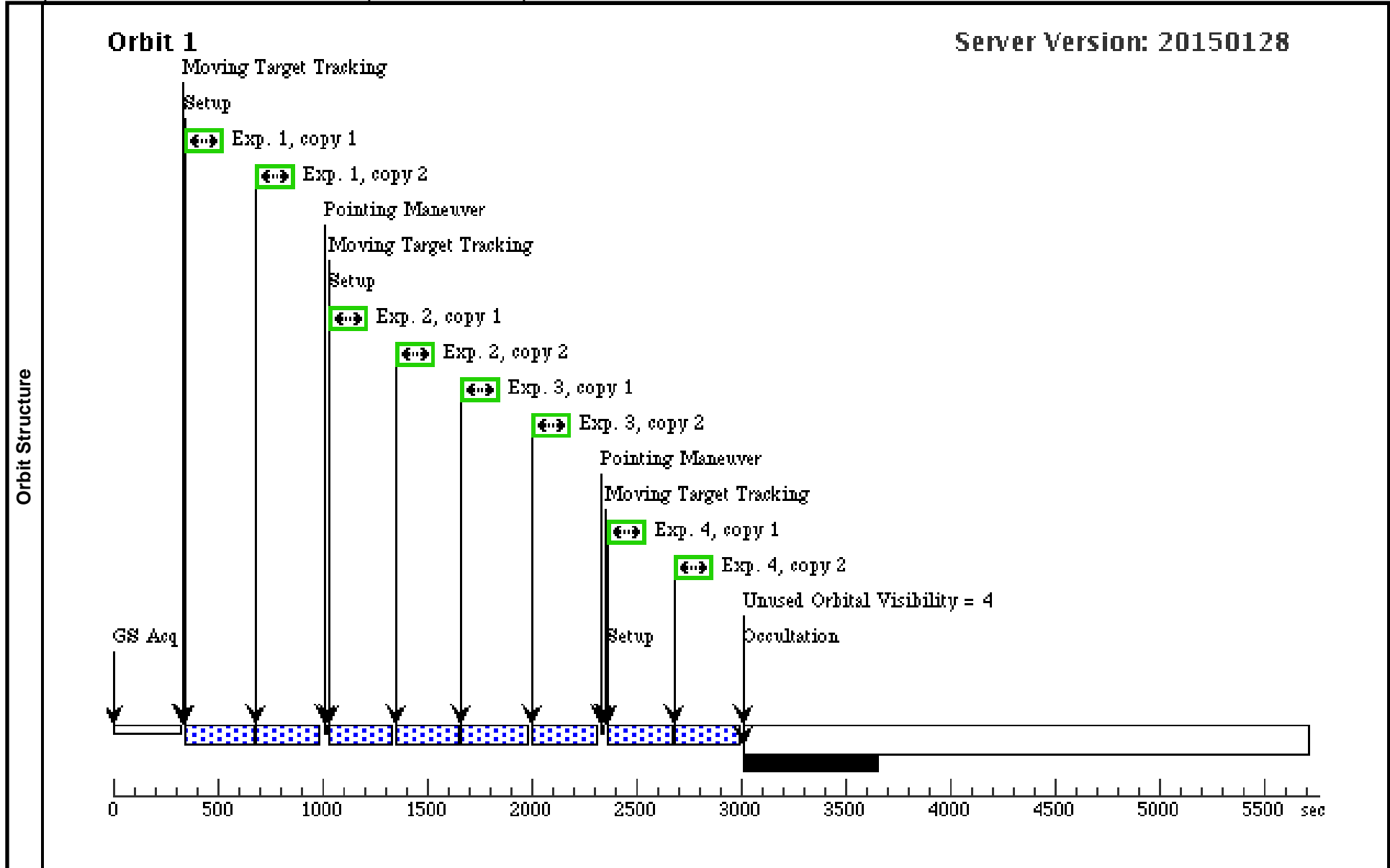
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(8) EUROPA-TRAN SITB	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=99			2700 Secs (2508 Secs) [=>2508.0 Secs]	[1]



Proposal 13829 - Visit 09 - The ice plumes of Europa

Sat Feb 14 02:03:51 GMT 2015

Visit		Proposal 13829, Visit 09, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 90%; BETWEEN 02-JAN-2015:00:00:00 AND 04-FEB-2015:02:00:00; BETWEEN 09-FEB-2015:12:00:00 AND 18-MAR-2015:00:00:00									
Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center				
		(9)	EUROPA-TRANSIT-WFC3	STD=JUPITER	STD=EUROPA		TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH, SEP OF EUROPA JUPITER FROM EARTH LT -5", SEP OF EUROPA GRSAPPROX FROM EARTH GT 5" 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		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W		POS TARG 1.67,1.8 6		140 Secs X 2 (268 Secs) [=>134.0 Secs (Copy 1)] [=>134.0 Secs (Copy 2)]	[1]	
	2		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W				140 Secs X 2 (268 Secs) [=>134.0 Secs (Copy 1)] [=>134.0 Secs (Copy 2)]	[1]	
	3		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F218W				150 Secs X 2 (288 Secs) [=>144.0 Secs (Copy 1)] [=>144.0 Secs (Copy 2)]	[1]	
	4		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F218W		POS TARG -1.67,-1. 86		150 Secs X 2 (288 Secs) [=>144.0 Secs (Copy 1)] [=>144.0 Secs (Copy 2)]	[1]	



Proposal 13829 - Visit 10 - The ice plumes of Europa

Sat Feb 14 02:03:51 GMT 2015

Visit	Proposal 13829, Visit 10, implementation Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/UVIS Special Requirements: SCHED 90%: BETWEEN 02-JAN-2015:00:00:00 AND 04-FEB-2015:02:00:00; BETWEEN 09-FEB-2015:12:00:00 AND 18-MAR-2015:00:00:00									
	Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window	Ephem Center		
	(9)	EUROPA-TRANSIT-WFC3	STD=JUPITER	STD=EUROPA			TRANSIT OF EUROPA ACROSS JUPITER FROM EARTH, SEP OF EUROPA JUPITER FROM EARTH LT -5", SEP OF EUROPA GRSAPPROX FROM EARTH GT 5" 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		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W		POS TARG 1.67,1.8 6		140 Secs X 2 (268 Secs) [=>134.0 Secs (Copy 1)] [=>134.0 Secs (Copy 2)]	[1]
	2		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F225W				140 Secs X 2 (268 Secs) [=>134.0 Secs (Copy 1)] [=>134.0 Secs (Copy 2)]	[1]
	3		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F218W				150 Secs X 2 (288 Secs) [=>144.0 Secs (Copy 1)] [=>144.0 Secs (Copy 2)]	[1]
	4		(9) EUROPA-TRAN SIT-WFC3	WFC3/UVIS, ACCUM, UVIS2-2K2C-SUB	F218W		POS TARG -1.67,-1.86		150 Secs X 2 (288 Secs) [=>144.0 Secs (Copy 1)] [=>144.0 Secs (Copy 2)]	[1]

