



13619 - Confirmation of Europa's water vapor plume activity

Cycle: 21, Proposal Category: GO/DD

(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>
1A	(1) EUROPA-TA200-A	STIS/CCD STIS/FUV-MAMA	5	02-Jan-2014 21:35:29.0	yes
1B	(2) EUROPA-TA200-B	STIS/CCD STIS/FUV-MAMA	5	02-Jan-2014 21:36:02.0	yes
2A	(3) EUROPA-TA225-A	STIS/CCD STIS/FUV-MAMA	5	02-Jan-2014 21:36:37.0	yes
2B	(4) EUROPA-TA225-B	STIS/CCD STIS/FUV-MAMA	5	02-Jan-2014 21:37:06.0	yes

20 Total Orbits Used

ABSTRACT

STIS spectral UV images of Jupiter's satellite Europa obtained during HST Cycle 20 revealed atomic H and O auroral emissions in intensity ratios which uniquely identify the source as electron impact excitation of water molecules above Europa's south pole and hypothesized to be associated with water vapor plumes as reported in Roth et al., Science, 2014. The plumes were detected when Europa was at apocenter on December 30/31, 2012. Two other sets of STIS observations when Europa was near pericenter did not show plume emission within the sensitivity of STIS. The plume variability is predicted to be correlated with Europa's distance from Jupiter in the observed way. However, the one plume detection at apocenter and the two non-detections near pericenter require confirmation. Therefore we request two visits of 5 orbits each to observe Europa at orbital positions of the predicted maximum plume activity (similar to the December 2012 STIS Europa visit) to provide confirmation of the initial STIS discovery and to consolidate the predicted geophysical variability pattern.

OBSERVING DESCRIPTION

The observations consist of 2 visits of 5 orbits each with STIS to observe Europa at orbital positions around orbital true anomaly values of $f = 200$ deg and $f = 225$ deg, respectively.

For our visit 1 the true anomaly should be within the range of 180 and 220 deg. The conditions for this visit are supposed to be as similar as possible to those from visit 2 (Target name: EUROPA-EAST-A) of the GO program 13040.

For our visit 2 a true anomaly range of 205 deg to 245 is requested.

Due to the precession (rotation) of Europa's orbit this constraint can only be defined by parameters available in the APT as e.g., by Europa's orbital longitude (OLG) for a given day and time of the observation.

An overlap in the covered true anomaly ranges of 5 deg between the visits would be ideal. The order, in which the visits are scheduled (first visit 1 or first visit 2), is NOT relevant.

The STIS setup will be adapted from our 2012 Europa observations campaign. With STIS's grating G140L and its 2 arcsec wide long-slit aperture, we will be able to separate reflected sunlight on Europa's surface from the two oxygen lines OI 135.6 nm and OI 130.4 nm, which are emitted predominantly from Europa's oxygen atmosphere. Due to the blotch on the MAMA detector we propose to use the pseudo aperture 52X2D1.

For the science output it is desirable if Europa covers the maximum range of Jovian magnetic latitudes. This condition is met if during each visit the CML OF JUPITER FROM EUROPA lies BETWEEN 184 AND 100 degrees or the CML OF JUPITER FROM EUROPA lies BETWEEN 11 AND

287 degrees. Therefore we have setup two possible target conditions and visits for our visits 1 and 2, respectively. Only ONE of these TWO options (1A or 1B and 2A or 2B) needs to be scheduled, respectively. These CML conditions could be relaxed in case of scheduling conflicts.

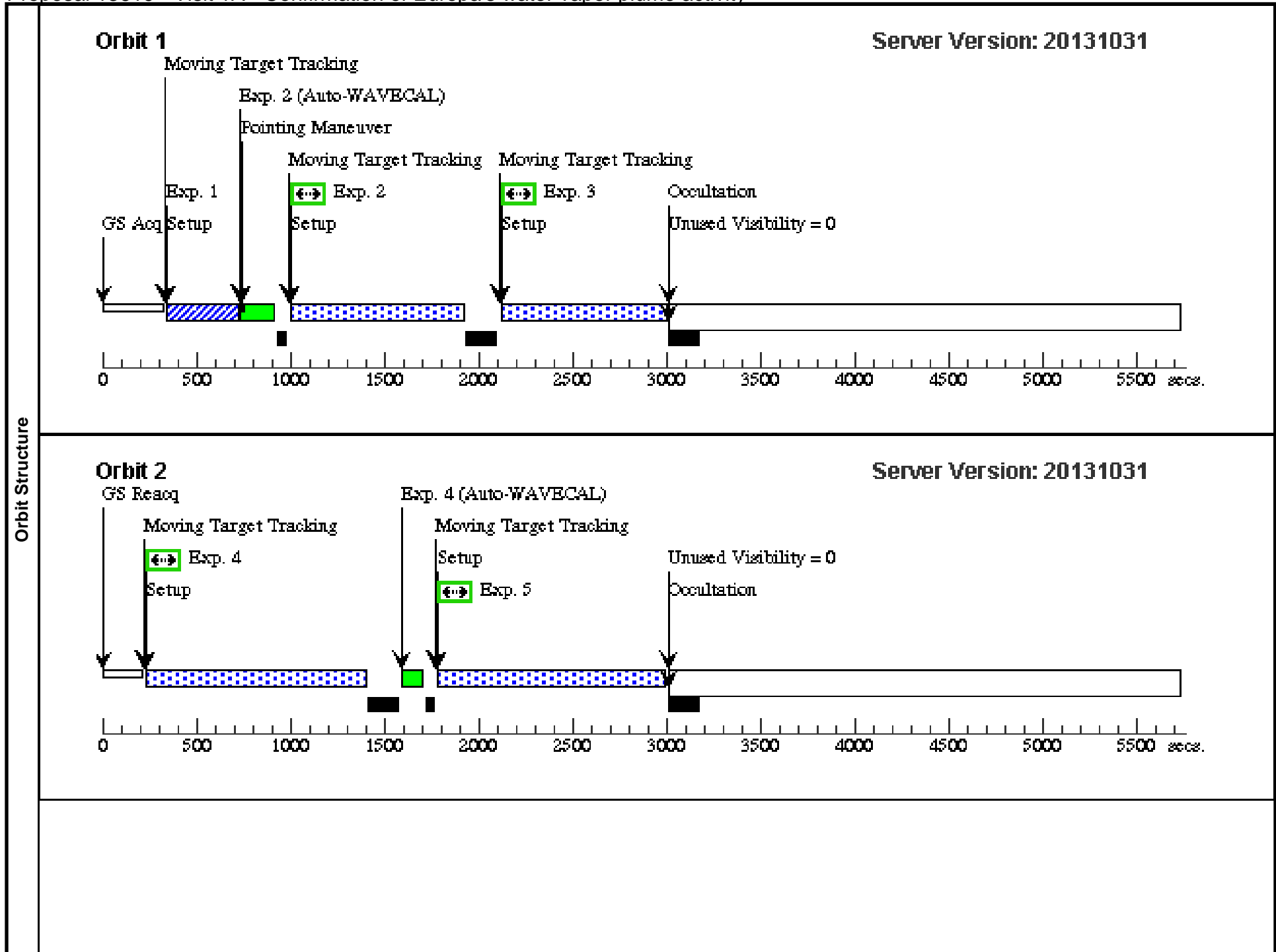
Proposal 13619 - Visit 1A - Confirmation of Europa's water vapor plume activity

Fri Jan 03 02:37:20 GMT 2014

Visit	<p>Proposal 13619, Visit 1A, implementation</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: STIS/CCD, STIS/FUV-MAMA</p> <p>Special Requirements: SCHED 100%</p> <p><i>Comments: Only one of visit 1A and 1B need to be executed.</i></p>																				
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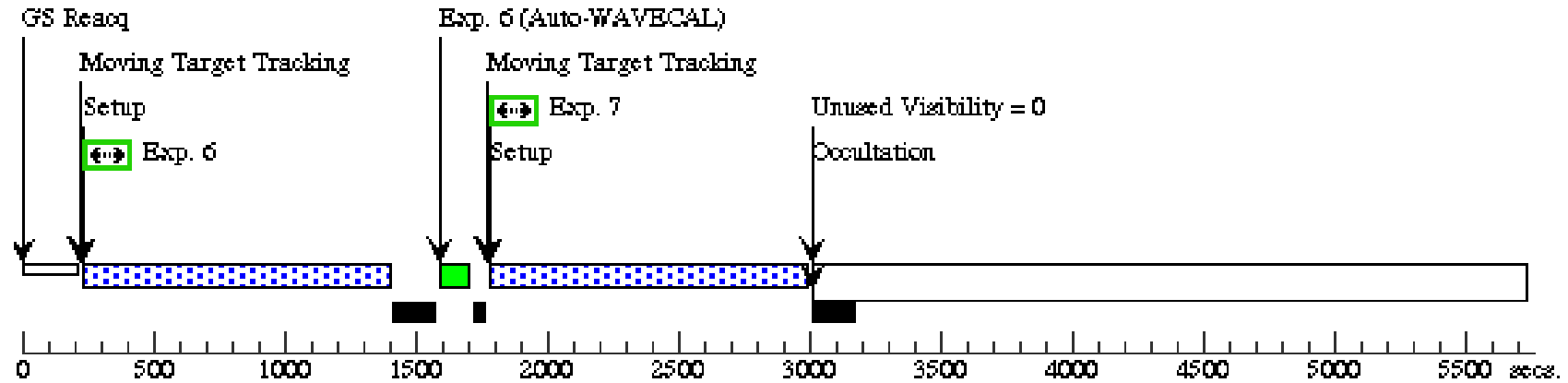
Proposal 13619 - Visit 1A - Confirmation of Europa's water vapor plume activity

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(1) EUROPA-TA200 -A	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=DIFFUSE; SE;	CHECKBOX=23; DIFFUSE-CENTER=GEOMETRIC-CENTER		0.1 Secs (0.1 Secs) [=>]	[1]
	2		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=50 0			850 Secs (865 Secs) [=>865.0 Secs]	[1]
	3		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=50 0			850 Secs (865 Secs) [=>865.0 Secs]	[1]
	4		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[2]
	5		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[2]
	6		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[3]
	7		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[3]
	8		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[4]
	9		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[4]
	10		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[5]
11		(1) EUROPA-TA200 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[5]	



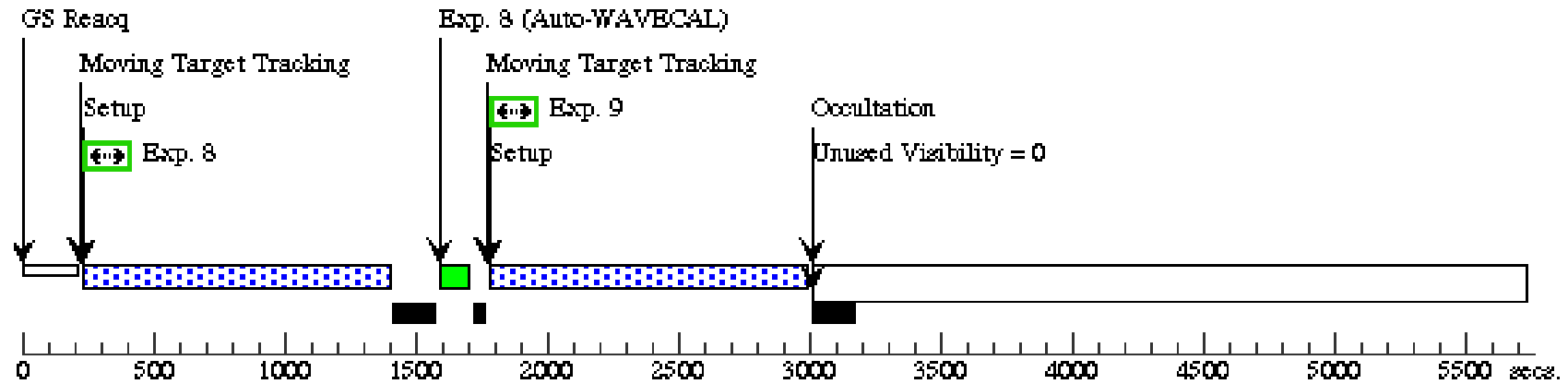
Server Version: 20131031

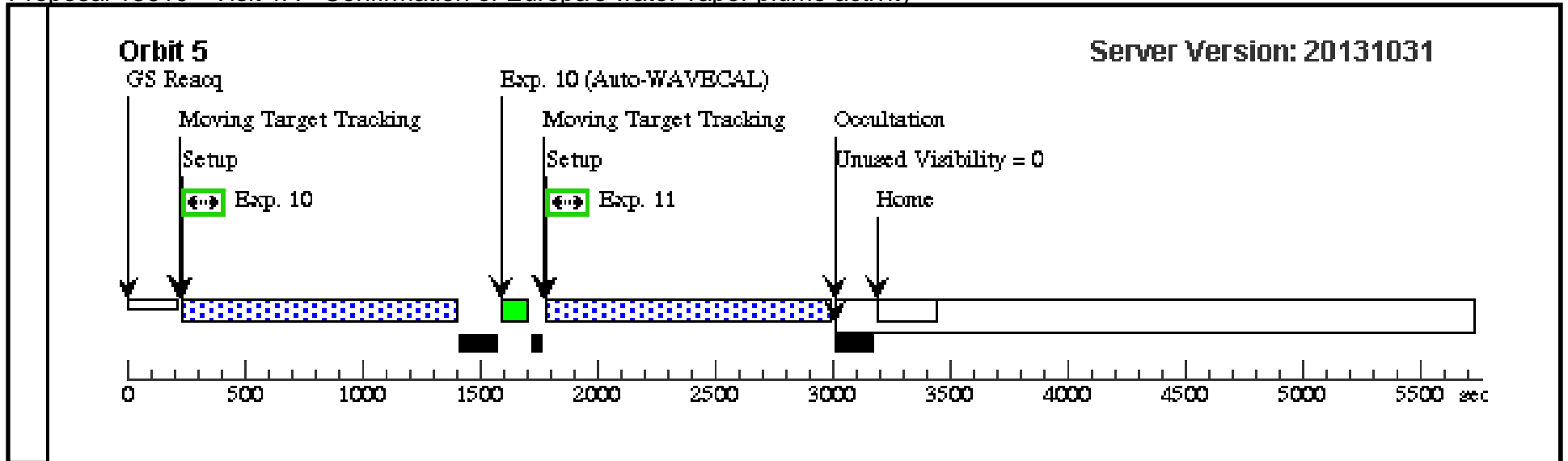
Orbit 3



Server Version: 20131031

Orbit 4





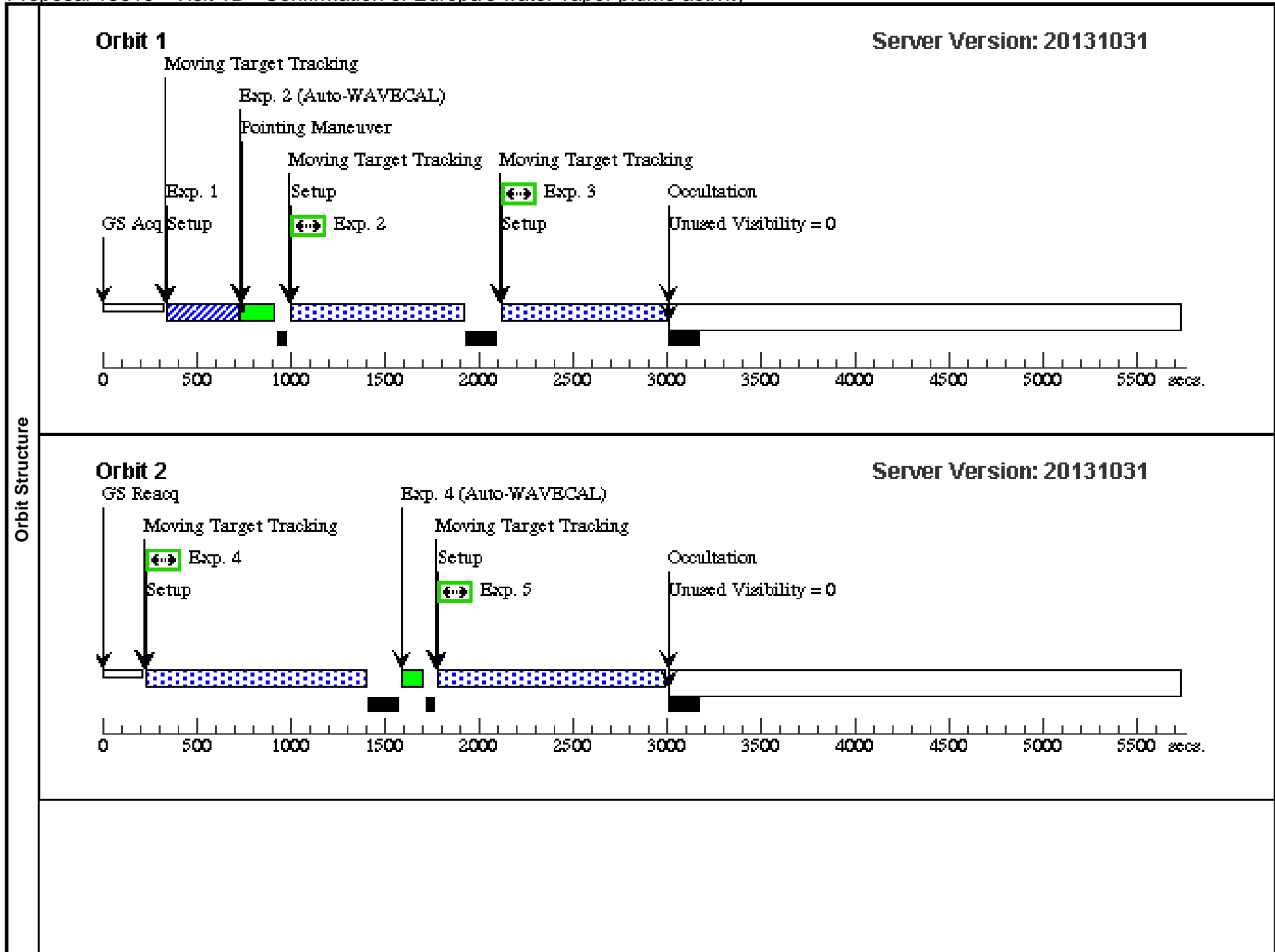
Proposal 13619 - Visit 1B - Confirmation of Europa's water vapor plume activity

Fri Jan 03 02:37:24 GMT 2014

Visit	<p>Proposal 13619, Visit 1B, implementation</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: STIS/CCD, STIS/FUV-MAMA</p> <p>Special Requirements: SCHED 100%</p> <p><i>Comments: Only one of visit 1A and 1B need to be executed.</i></p>																				
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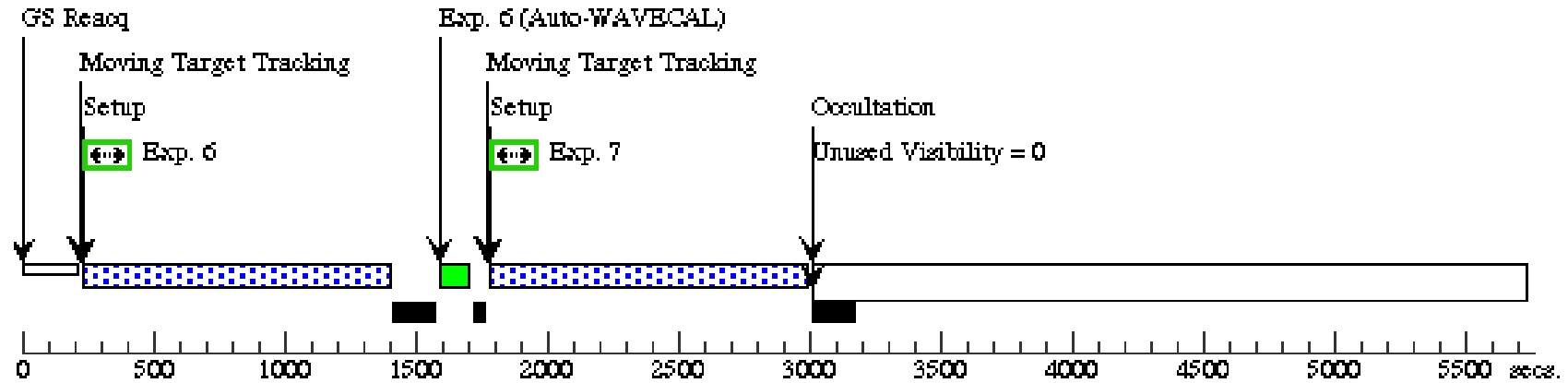
Proposal 13619 - Visit 1B - Confirmation of Europa's water vapor plume activity

Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(2) EUROPA-TA200 -B	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=DIFFUSE; SE;	CHECKBOX=23; DIFFUSE-CENTER=GEOMETRIC-CENTER		0.1 Secs (0.1 Secs) [=>]	[1]
	2		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=50 0			850 Secs (865 Secs) [=>865.0 Secs]	[1]
	3		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=50 0			850 Secs (865 Secs) [=>865.0 Secs]	[1]
	4		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[2]
	5		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[2]
	6		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[3]
	7		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[3]
	8		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[4]
	9		(2) EUROPA-TA200 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[4]
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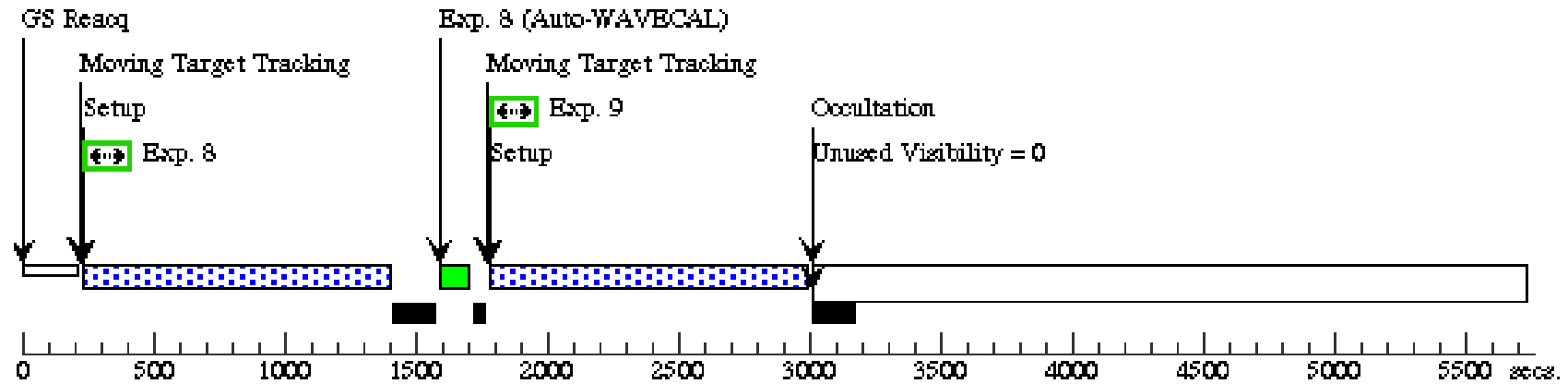
Server Version: 20131031

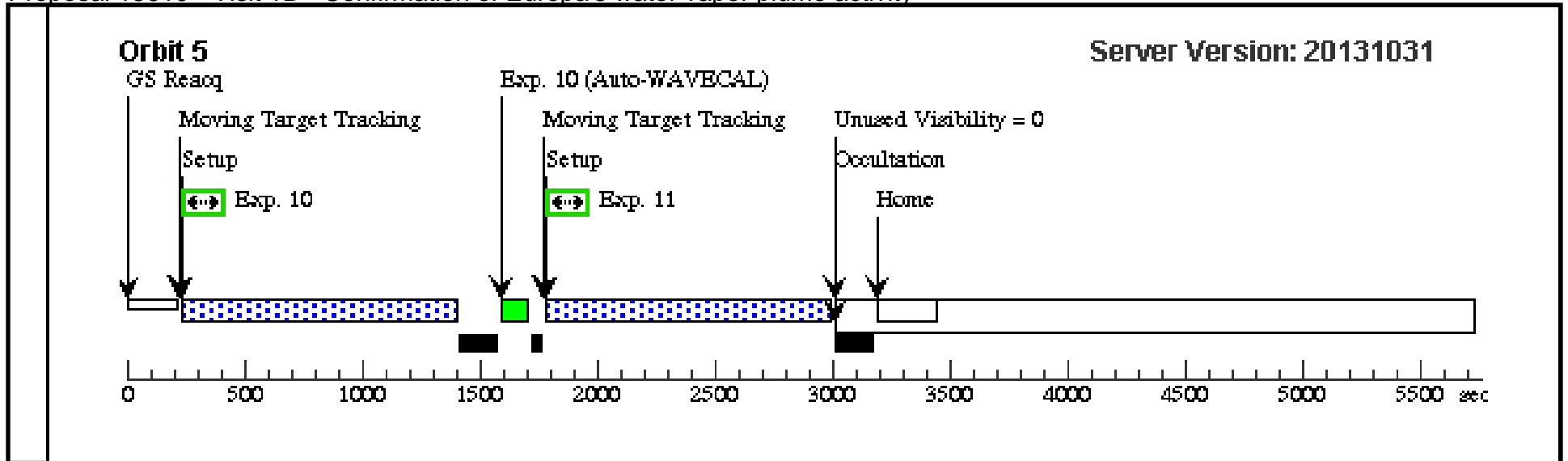
Orbit 3



Server Version: 20131031

Orbit 4





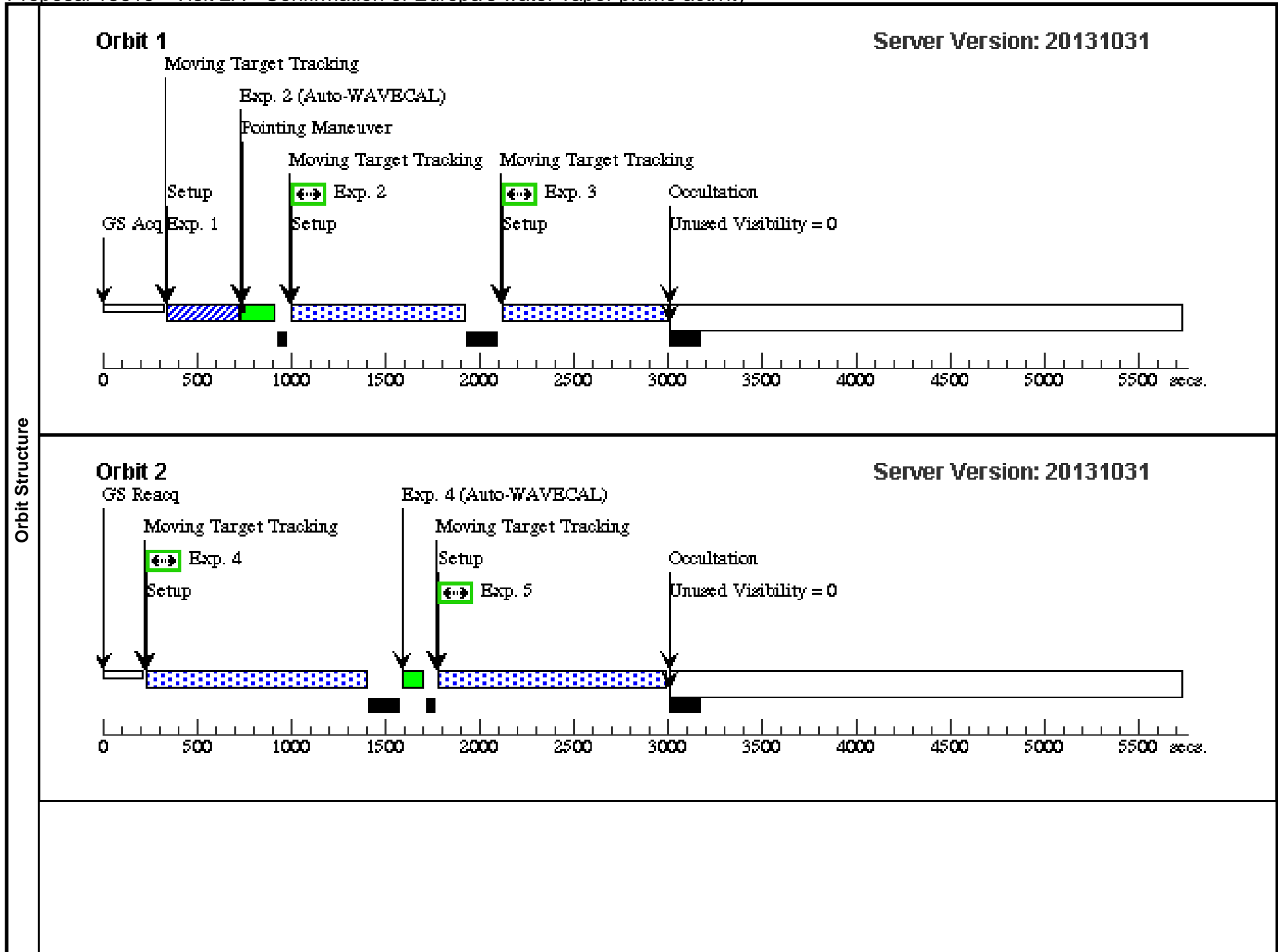
Proposal 13619 - Visit 2A - Confirmation of Europa's water vapor plume activity

Fri Jan 03 02:37:27 GMT 2014

Visit	<p>Proposal 13619, Visit 2A, implementation</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: STIS/CCD, STIS/FUV-MAMA</p> <p>Special Requirements: SCHED 100%</p> <p><i>Comments: Only one of visit 2A and 2B need to be executed.</i></p>						
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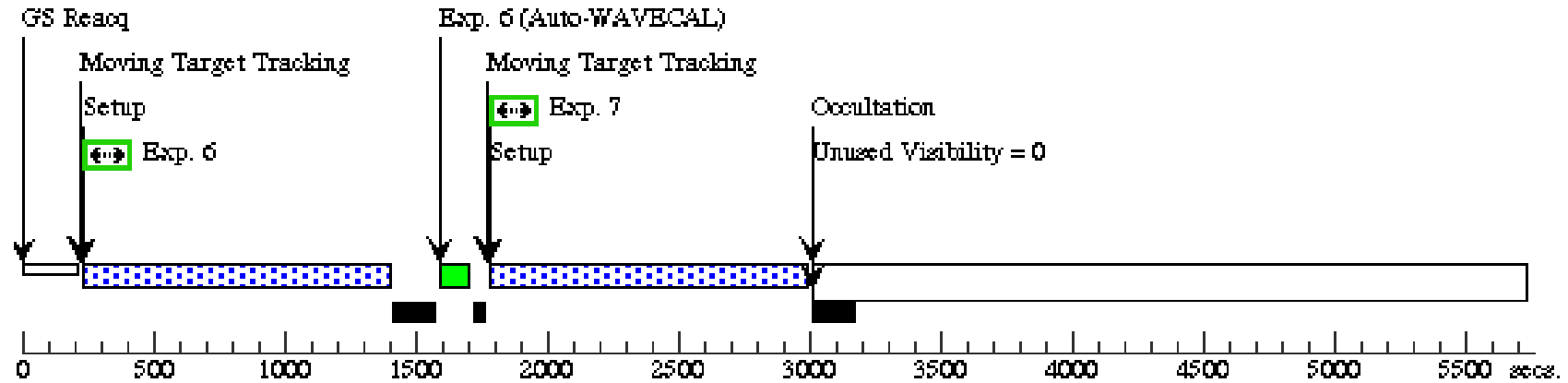
Proposal 13619 - Visit 2A - Confirmation of Europa's water vapor plume activity

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	2		(3) EUROPA-TA225 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=50 0			850 Secs (865 Secs) [=>865.0 Secs]	[1]	
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	5		(3) EUROPA-TA225 -A	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[2]	
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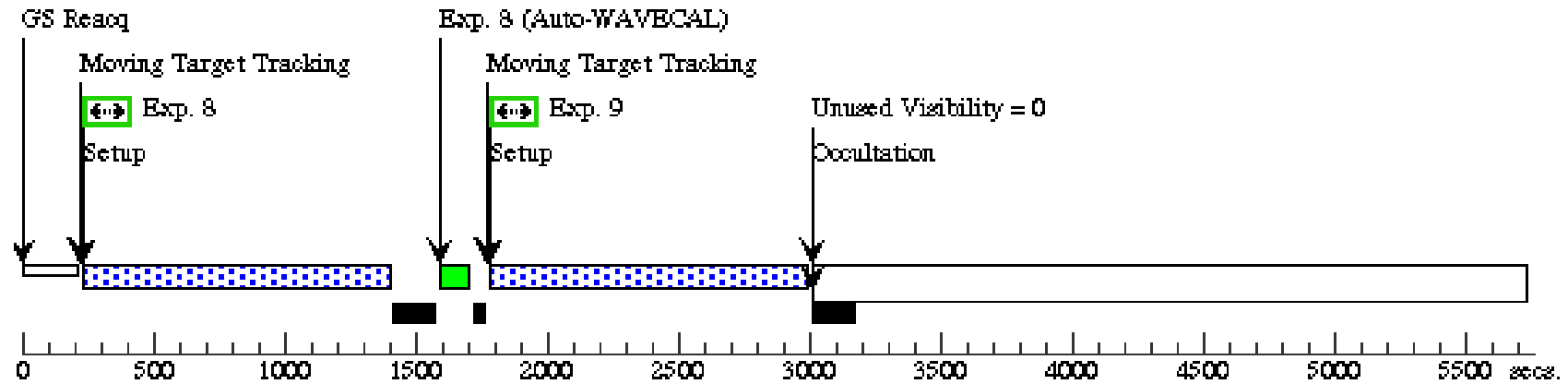
Server Version: 20131031

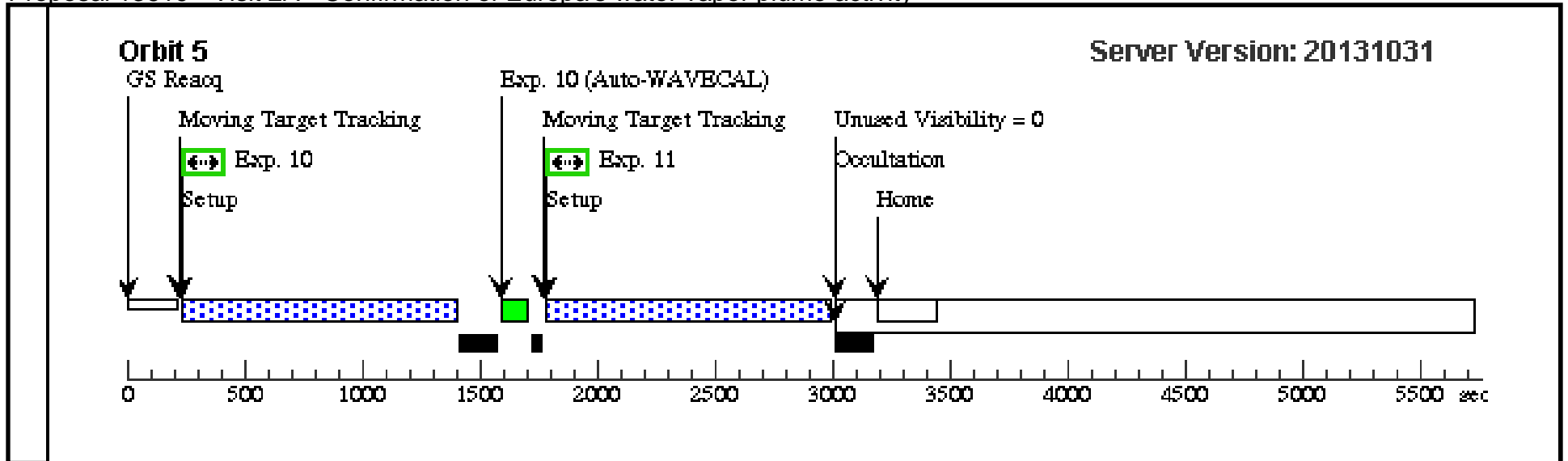
Orbit 3



Server Version: 20131031

Orbit 4





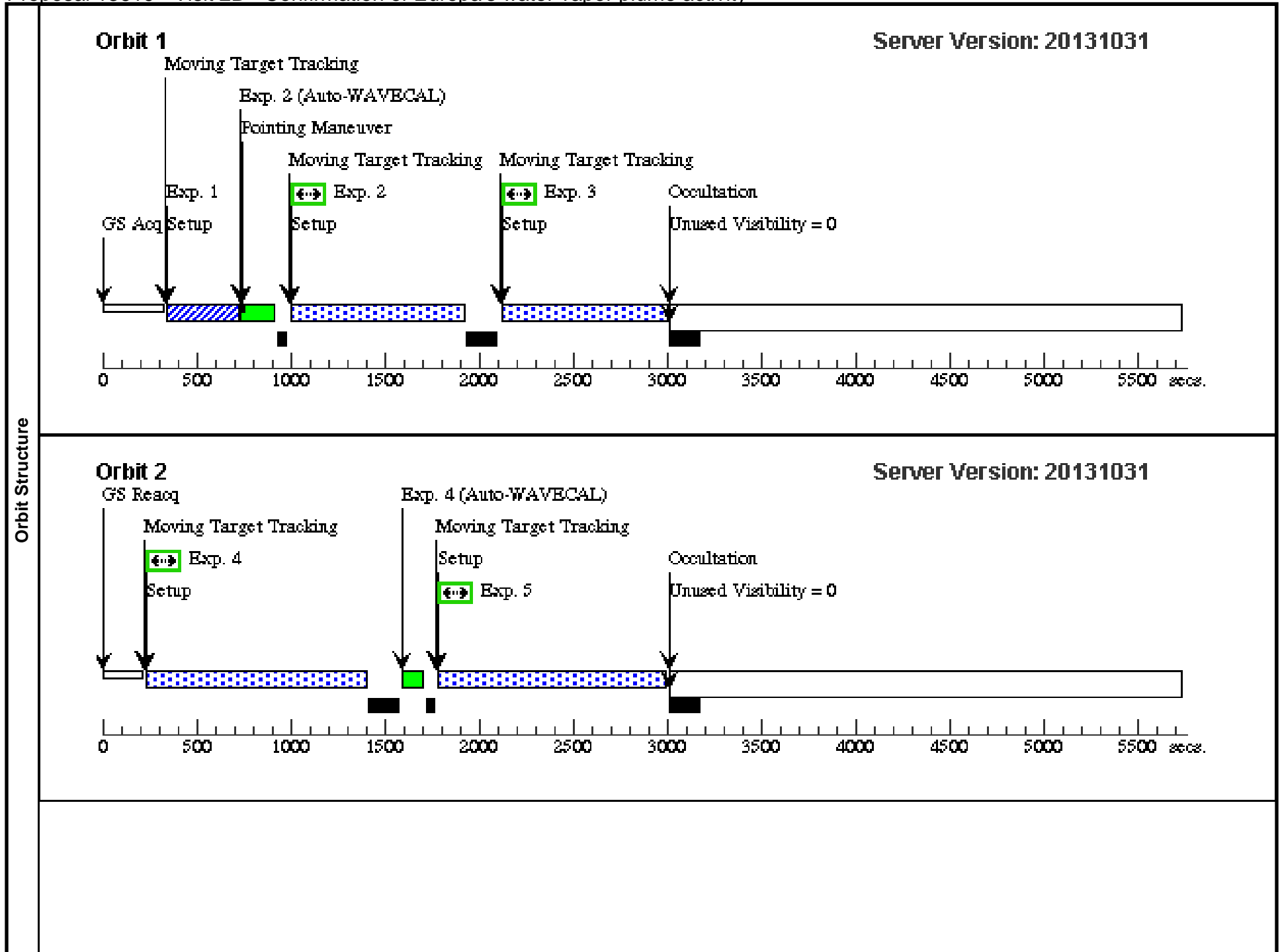
Proposal 13619 - Visit 2B - Confirmation of Europa's water vapor plume activity

Fri Jan 03 02:37:29 GMT 2014

Visit	<p>Proposal 13619, Visit 2B, implementation</p> <p>Diagnostic Status: Warning</p> <p>Scientific Instruments: STIS/CCD, STIS/FUV-MAMA</p> <p>Special Requirements: SCHED 100%</p> <p><i>Comments: Only one of visit 2A and 2B need to be executed.</i></p>																				
	Diagnostics	<p>(Exposure 2 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 3 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 4 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 5 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 6 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 7 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 8 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 9 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 10 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p> <p>(Exposure 11 (Visit 2B)) Warning (Form): Sensitive exposures should have an ETC run number provided.</p>																			
Solar System Targets		<table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Level 1</th> <th>Level 2</th> <th>Level 3</th> <th>Window</th> <th>Ephem Center</th> </tr> </thead> <tbody> <tr> <td>(4)</td> <td>EUROPA-TA225-B</td> <td>STD=JUPITER</td> <td>STD=EUROPA</td> <td></td> <td>SEP OF EUROPA-TA225-B JUPITER FROM EARTH GT 20", SEP OF EUROPA-TA225-B CALLISTO FROM EARTH GT 5", SEP OF EUROPA-TA225-B IO FROM EARTH GT 10", SEP OF EUROPA-TA225-B GANYMEDE FROM EARTH GT 5", OLG OF JUPITER FROM EARTH BETWEEN 330 30, NOT OLG OF EUROPA FROM EARTH BETWEEN 160 200, NOT OLG OF EUROPA FROM EARTH BETWEEN 350 20, CML OF JUPITER FROM EUROPA BETWEEN 184 100</td> <td>EARTH</td> </tr> </tbody> </table>						#	Name	Level 1	Level 2	Level 3	Window	Ephem Center	(4)	EUROPA-TA225-B	STD=JUPITER	STD=EUROPA		SEP OF EUROPA-TA225-B JUPITER FROM EARTH GT 20", SEP OF EUROPA-TA225-B CALLISTO FROM EARTH GT 5", SEP OF EUROPA-TA225-B IO FROM EARTH GT 10", SEP OF EUROPA-TA225-B GANYMEDE FROM EARTH GT 5", OLG OF JUPITER FROM EARTH BETWEEN 330 30, NOT OLG OF EUROPA FROM EARTH BETWEEN 160 200, NOT OLG OF EUROPA FROM EARTH BETWEEN 350 20, CML OF JUPITER FROM EUROPA BETWEEN 184 100	EARTH
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<p><i>Comments: The orbital true anomaly value of Europa needs to be within the range of 205 and 245 deg.</i></p>																					

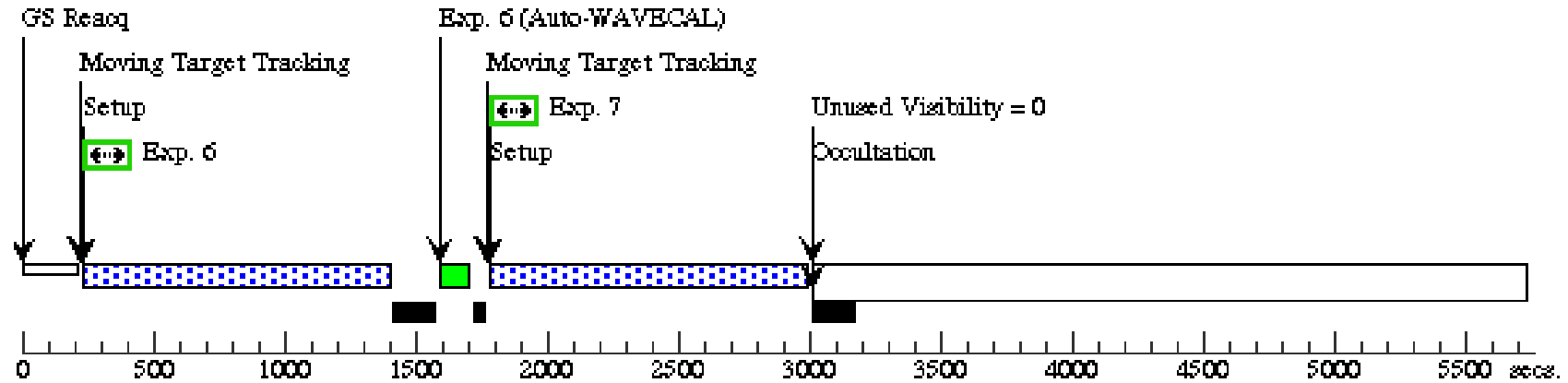
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Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ	(4) EUROPA-TA225 -B	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=DIFFUSE; SE;	CHECKBOX=23; DIFFUSE-CENTER=GEOMETRIC-CENTER		0.1 Secs (0.1 Secs) [=>]	[1]
	2		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=50 0			850 Secs (865 Secs) [=>865.0 Secs]	[1]
	3		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=50 0			850 Secs (865 Secs) [=>865.0 Secs]	[1]
	4		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[2]
	5		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[2]
	6		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[3]
	7		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[3]
	8		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[4]
	9		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[4]
	10		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[5]
11		(4) EUROPA-TA225 -B	STIS/FUV-MAMA, TIME-TAG, 52X2D1	G140L 1425 A	BUFFER-TIME=60 0			1200 Secs (1159 Secs) [=>1159.0 Secs]	[5]	



Server Version: 20131031

Orbit 3



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