



# 10506 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Cycle: 14, Proposal Category: GO

(Availability Mode: SUPPORTED)

## INVESTIGATORS

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## VISITS

<i>Visit</i>	<i>Targets</i>	<i>Configurations</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:00:40.0	yes
02	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:00:45.0	yes
03	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:00:48.0	yes

## Proposal 10506 - Overview

<i>Visit</i>	<i>Targets</i>	<i>Configurations</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
04	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:00:50.0	yes
05	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:00:53.0	yes
06	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:00:55.0	yes
07	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:00:58.0	yes
08	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:01:00.0	yes
09	(1) SATURN1	ACS/SBC	1	22-Jun-2005 21:01:02.0	yes

9 Total Orbits Used

### **ABSTRACT**

Planetary FUV aurora is the most spectacular signature of the electrodynamic coupling between the solar wind, the planet's magnetic field, and its atmosphere. Saturn's magnetosphere has similarities both with the Earth's magnetosphere, which is 'open' to solar wind interaction and Jupiter's relatively 'closed' case with its large internal sources of plasma. HST observations of Saturn's aurora have shown a much more complex and dynamic morphology than anticipated: a frequent 'spiral' structure, a changing size of the oval in response to variations of the solar wind dynamics pressure, and large brightness changes in a few ten of minutes following compression of the magnetosphere by the solar wind. In addition, the global morphology and some spots move at 70% of the planetary co-rotation, while some other features appear nearly fixed in local time. Recently, ideas have emerged to account for Saturn's aurora specificities, although many aspects are still not understood due to the paucity of observational data. Electric current models suggest that the main oval is located at the limit between closed and open magnetic field lines, near the magnetopause. The availability of Cassini in Saturn's magnetic environment now offers a unique opportunity for collaborative science. We thus propose to test the relationship between the aurora and conditions at Saturn's magnetopause (MP) boundary. We plan to image the FUV aurora with ACS at times of inbound Cassini crossing of the MP from the upstream solar wind/magnetosheath region into the middle magnetosphere during an inbound segment of a Cassini's orbit. FUV images will also reveal whether the main oval changes its size over the interval, possibly indicating evidence for changes in the amount of open flux in the system. These HST images of the aurora simultaneous with in situ measurements of the plasma characteristics and electrodynamic inside the magnetosphere are critical to obtain key observational tests and constraints to future ideas and models of Saturn's auroral

precipitation and magnetospheric processes involved.

### **OBSERVING DESCRIPTION**

These observations must be carried out in parallel with Cassini in situ observations of Saturn's magnetopause crossing.

We need an interval of about 48 hours in order to fully encompass the full range of expected magnetopause positions.

We plan to take images at a frequency of one HST orbit every 5-7 hours, in order to maximize the probability to observe magnetopause crossing whilst imaging.

Using 9 individual HST orbits placed 3-5 orbits apart, we will obtain 8 intervals straddling the upstream solar wind down to the middle magnetosphere .

ACS images will be obtained in each orbit, with the F125LP FUV filter.

Consideration of Cassini's schedules and magnetopause crossings leads to the following list of suitable observation periods, among which one Cassini orbital segment will be selected:

Rev. 16: between day 282 (9th October) 12:00 and day 284 (11th October) 06:00 UT

Rev. 17: between day 300 (27th October) 06:00 and day 302 (29th October) 00:00 UT

Rev. 18: between day 328 (24th November) 18:00 and day 330 (26th November) 12:00 UT

Rev. 19: between day 356 (22nd December) 00:00 and day 358 (24th December) 00:00 UT

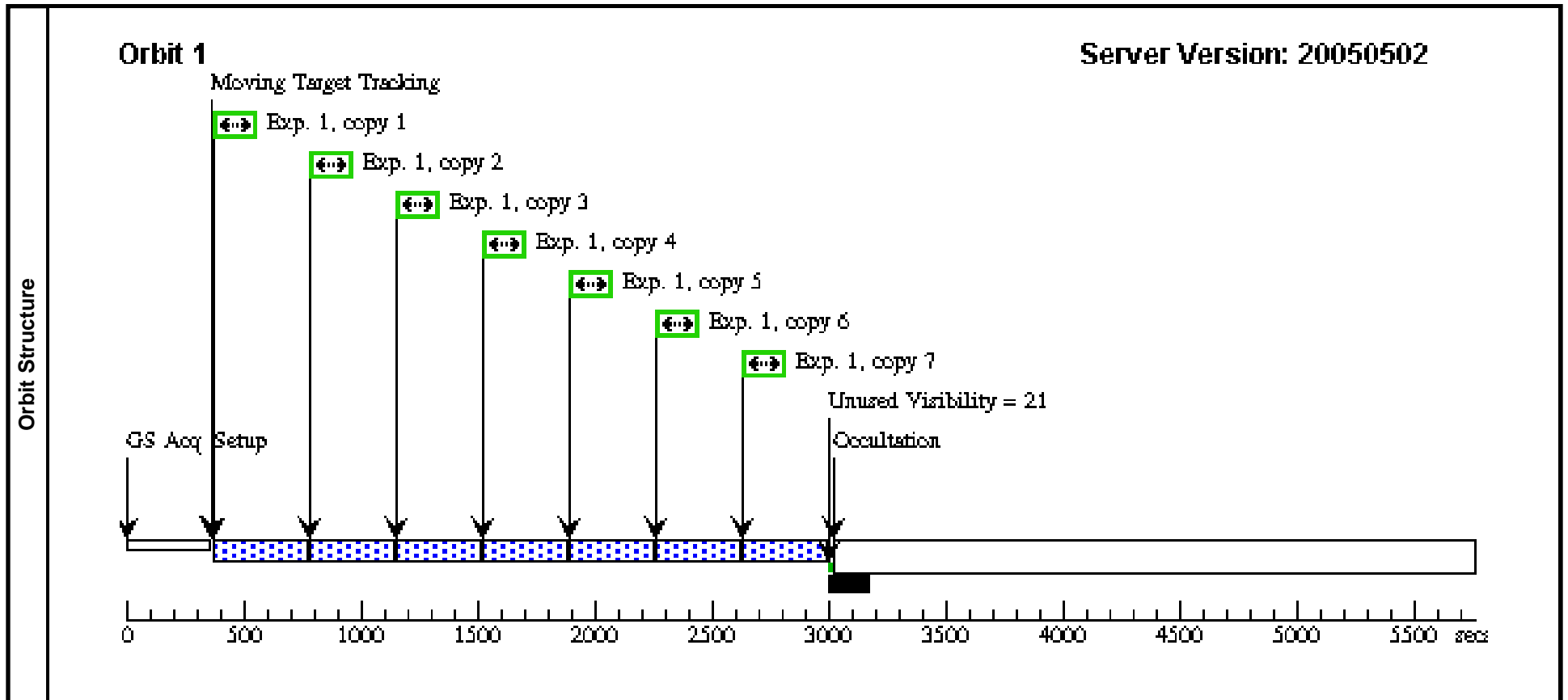
Rev. 20: between day 014 (14th January) 00:00 and day 16 (16th January) 06:00 UT

Rev. 21: between day 052 (21st February) 18:00 and day 055 (24th February) 06:00 UT

Proposal 10506 - Visit 01 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:04 GMT 2005

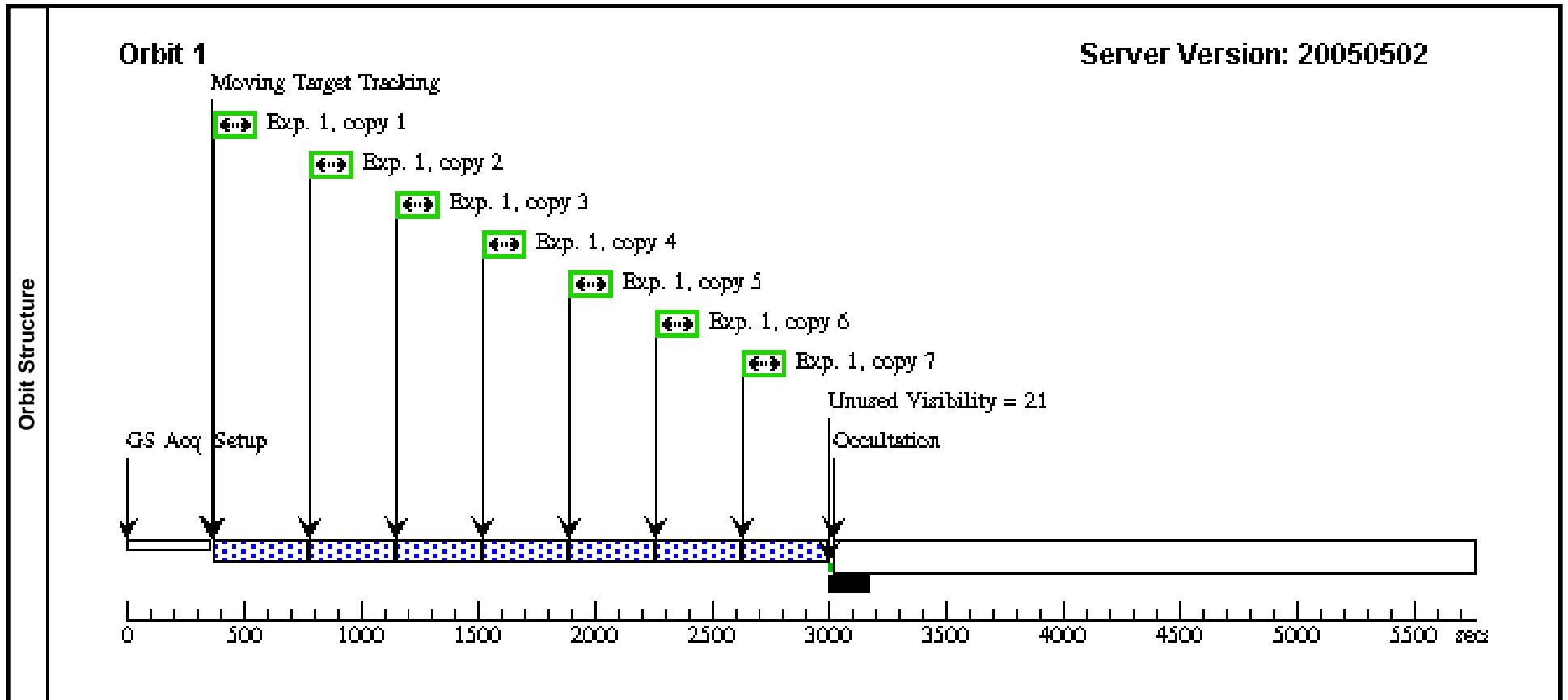
<b>Visit</b>	<p><b>Proposal 10506, Visit 01</b></p> <p><b>Diagnostic Status: No Diagnostics</b></p> <p>Scientific Instruments: ACS/SBC</p> <p>Special Requirements: SCHED 100%; BETWEEN 20-DEC-2005:12:00:00 AND 21-DEC-2005:12:00:00; BETWEEN 23-NOV-2005:08:00:00 AND 24-NOV-2005:08:00:00; BETWEEN 25-OCT-2005:18:00:00 AND 26-OCT-2005:18:00:00; BETWEEN 08-OCT-2005:01:00:00 AND 09-OCT-2005:01:00:00; SEQ 01,02,03,04,05,06,07,08,09 WITHIN 12 D</p> <p><i>Comments: There are 4 windows, corresponding to Cassini's observation periods (Rev) :</i></p> <p>Rev 16 : day 281                  Rev 17 : day 299                  Rev 18 : day 327                  Rev 19 : day 354</p> <p>Rev 19 (20 Dec 2005) is our best choice                  The final choice will be discussed with the CS and the TA.</p> <p>In the TIMING REQUIREMENTS, we have used SEQUENCE within 12 days in order to make sure that all the visits will be executed during the same Cassini window that is they are not scattered over the 4 windows.</p>									
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>			
(1)		SATURN1	STD=SATURN	<p><i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i></p>						
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>	<b>Orbit</b>
	1		(1) SATURN1	ACS/SBC, ACCUM, SBC	F125LP				330.0 Secs X 7 [=>(Copy 1)] [=>(Copy 2)] [=>(Copy 3)] [=>(Copy 4)] [=>(Copy 5)] [=>(Copy 6)] [=>(Copy 7)]	[1]



Proposal 10506 - Visit 02 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:05 GMT 2005

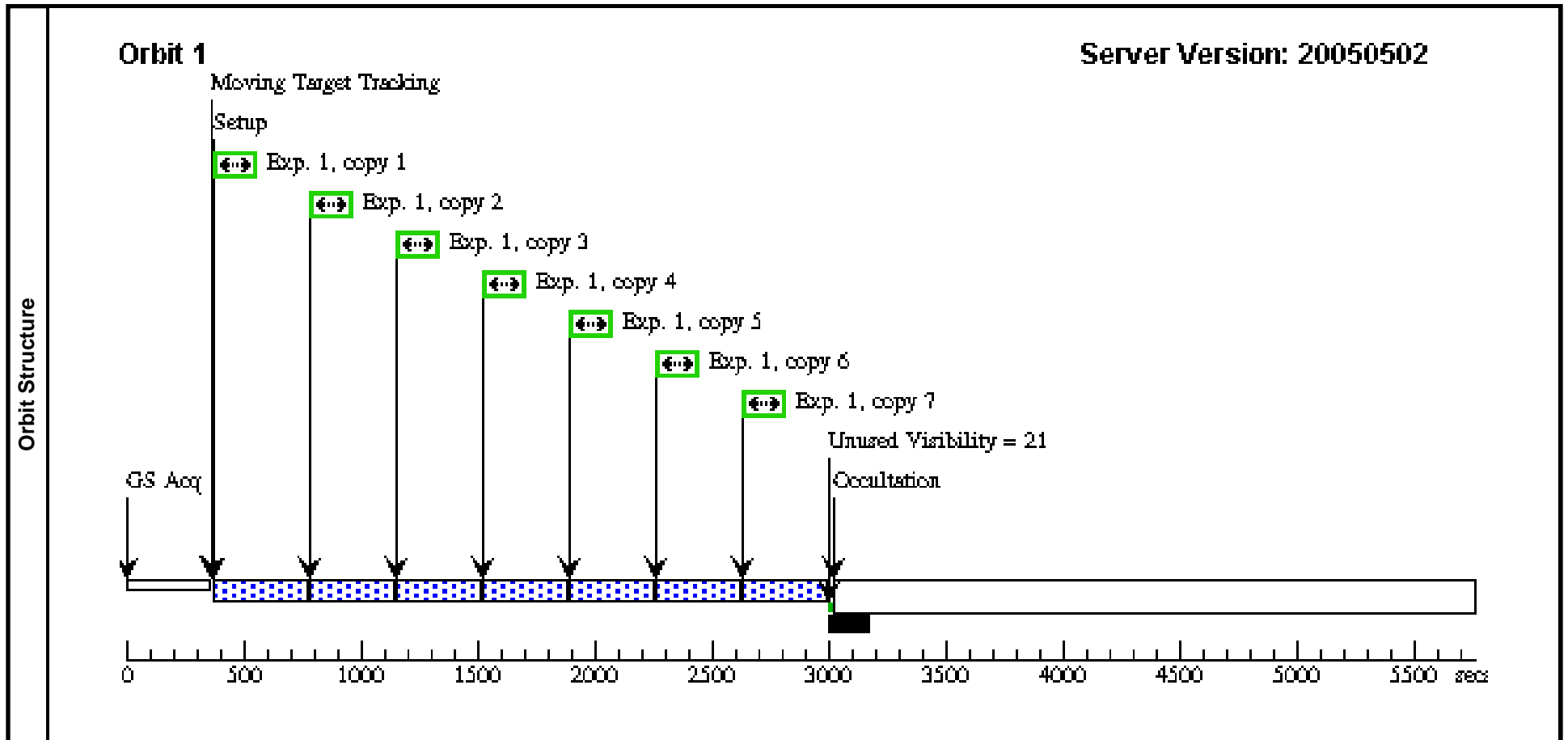
<b>Visit</b>	<b>Proposal 10506, Visit 02</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 01 BY 18 H TO 22 H										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
	1		(1) SATURN1	ACS/SBC, ACCUM, SBC	F125LP				330.0 Secs X 7		[1]
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Proposal 10506 - Visit 03 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:05 GMT 2005

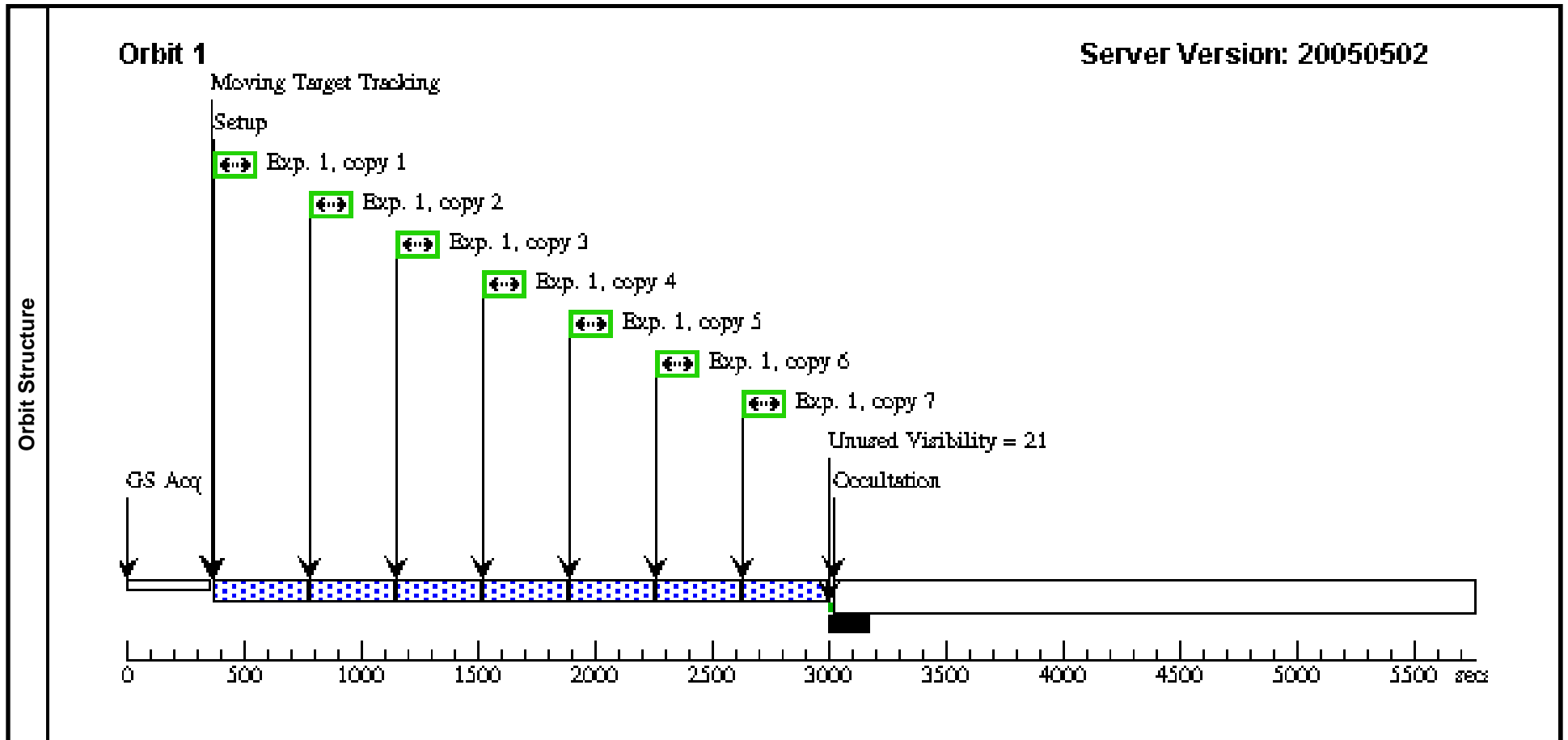
<b>Visit</b>	<b>Proposal 10506, Visit 03</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 02 BY 4 H TO 8 H										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
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Proposal 10506 - Visit 04 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:05 GMT 2005

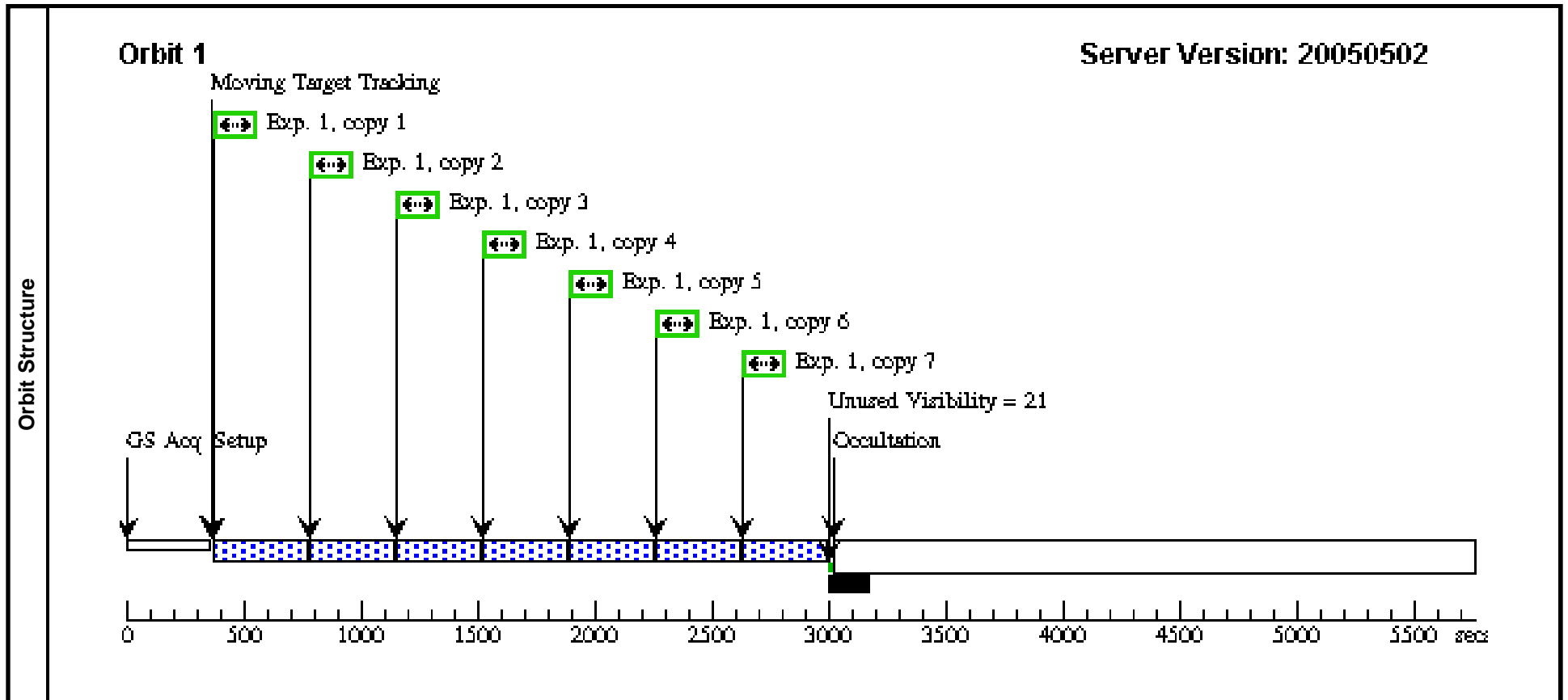
<b>Visit</b>	<b>Proposal 10506, Visit 04</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 01 BY 42 H TO 46 H										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
	1		(1) SATURN1	ACS/SBC, ACCUM, SBC	F125LP				330.0 Secs X 7		[1]
									[==>(Copy 1)]		
									[==>(Copy 2)]		
									[==>(Copy 3)]		
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Proposal 10506 - Visit 05 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:06 GMT 2005

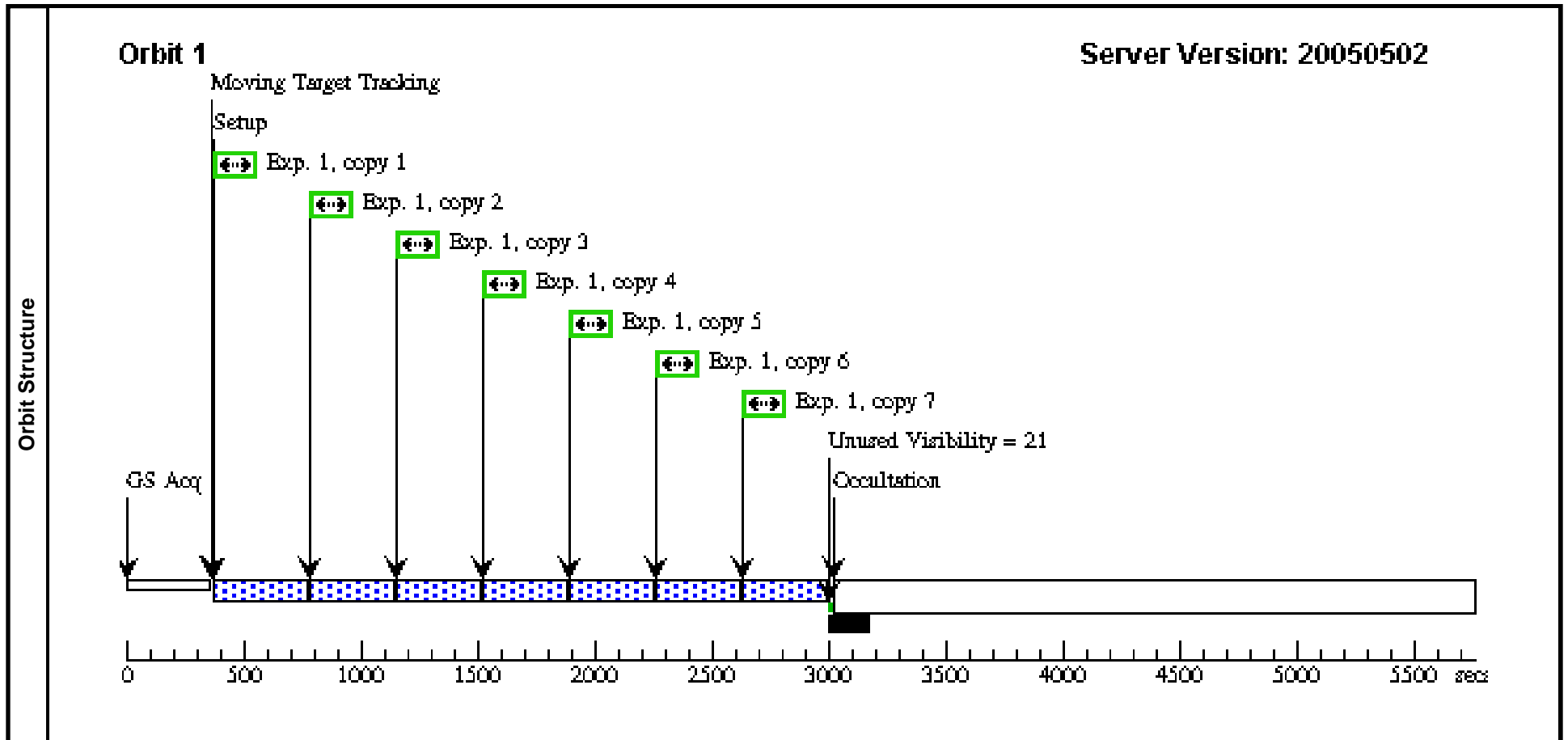
<b>Visit</b>	<b>Proposal 10506, Visit 05</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 04 BY 4 H TO 8 H										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
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Proposal 10506 - Visit 06 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:07 GMT 2005

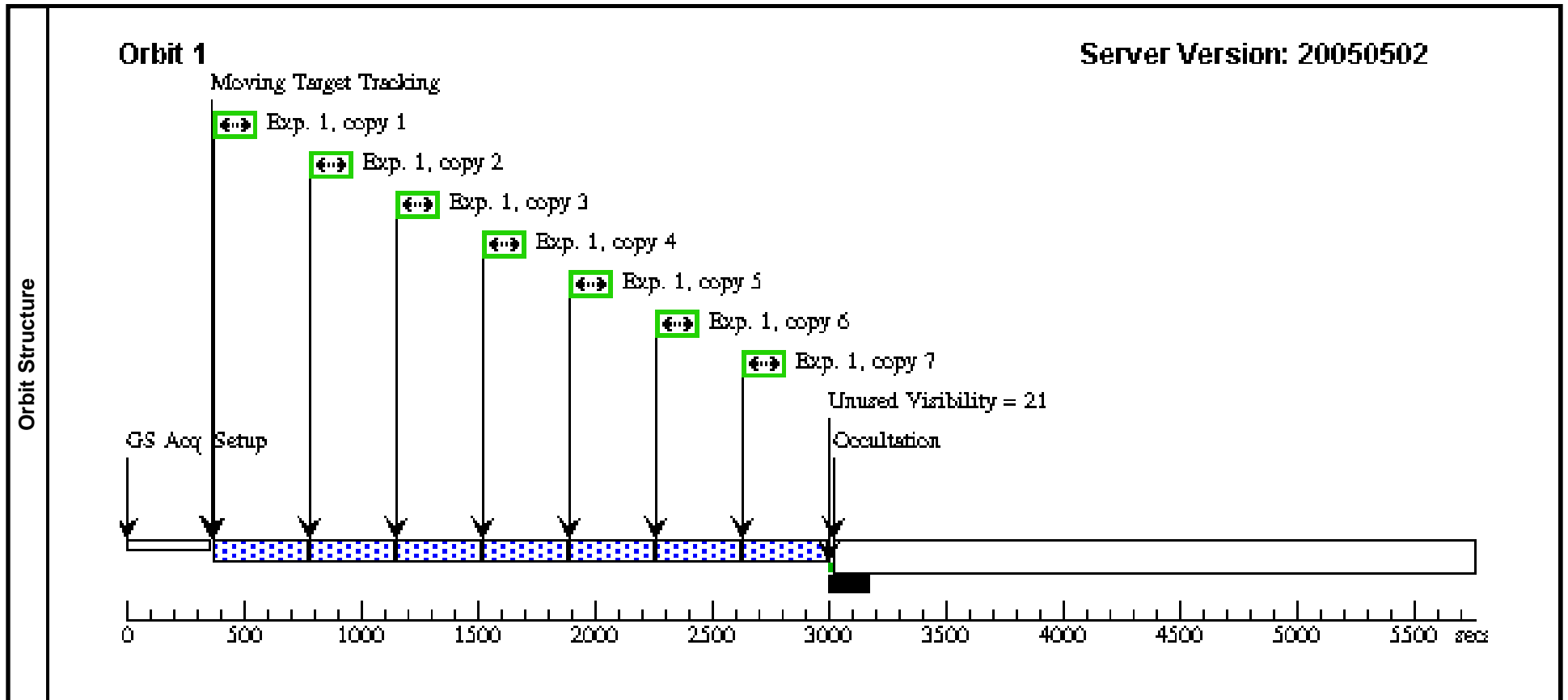
<b>Visit</b>	<b>Proposal 10506, Visit 06</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 01 BY 66 H TO 70 H										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
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									[=>(Copy 6)]		
									[=>(Copy 7)]		



Proposal 10506 - Visit 07 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:07 GMT 2005

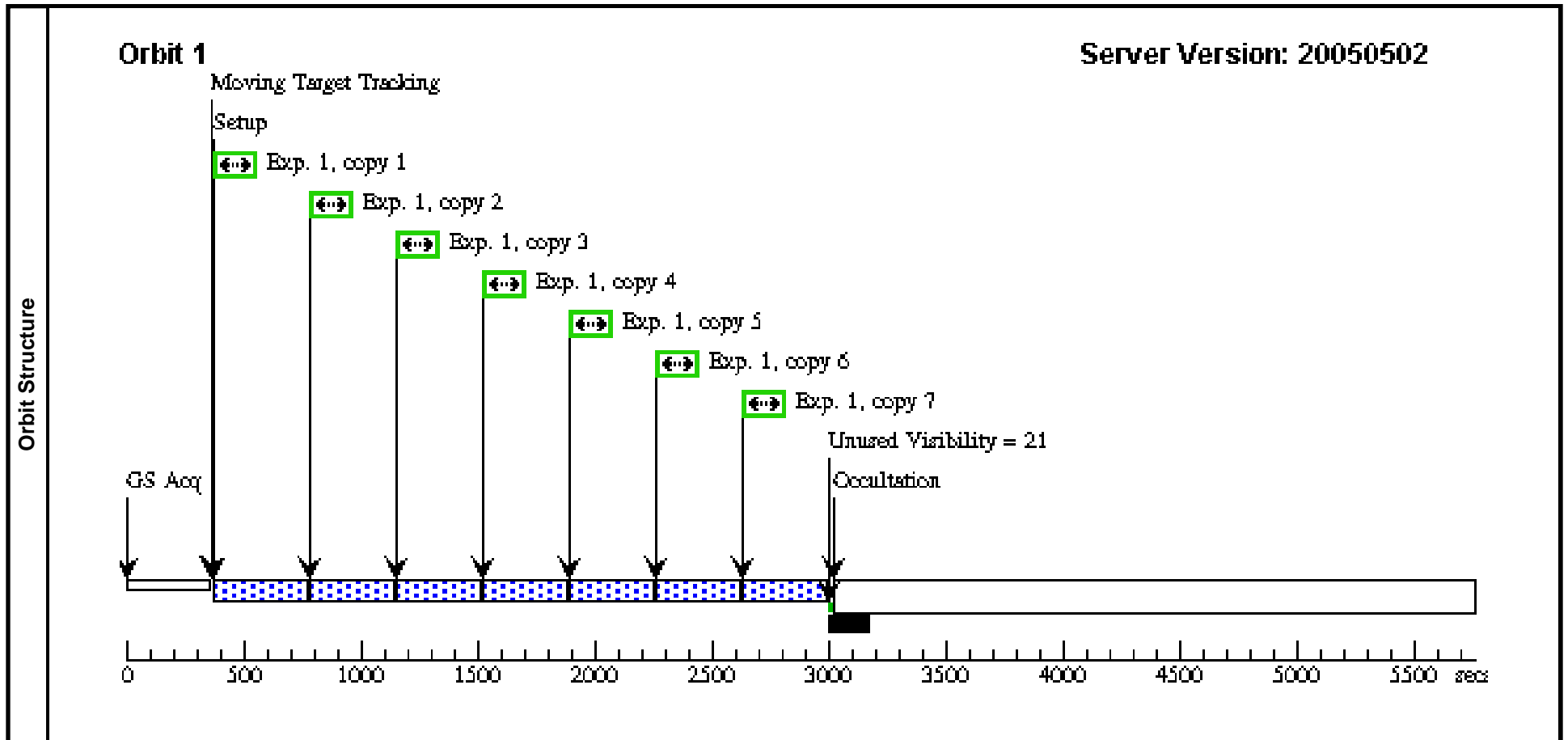
<b>Visit</b>	<b>Proposal 10506, Visit 07</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 06 BY 4 H TO 8 H										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
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Proposal 10506 - Visit 08 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:08 GMT 2005

<b>Visit</b>	<b>Proposal 10506, Visit 08</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 07 BY 3 D TO 5 D										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
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									[=>(Copy 7)]		



Proposal 10506 - Visit 09 - Coordinated observations of Saturn's auroral dynamic morphology and Cassini plasma measurements

Thu Jun 23 01:01:08 GMT 2005

<b>Visit</b>	<b>Proposal 10506, Visit 09</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: SCHED 100%; AFTER 08 BY 4 H TO 8 H										
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>				
(1)		SATURN1	STD=SATURN								
<i>Comments: We need to place Saturn's center at the center of the field of view as we already did in program GO-10156.</i>											
<b>Exposures</b>	<b>#</b>	<b>Label</b>	<b>Target</b>	<b>Config,Mode,Aperture</b>	<b>Spectral Els.</b>	<b>Opt. Params.</b>	<b>Special Reqs.</b>	<b>Groups</b>	<b>Exp. Time/[Actual Dur.]</b>		<b>Orbit</b>
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									[==>(Copy 7)]		

