



## 10502 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Cycle: 14, Proposal Category: GO

(Availability Mode: SUPPORTED)

### INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
<b>Prof. John T. Clarke (PI)</b>	<b>Boston University</b>	<b>jclarke@bu.edu</b>
Dr. Jody K. Wilson (CoI)	Boston University	jkwilson@bu.edu

### 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) URANUS	ACS/SBC	1	20-Jul-2005 21:02:23.0	yes
02	(1) URANUS	ACS/SBC	1	20-Jul-2005 21:02:28.0	yes
03	(1) URANUS	ACS/SBC	1	20-Jul-2005 21:02:31.0	yes
04	(1) URANUS	ACS/SBC	1	20-Jul-2005 21:02:33.0	yes
05	(1) URANUS	ACS/SBC	1	20-Jul-2005 21:02:36.0	yes
06	(1) URANUS	ACS/SBC	1	20-Jul-2005 21:02:38.0	yes
07	(1) URANUS	ACS/SBC	1	20-Jul-2005 21:02:41.0	yes
08	(1) URANUS	ACS/SBC	1	20-Jul-2005 21:02:43.0	yes

8 Total Orbits Used

## **ABSTRACT**

ACS SBC UV observations of Uranus are proposed with dual purposes that can be achieved with a single set of observations. First, we propose to observe the very unusual auroral of Uranus for the first time since IUE and Voyager in the 1980's. The Uranus aurora are centered on the magnetic poles, corresponding to the 60 deg. tilted magnetic moment, closer to the equator than the rotational poles. The brighter auroral emission appears around the weaker magnetic pole. The auroral emissions are highly variable, as recorded with IUE, and the rotational phase of Uranus is not known. The observations will therefore cover the extent of a Uranus rotation (17.29 hours), and will be repeated one-half solar rotation later to allow for variations in the solar wind at Uranus. The high sensitivity of the ACS SBC at long wavelengths will increase the sensitivity to auroral H<sub>2</sub> emissions, and observations in cycle 14 near solar minimum will limit the sky background and reflected solar emissions from the Uranus disc. Secondly, these images will measure the extended hydrogen corona of Uranus, first seen by the Voyager 2 UVS. We propose to model the distribution of the hydrogen corona to determine the source processes in the Uranus upper atmosphere, by comparison with model runs from an exospheric code.

## **OBSERVING DESCRIPTION**

These observations are to make images of the H Ly alpha emission from the atmosphere and aurora on Uranus, including the extended cloud of superthermal H around the planet. We hope to detect auroral emissions from the planet disc, and since the rotational ephemeris of Uranus has been lost since the Voyager encounter in 1986, images must be taken over a complete Uranus rotation to cover all phases, including when the auroral ovals may be pointing toward the Earth.

This proposal is to observe Uranus from 4 sides separated by approx. 90 deg. of rotation, and to repeat this series about 2 weeks later, for a total of 8 orbits. In one 5 orbit ACS SBC visibility period, two quadrants can be observed (Uranus rotation period = 17.24 hours, and 90 deg. rotation takes 4.3 hours) by observations separated by two orbits. If, on day One, Uranus is observed in the 1st and 4th orbits during the 5 orbit ACS visibility period, and on the following day Two during the 2nd and 5th orbits of the next visibility period, this will correspond to relative longitudes on Uranus of 0 and 100 deg. on day One, and 174 and 274 deg. on day Two. This assumes the visibility period starts at approx. the same local time each day. The cycle should be repeated about 2 weeks later, when the solar wind conditions will have passed through 1/2 solar rotation for the most likely change in solar wind conditions at Uranus.

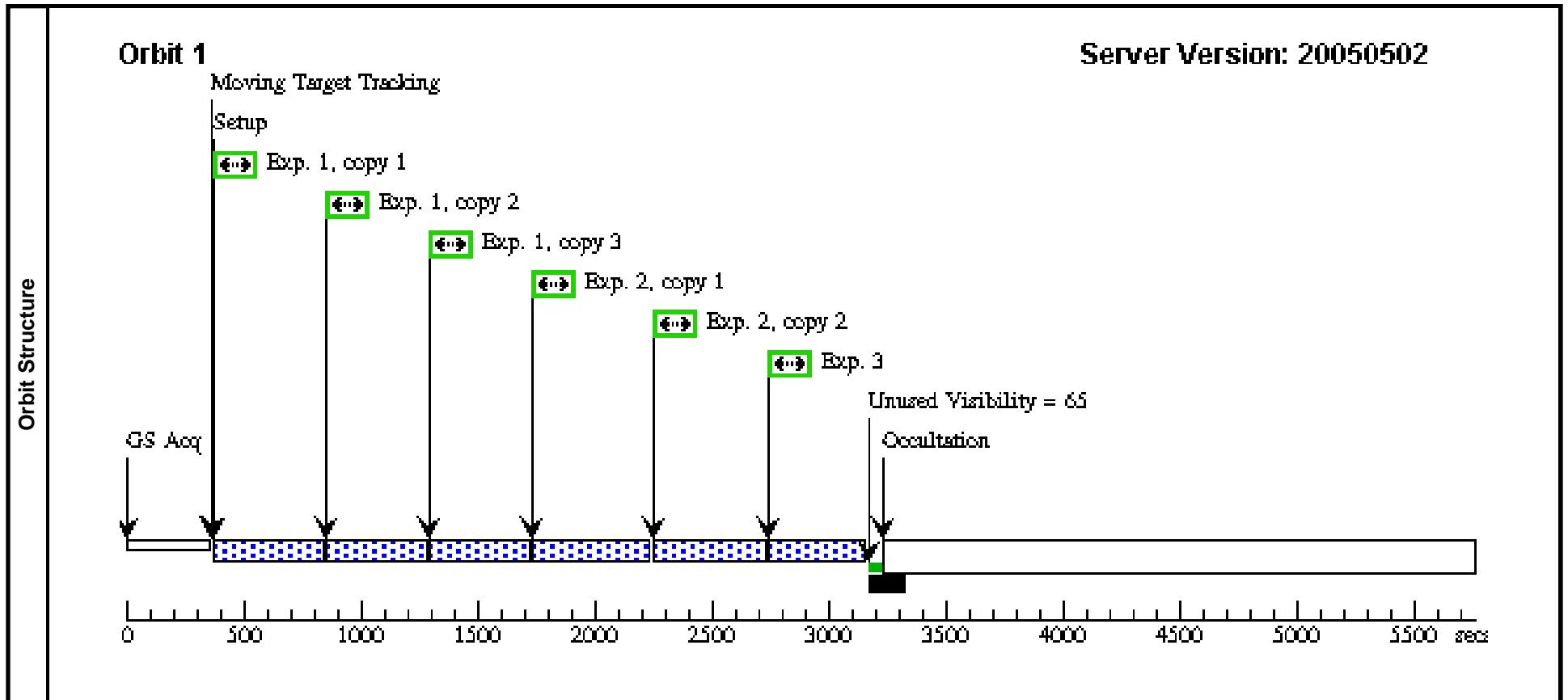
## Proposal 10502 - Overview

The observations also need to be scheduled close to Uranus opposition to minimize the geocoronal Ly alpha background, but only within +/- one month. Under 2 gyro mode, the main period of visibility for any object is the month before Uranus opposition around 5 Sept. 2005, and that is the one that is proposed here.

Proposal 10502 - Visit 01 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:45 GMT 2005

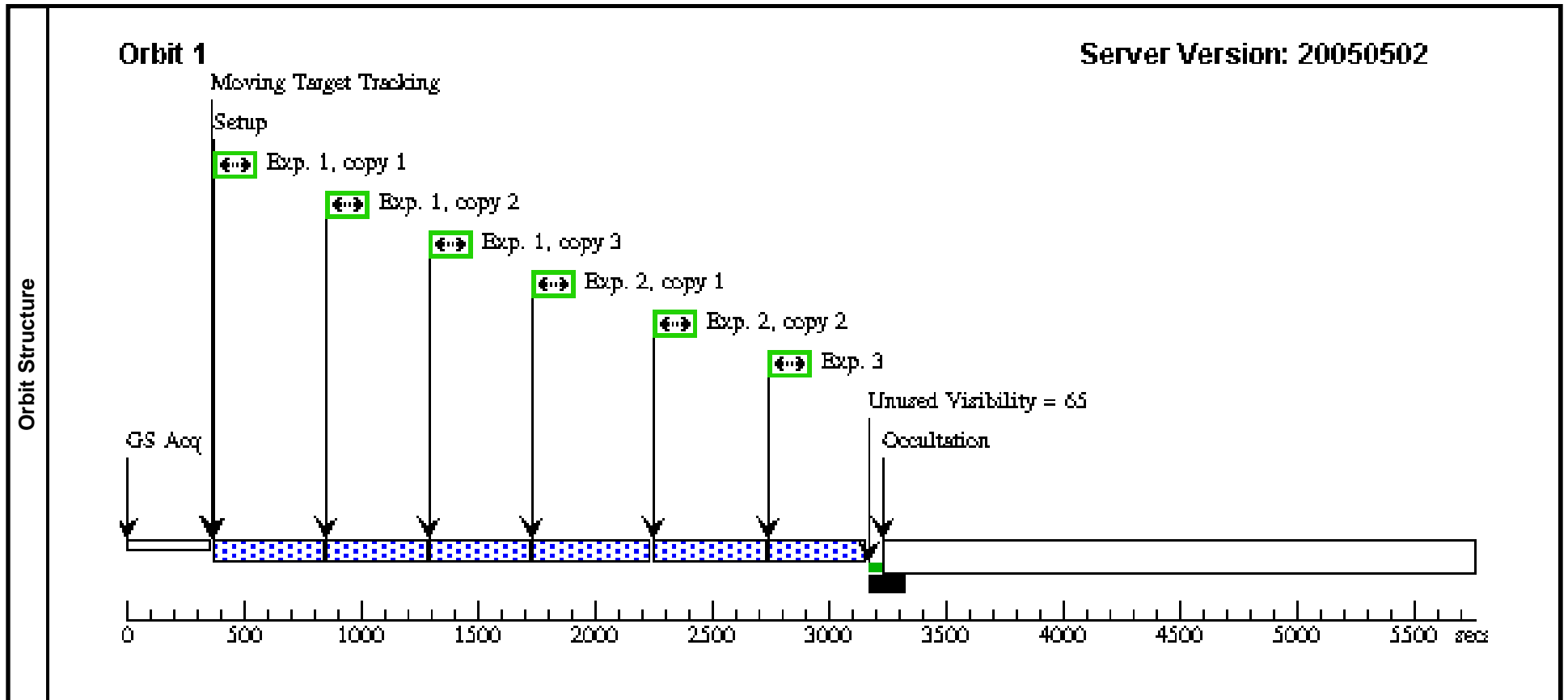
<b>Visit</b>	<p><b>Proposal 10502, Visit 01</b></p> <p><b>Diagnostic Status: No Diagnostics</b></p> <p>Scientific Instruments: ACS/SBC</p> <p>Special Requirements: BETWEEN 10-AUG-2005:00:00:00 AND 27-AUG-2005:00:00:00</p> <p><i>Comments: First visit to Uranus, this is the first orbit at the start of a sequence. ACS SBC MAMA observations are limited to 5 orbits/day outside SAA, about the same time each day. It is not important which side of Uranus is observed at the start of this program, as long as all 4 quadrants are observed over 2 days. In this visit 1, observe in 1st orbit in 5 orbit visibility period, then key timing of visits 2-4 to this time.</i></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)	URANUS	STD=URANUS							
<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) URANUS	(1) URANUS	ACS/SBC, ACCUM, SBC	F115LP				400.0 Secs X 3	
									[==>(Copy 1)]	
									[==>(Copy 2)]	[1]
									[==>(Copy 3)]	
	2	(1) URANUS	(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP				450.0 Secs X 2	
									[==>(Copy 1)]	
								[==>(Copy 2)]	[1]	
3	(1) URANUS	(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP				360.0 Secs		
								[==>]	[1]	



Proposal 10502 - Visit 02 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:46 GMT 2005

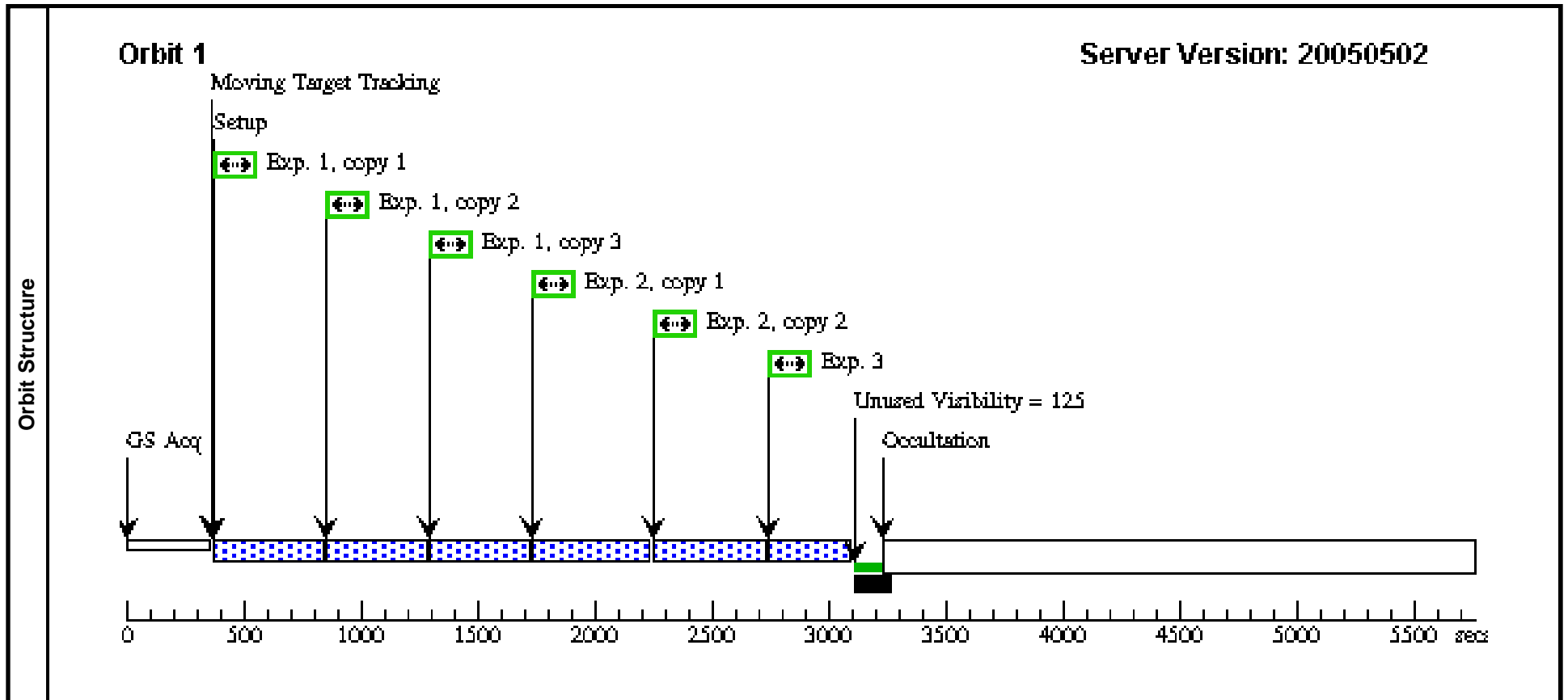
<b>Visit</b>	<p><b>Proposal 10502, Visit 02</b></p> <p><b>Diagnostic Status: No Diagnostics</b></p> <p>Scientific Instruments: ACS/SBC</p> <p>Special Requirements: AFTER 01 BY 2.75 Orbits TO 3.25 Orbits</p> <p><i>Comments: Observe Uranus three orbits after start of visit 1, i.e. two orbits have passed since the end of visit 1. This timing lets Uranus rotate 100 deg. between visits 1 and 2, giving the second of the four quadrants needed in two days.</i></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)		URANUS	STD=URANUS							
<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) URANUS	ACS/SBC, ACCUM, SBC	F115LP				400.0 Secs X 3	
									[==>(Copy 1)]	
									[==>(Copy 2)]	[1]
									[==>(Copy 3)]	
	2		(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP				450.0 Secs X 2	
									[==>(Copy 1)]	
								[==>(Copy 2)]	[1]	
3		(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP				360.0 Secs		
								[==>]	[1]	



Proposal 10502 - Visit 03 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:46 GMT 2005

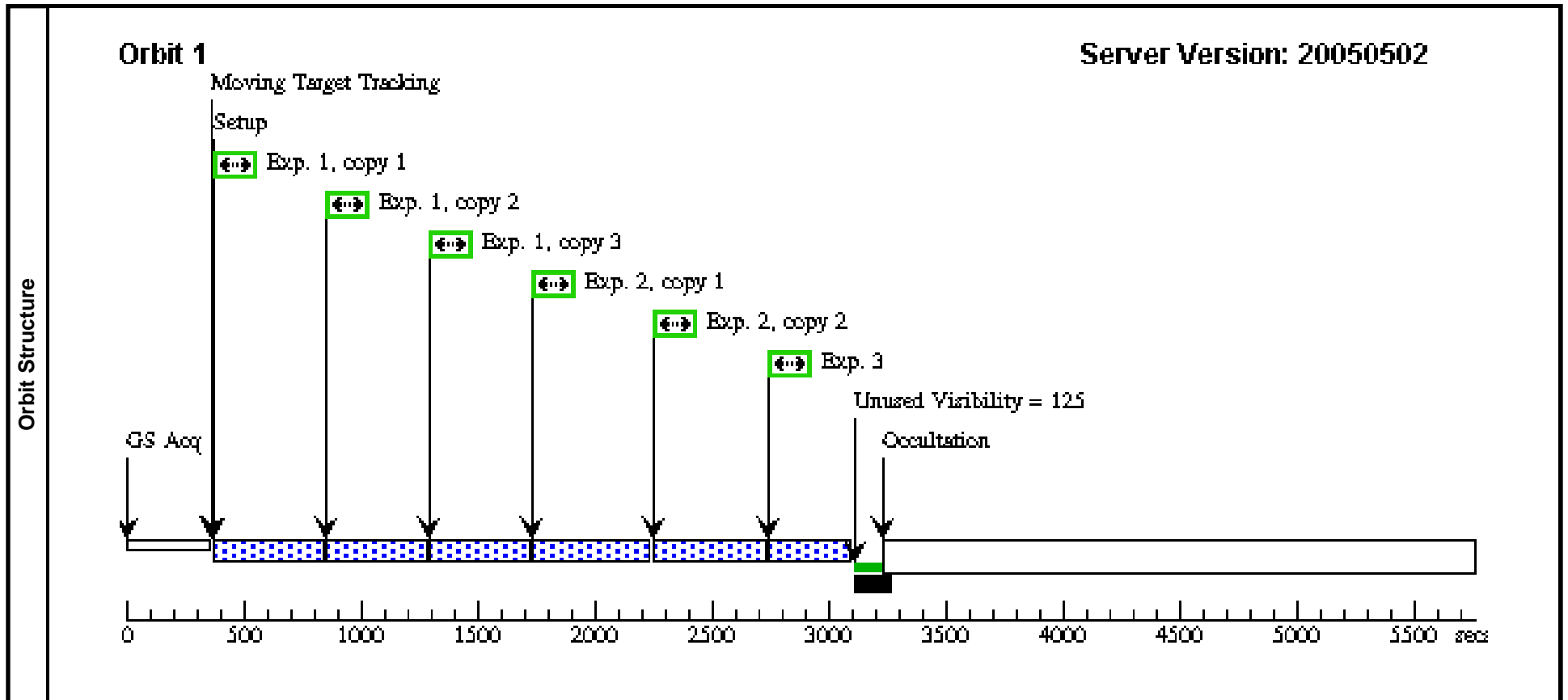
<b>Visit</b>	<b>Proposal 10502, Visit 03</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: AFTER 01 BY 15.75 Orbits TO 16.25 Orbits <i>Comments: Observe Uranus one day after visits 1 and 2, to get the remaining two quadrants in the next 5 orbit visibility window. This visit sees Uranus at a longitude 174 deg. (plus one complete rotation) after visit 1. The requested time is 16 orbits after the start of visit 1, this is expected to be the 2nd orbit in the 5 orbit visibility period on the second day.</i>									
<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)	URANUS	STD=URANUS							
<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) URANUS	ACS/SBC, ACCUM, SBC	F115LP				400.0 Secs X 3	
									[==>(Copy 1)]	
									[==>(Copy 2)]	[1]
									[==>(Copy 3)]	
	2		(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP				450.0 Secs X 2	
								[==>(Copy 1)]		
								[==>(Copy 2)]	[1]	
3		(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP				300.0 Secs		
								[==>]	[1]	



Proposal 10502 - Visit 04 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:47 GMT 2005

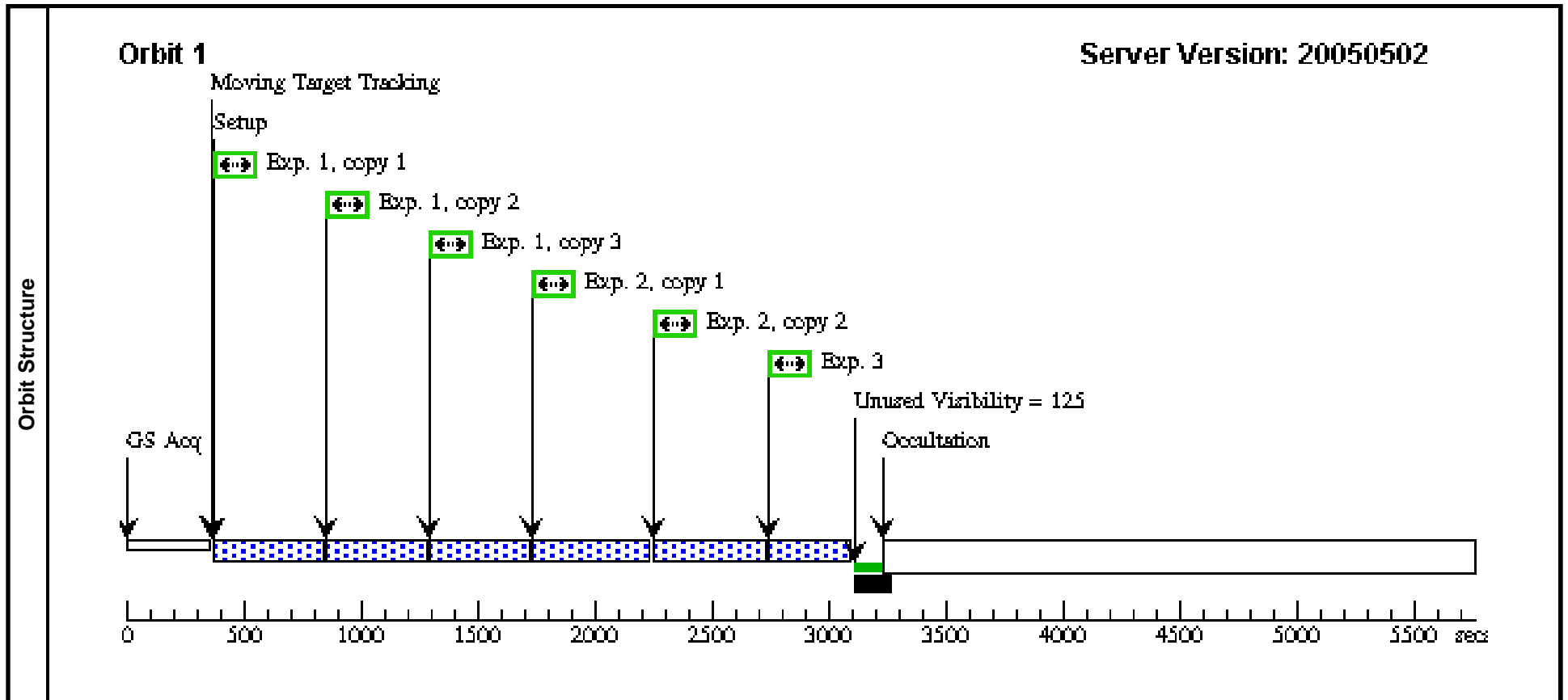
<b>Visit</b>	<b>Proposal 10502, Visit 04</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: AFTER 03 BY 2.75 Orbits TO 3.25 Orbits <i>Comments: Observe Uranus three orbits after start of visit 3, i.e. two orbits have passed since the end of visit 3. This timing lets Uranus rotate 100 deg. between visits 3 and 4, or a longitude of 274 deg. with respect to the start of orbit 1, giving the last of the four quadrants needed in two days.</i>									
	<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)		URANUS	STD=URANUS							
<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) URANUS	(1) URANUS	ACS/SBC, ACCUM, SBC	F115LP				400.0 Secs X 3 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]
	2	(1) URANUS	(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP				450.0 Secs X 2 [==>(Copy 1)] [==>(Copy 2)]	[1]
	3	(1) URANUS	(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP				300.0 Secs [==>]	[1]



Proposal 10502 - Visit 05 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:47 GMT 2005

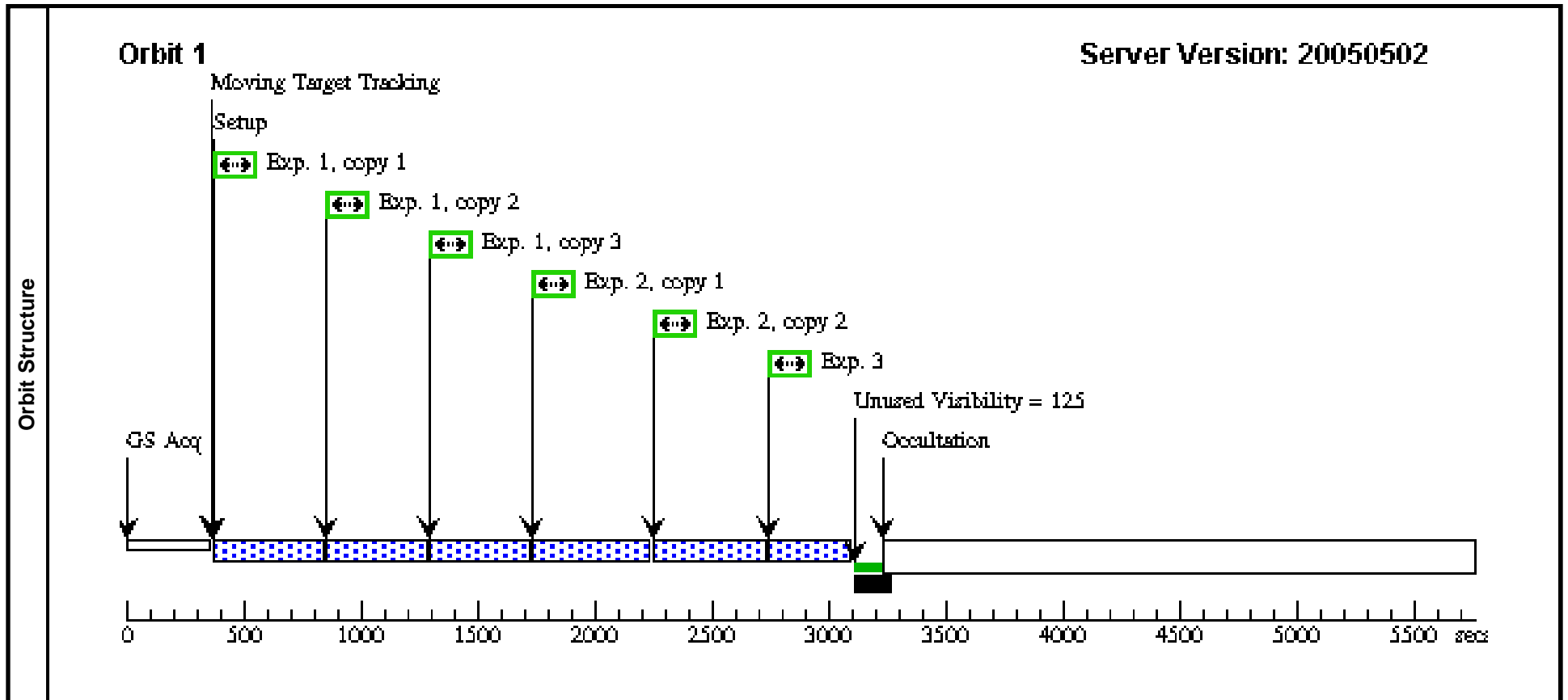
<b>Visit</b>	<b>Proposal 10502, Visit 05</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: AFTER 01 BY 12 D TO 16 D <i>Comments: Repeat series of observations in visit 1-4, approx. two weeks after visits 1-4. Exact start date is not important, but sequence of orbits is laid out as in visits 1-4, and visits 6-8 must start at requested times with respect to the start of visit 5.</i>									
	<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)		URANUS	STD=URANUS							
<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) URANUS	ACS/SBC, ACCUM, SBC	F115LP				400.0 Secs X 3 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]
	2		(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP				450.0 Secs X 2 [==>(Copy 1)] [==>(Copy 2)]	[1]
	3		(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP				300.0 Secs [==>]	[1]



Proposal 10502 - Visit 06 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:48 GMT 2005

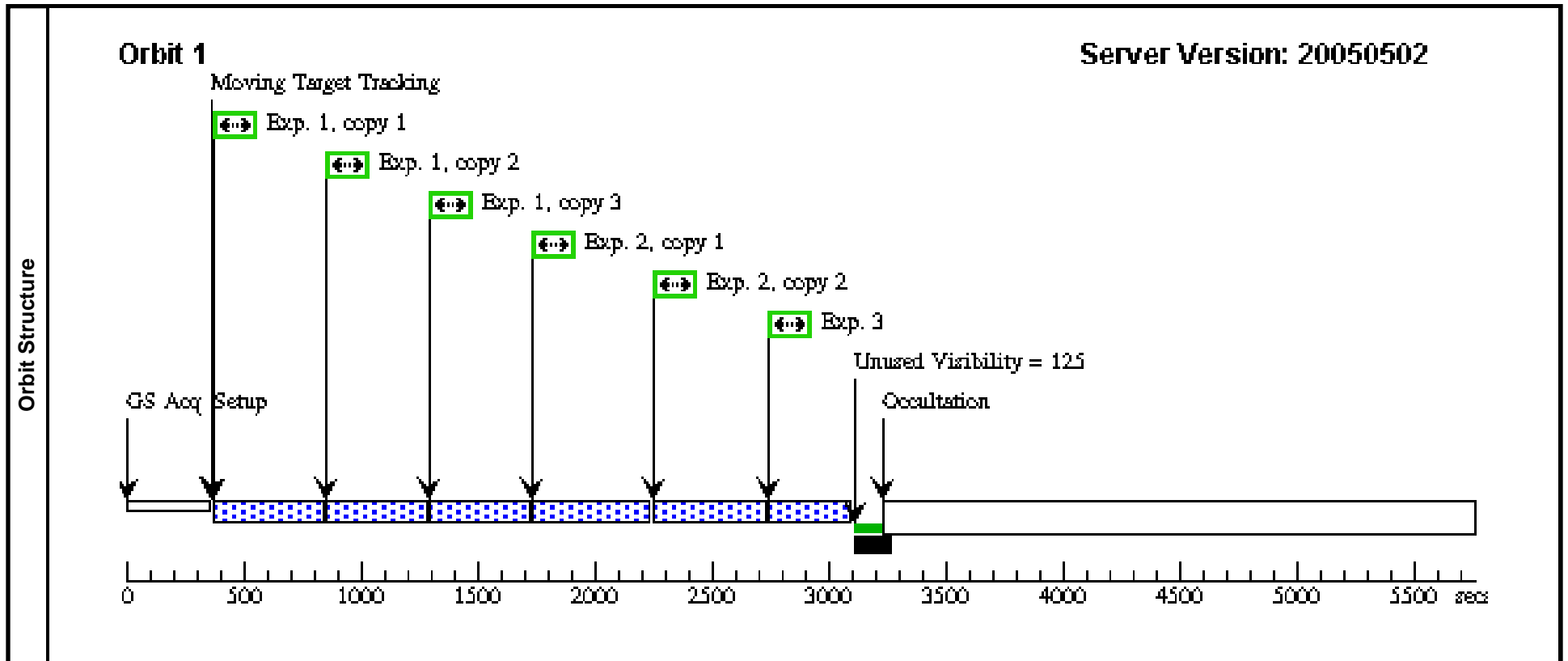
<b>Visit</b>	<b>Proposal 10502, Visit 06</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: AFTER 05 BY 2.75 Orbits TO 3.25 Orbits Comments: Equivalent to visit 2 in second series of observations, i.e. 3 orbits after visit 5.									
	<b>Solar System Targets</b>	<b>#</b>	<b>Name</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Window</b>			
(1)		URANUS	STD=URANUS							
<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) URANUS	ACS/SBC, ACCUM, SBC	F115LP					400.0 Secs X 3 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]
	2	(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP					450.0 Secs X 2 [==>(Copy 1)] [==>(Copy 2)]	[1]
	3	(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP					300.0 Secs [==>]	[1]



Proposal 10502 - Visit 07 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:48 GMT 2005

Visit	<b>Proposal 10502, Visit 07</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: AFTER 05 BY 15.75 Orbits TO 16.25 Orbits Comments: Equivalent to visit 3 in second series of observations, i.e. 16 orbits after visit 5.									
	Solar System Targets									
#	Name	Level 1	Level 2	Level 3	Window					
(1)	URANUS	STD=URANUS								
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(1) URANUS	ACS/SBC, ACCUM, SBC	F115LP					400.0 Secs X 3 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]
	2	(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP					450.0 Secs X 2 [==>(Copy 1)] [==>(Copy 2)]	[1]
	3	(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP					300.0 Secs [==>]	[1]



Proposal 10502 - Visit 08 - ACS Imaging of the Uranus Aurora and Hydrogen Corona

Thu Jul 21 01:02:49 GMT 2005

Visit	<b>Proposal 10502, Visit 08</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/SBC Special Requirements: AFTER 07 BY 2.75 Orbits TO 3.25 Orbits Comments: Equivalent to visit 4 in second series of observations, i.e. 3 orbits after visit 7.										
	Solar System Targets	#	Name	Level 1	Level 2	Level 3	Window				
	(1)	URANUS	STD=URANUS								
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit	
	1		(1) URANUS	ACS/SBC, ACCUM, SBC	F115LP				400.0 Secs X 3 [==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)]	[1]	
	2		(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP				450.0 Secs X 2 [==>(Copy 1)] [==>(Copy 2)]	[1]	
	3		(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP				300.0 Secs [==>]	[1]	

