



## 10923 - Measuring the size of the close-in transiting extrasolar planet HD 189733b

Cycle: 15, 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) HD189733	ACS/HRC	5	15-May-2006 22:12:59.0	yes
02	(1) HD189733	ACS/HRC	5	15-May-2006 22:15:21.0	yes
03	(1) HD189733	ACS/HRC	5	15-May-2006 22:17:45.0	yes
04	(1) HD189733	ACS/HRC	5	15-May-2006 22:20:03.0	yes

20 Total Orbits Used

## **ABSTRACT**

A new transiting exoplanet was found by our radial velocity search around the bright K dwarf HD 189733. With an apparent V magnitude of 7.67 and a distance of 19 pc, it is the closest star known with a transiting extrasolar planet. Moreover, the high radius ratio ( $R_{pl}/R \sim 0.17$ ) makes it a uniquely favorable target for exoplanet studies. This planet is set to become the most observed hot Jupiter and a landmark in the understanding of hot Jupiter structure and formation.

We propose a fundamental observations with the HST: to measure precisely the size of the transiting planet around HD189733 and the inclination angle of its orbit. The radius is an important characteristic of the planet in itself. A precise, model-independent radius determination is also a necessary prerequisite for further observations of the system with ground-based large telescopes and Spitzer (e.g. to detect reflected light and intrinsic infrared light from the planet, to measure the Rossiter-McLaughlin effect).

This observation requires a high-accuracy spectrophotometry light curve with ACS in the visible.

Similar observations for the formerly closest transiting planet, HD 209458b, have revealed that the planet was much larger than accounted for by any model, and undergoing strong evaporation, two observations that have had a profound impact on our understanding of the structure of close-in exoplanets and the migration process.

## **OBSERVING DESCRIPTION**

Visits: 3 each consisting of 5 HST orbits roughly centered on a transit of HD189733b.

The first orbit of each visit will start with a short exposure with F660N for wavelength definition. Then all remaining time in the 5 orbits consists of repeated 25s exposures using the G800L grism.

In order to keep overhead times low the HRC-512 subarray will be used.

Since the first order grism spectrum and zeroth order (useful for establishing drifts) cover a substantial part of this subarray accurate

## Proposal 10923 - Overview

positioning with POS TARGs is required.

These observations are non-standard in that the detector will be allowed to saturate by a factor of 5 (GAIN = 4 must be used) yielding  $4e8$  detected photons per integration. We expect about 45 exposures per orbit.

### **ADDITIONAL COMMENTS**

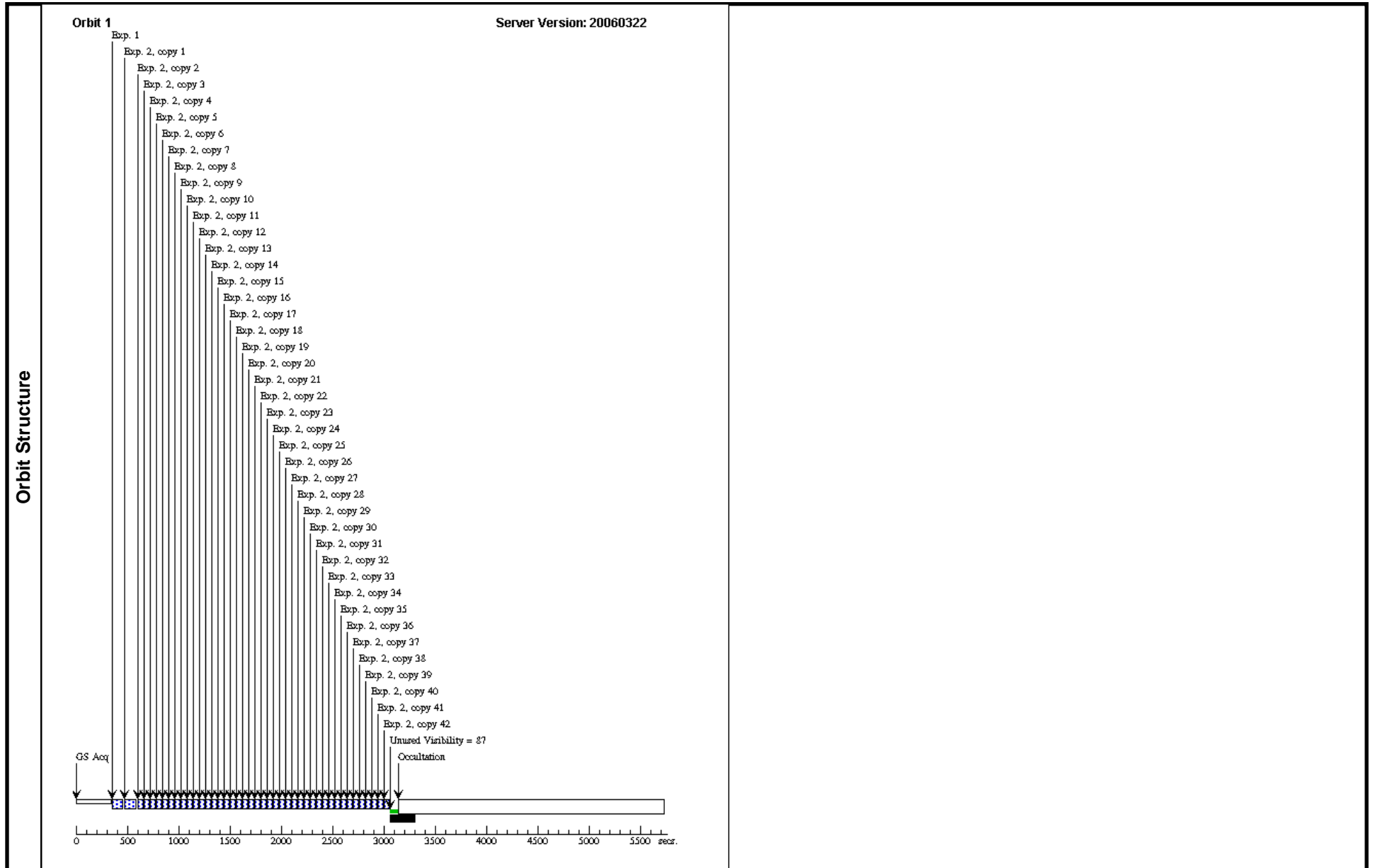
For each visit it is essential for the 5 orbits to be scheduled as one contiguous 5 orbit block.

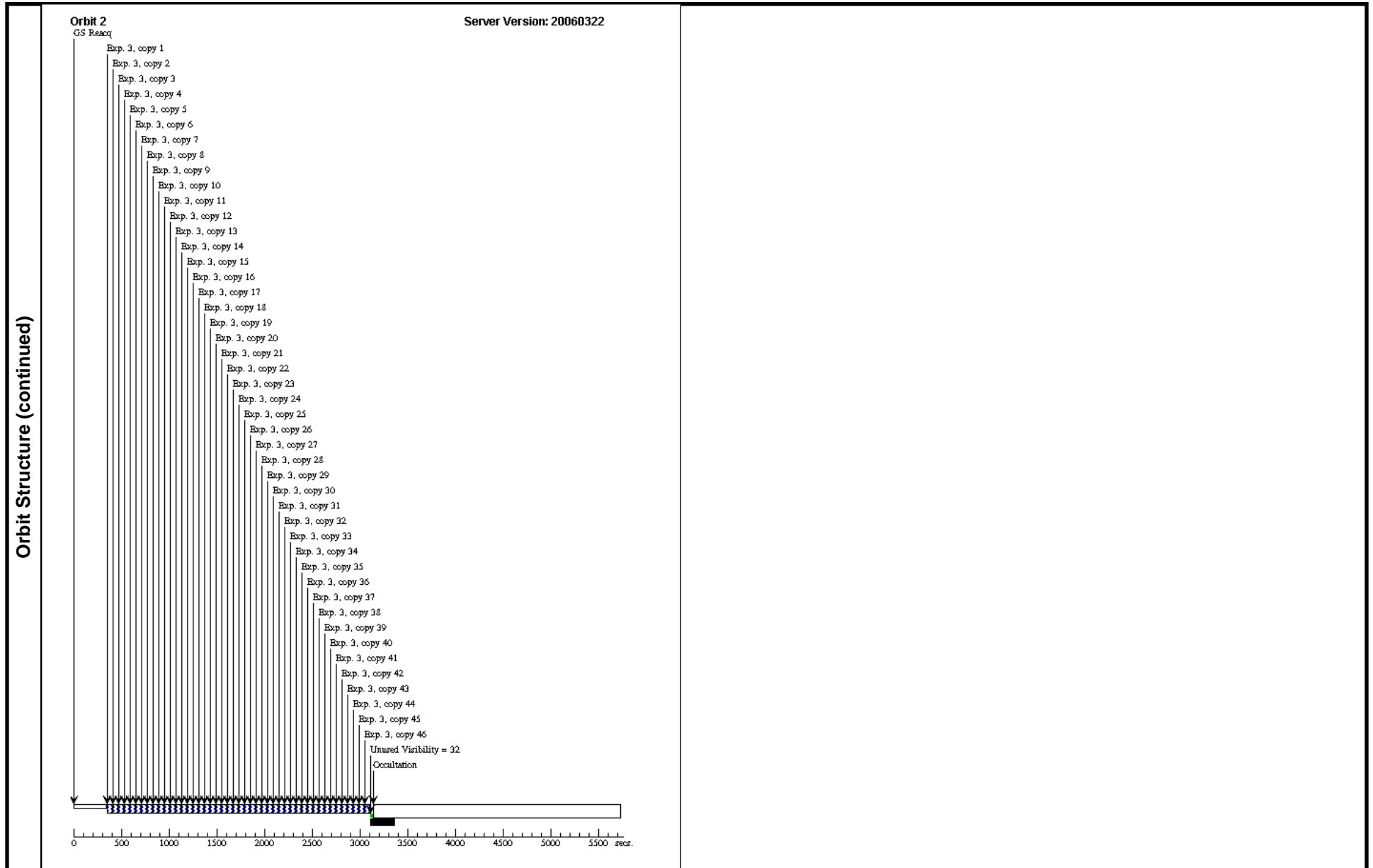
The visibility windows must therefore remain free of SAA interference.

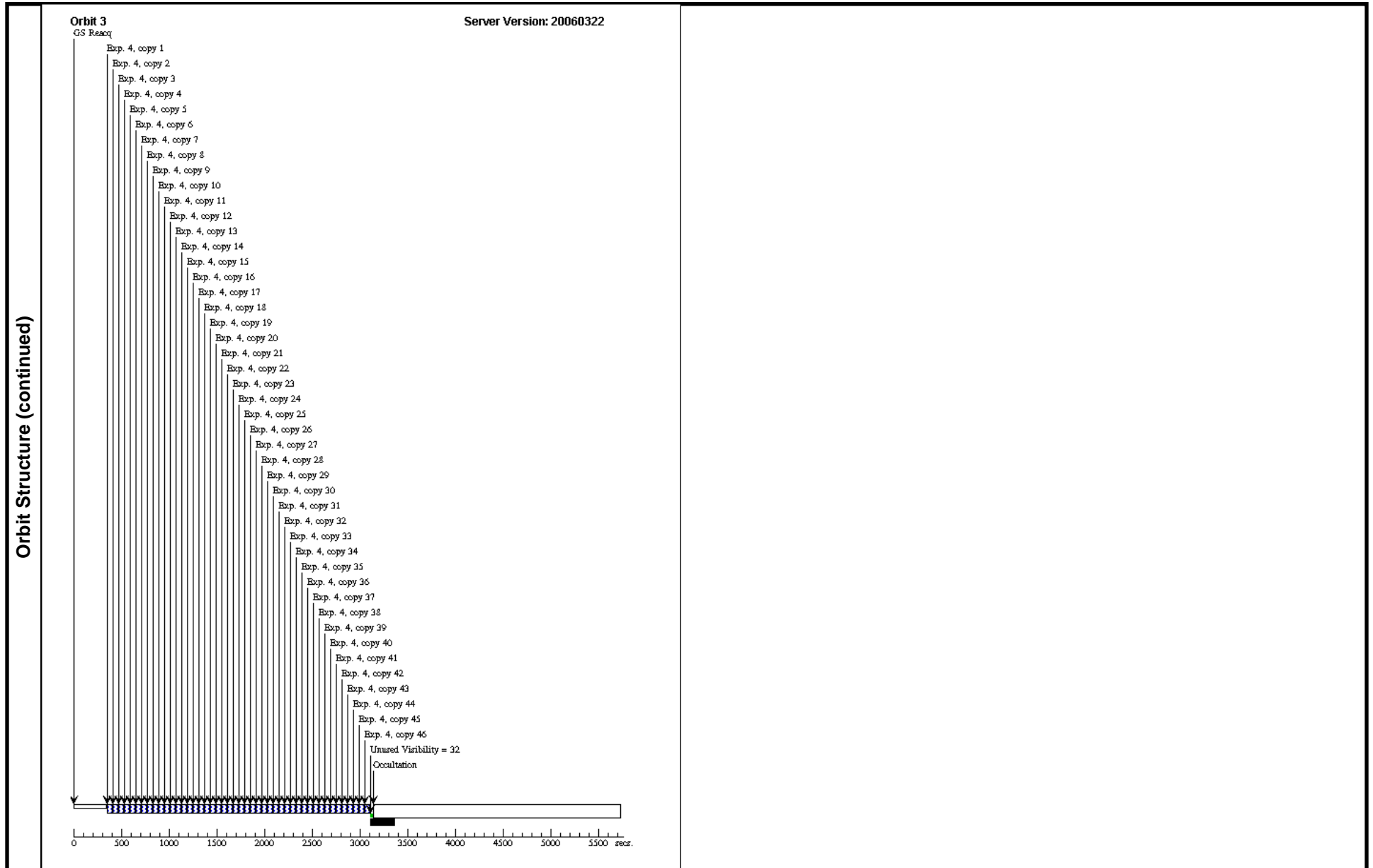
Proposal 10923 - Visit 01 - Measuring the size of the close-in transiting extrasolar planet HD 189733b

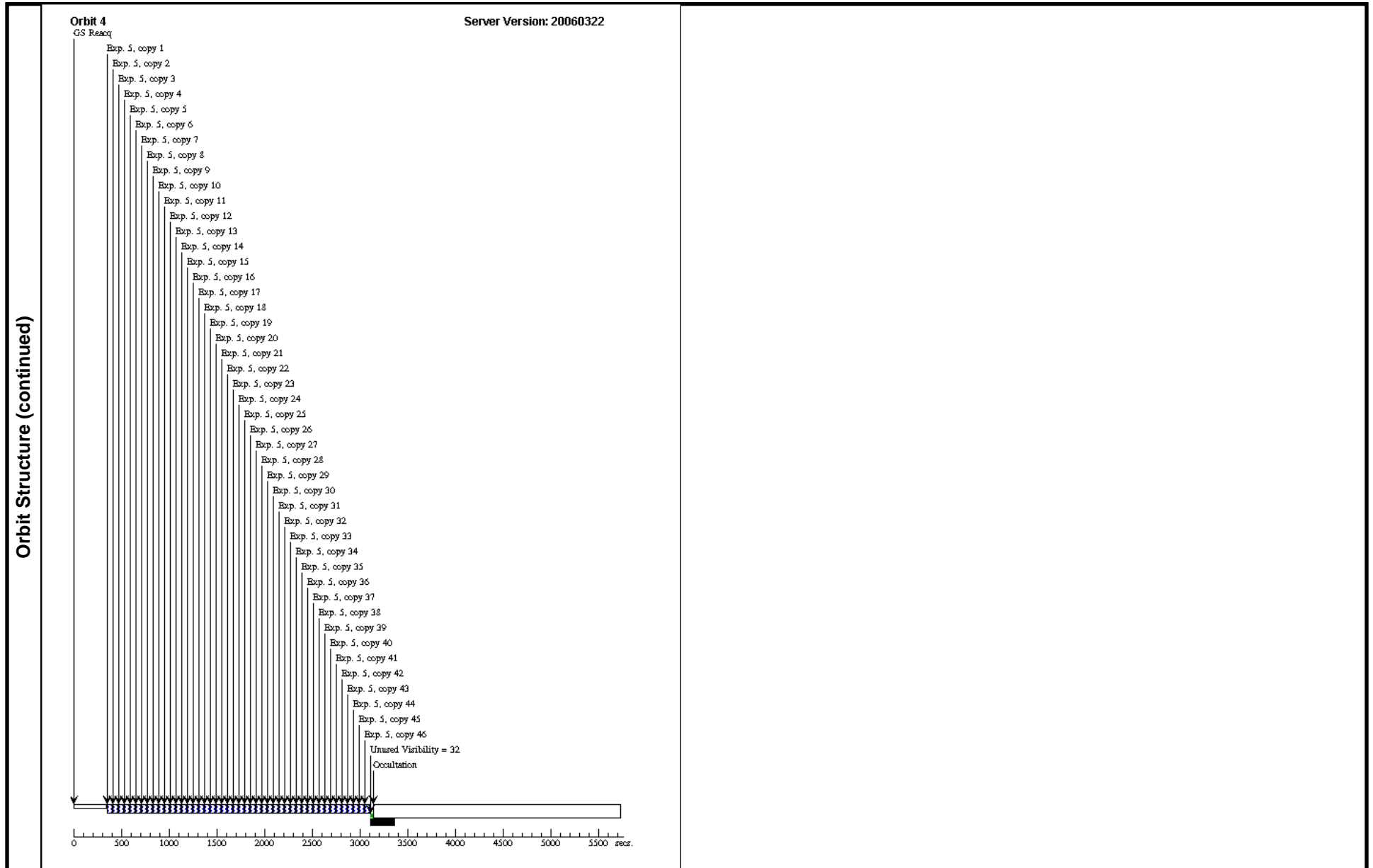
Tue May 16 02:20:22 GMT 2006

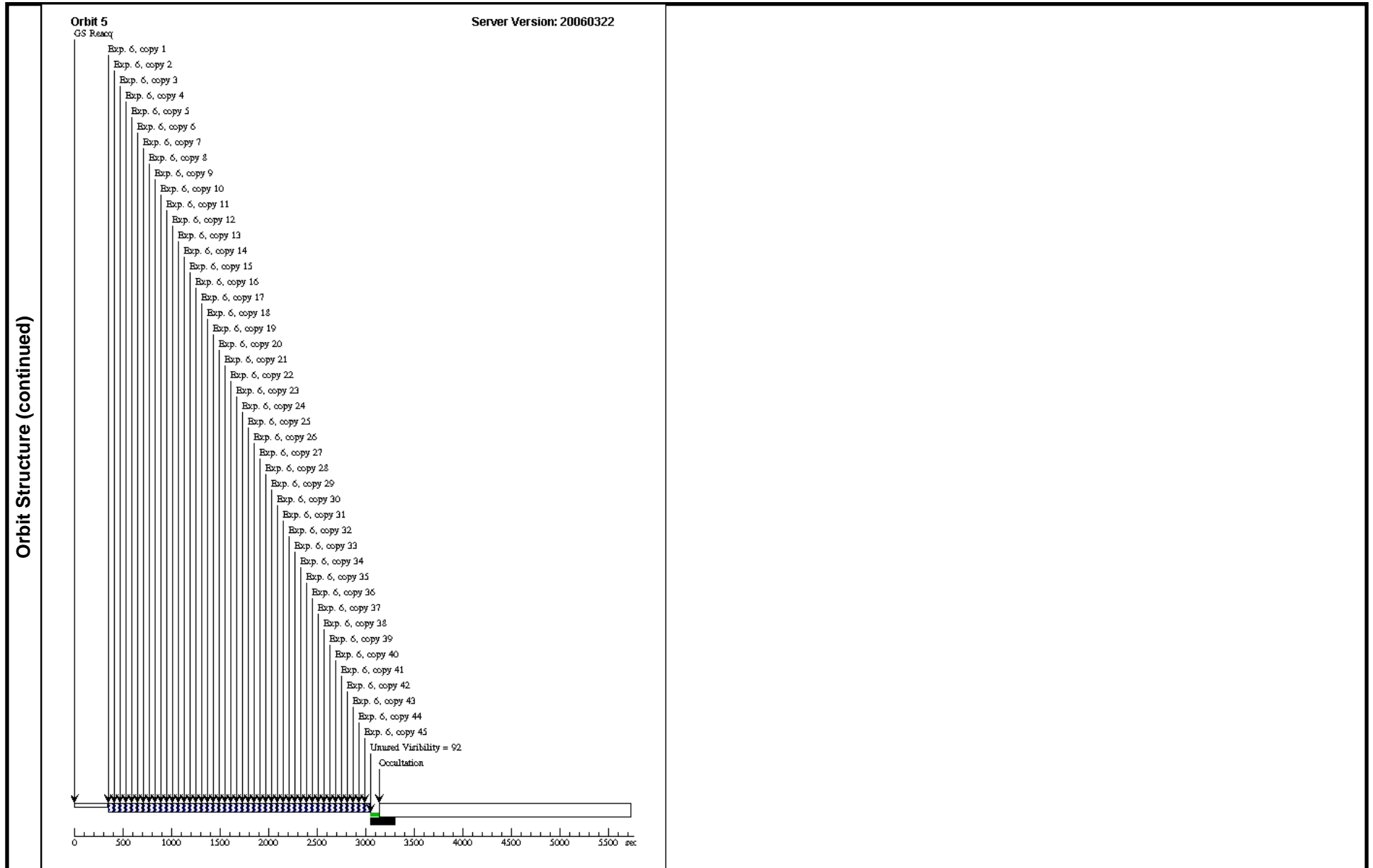
<b>Visit</b>	<b>Proposal 10923, Visit 01</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/HRC Special Requirements: Period 2.218573 D AND ZERO-PHASE JD2453629.3942 <i>Comments: First of three visits.</i> <i>It is essential for the five orbits to be scheduled in a contiguous five orbit block.</i> <i>The visibility windows must therefore be free of the SAA.</i>									
	<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>			
(1)		HD189733	RA: 20 00 43.7130 (300.1821375d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000	Proper Motion RA: -0.00018s/yr Proper Motion Dec: -0.251"/yr Parallax: 0.052" Epoch of Position: 2000.0	V=7.67+/-0.01 B-V = 0.932	Reference Frame: ICRS				
<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) HD189733	(1) HD189733	ACS/HRC, ACCUM, HRC-512	F660N	GAIN=4; CR-SPLIT=NO	POS TARG -1,0; PHASE 0.9005 TO 0 .935		2.0 Secs [==>]	[1]
<i>Comments: Expect to reach 0.55 of full well.</i>										







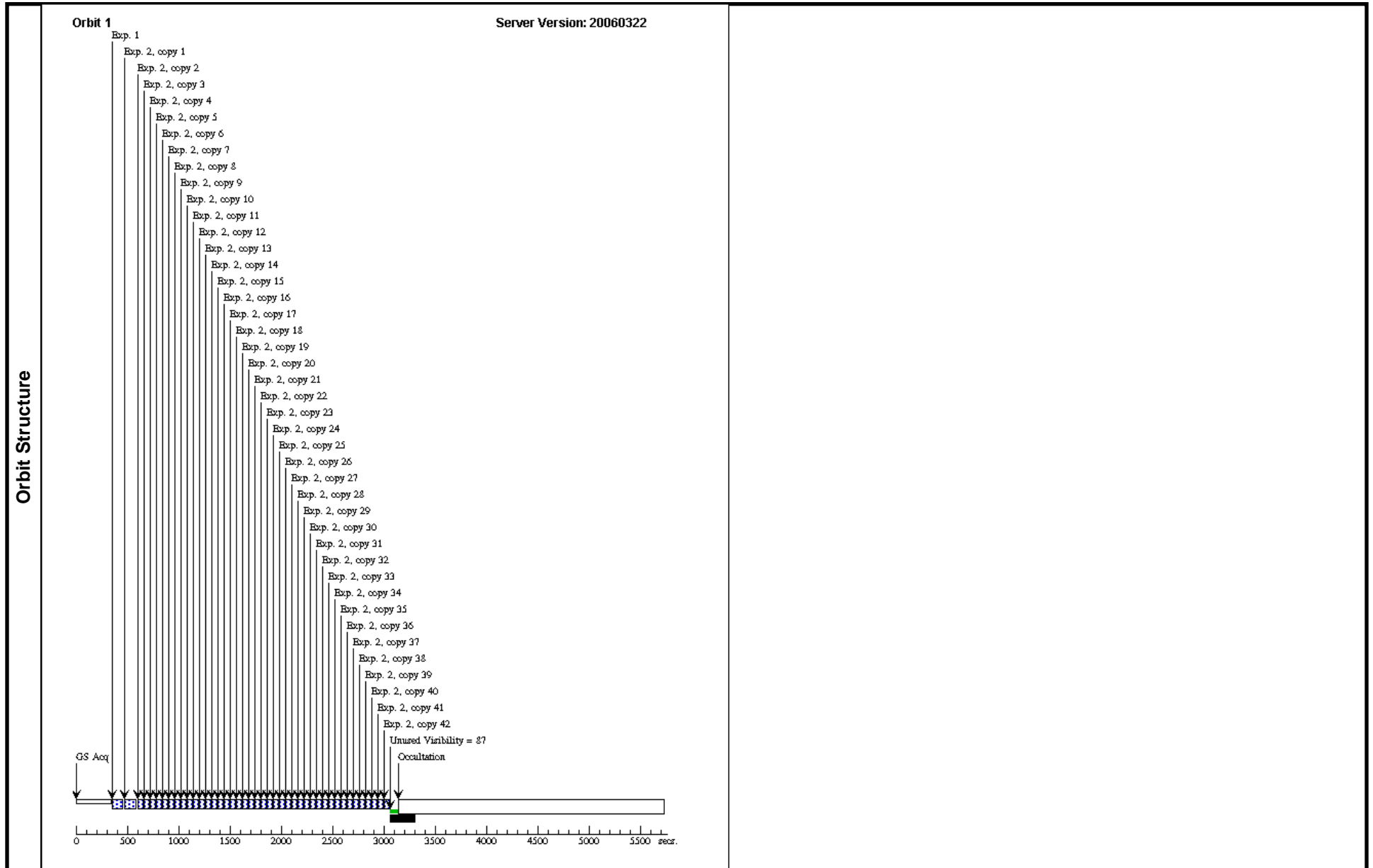


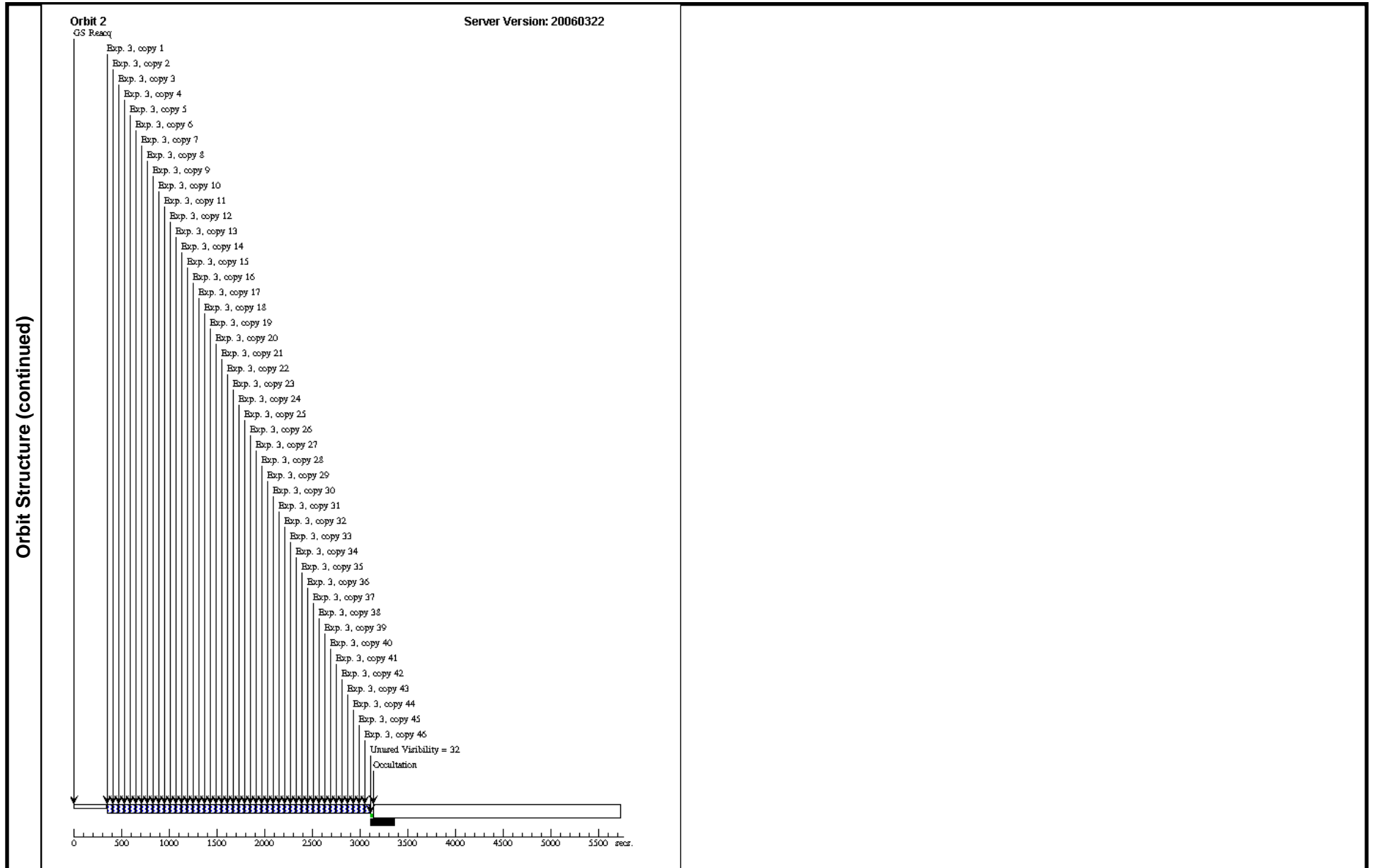


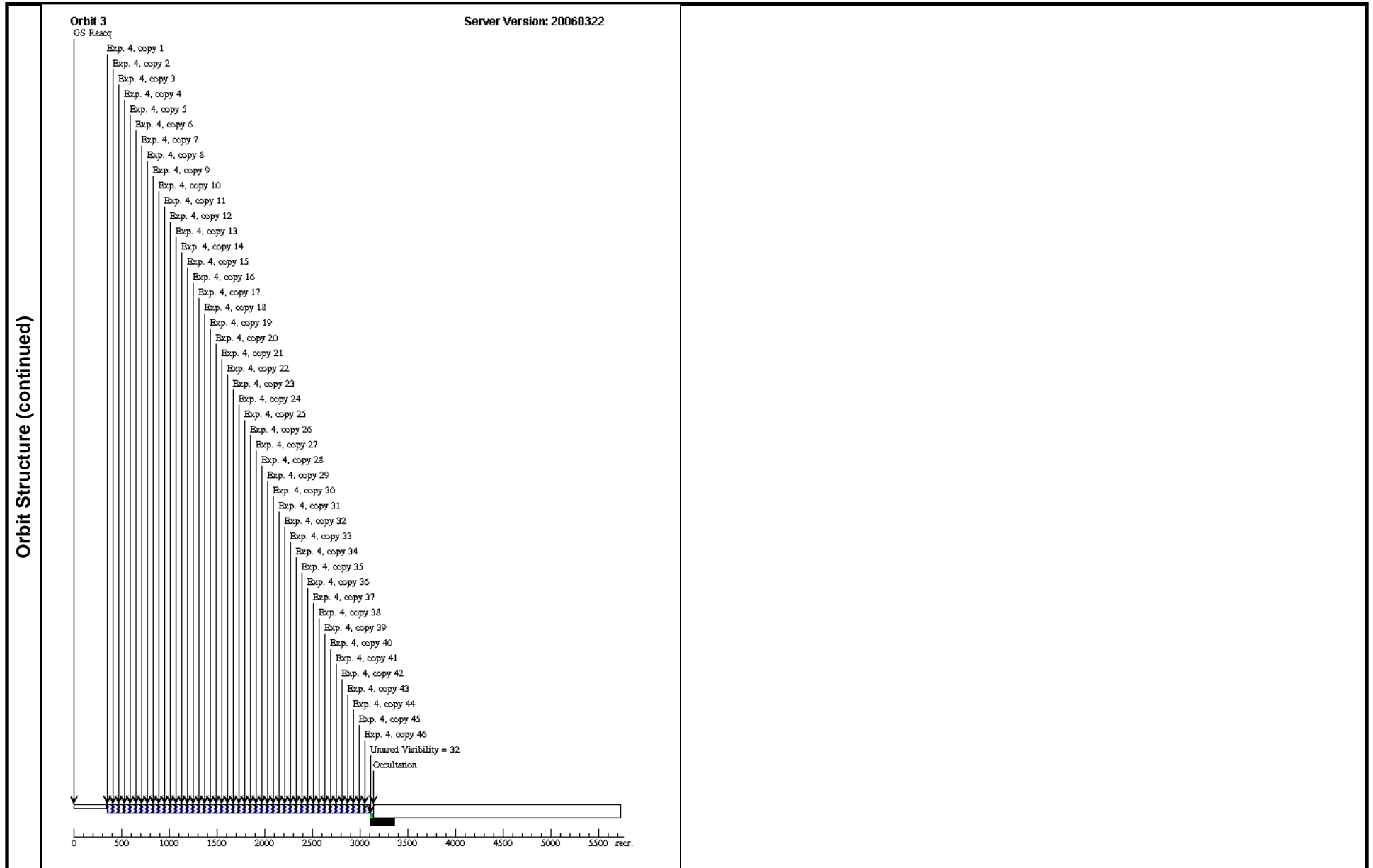
Proposal 10923 - Visit 02 - Measuring the size of the close-in transiting extrasolar planet HD 189733b

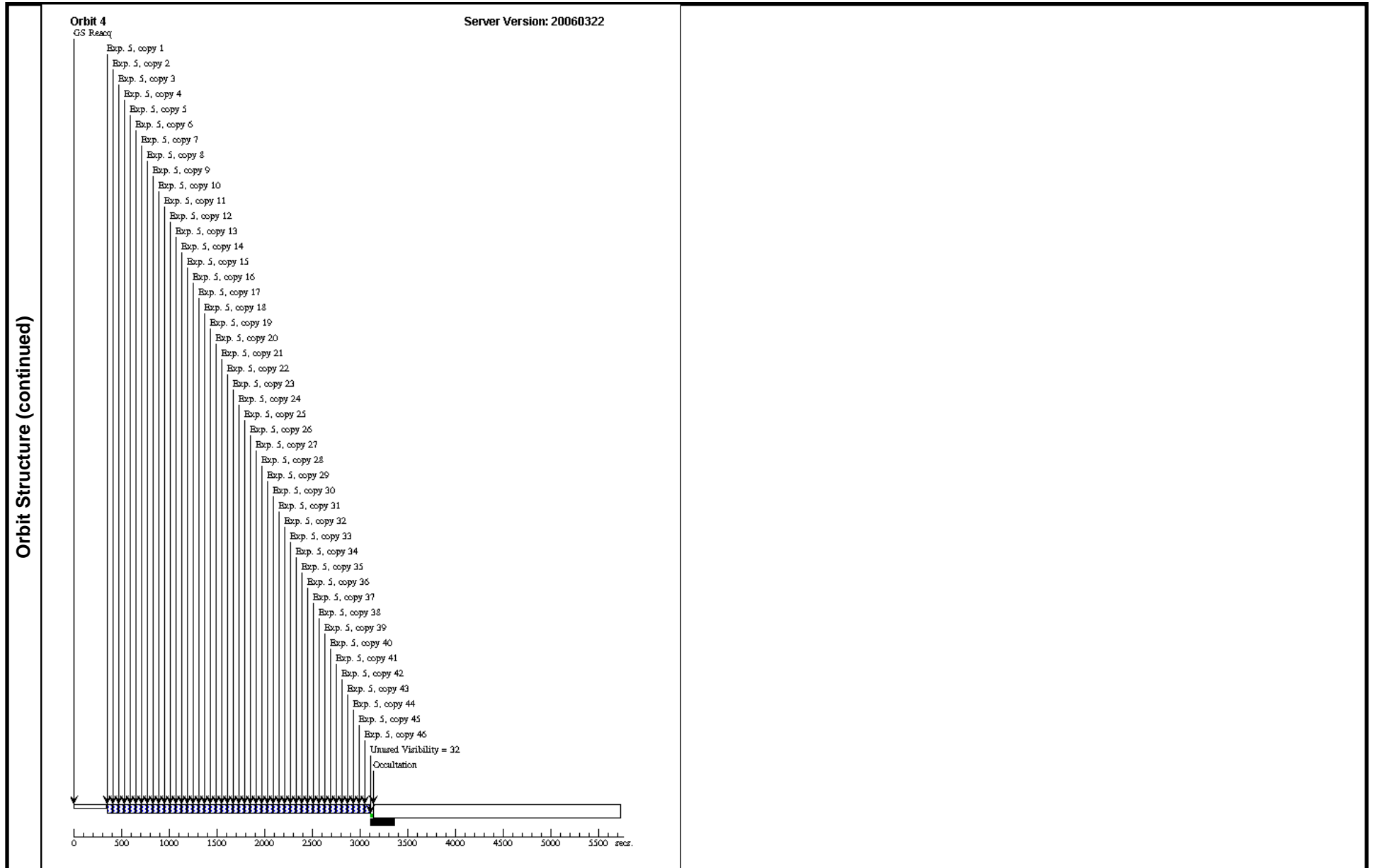
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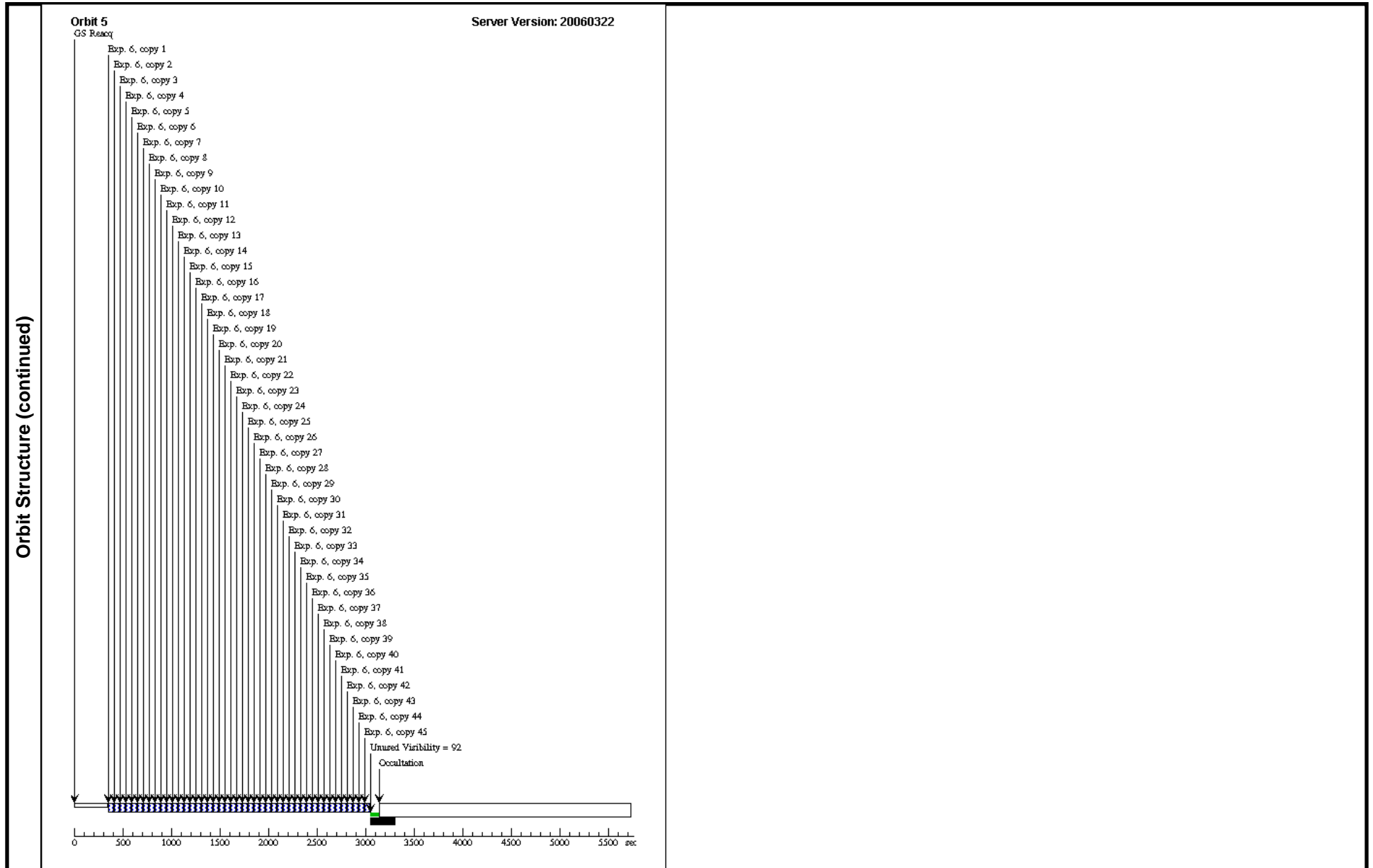
<b>Visit</b>	<p><b>Proposal 10923, Visit 02</b></p> <p><b>Diagnostic Status: No Diagnostics</b></p> <p>Scientific Instruments: ACS/HRC</p> <p>Special Requirements: Period 2.218573 D AND ZERO-PHASE JD2453629.3942; ON HOLD</p> <p><i>Comments: Second of three visits. It is essential for the 5 orbits to schedule as one contiguous block of 5 orbits. The visibility windows must therefore remain free of the SAA.</i></p> <p><i>On Hold Comments: Visit 01 was given a large phase window to facilitate quick, and easy, scheduling. Visits 01,02, and 03 as a group are intended to have unique phases with respect to the 2.2 day period of transits to map out the full transit curve and assure good coverage on the most important parts of it such as ingress and egress. Rather than start with three small phase windows that yield guaranteed good phase coverage, but likely suffering from poor schedulability, we have opted to try this new approach. Within two weeks of receiving Visit 01 data we can lift the hold for both Visits 02 and 03, after providing narrowed phase windows for them that are complementary to that found in reality for Visit 01. Also, since there are still unique aspects to this program, allowing a chance for minor changes to Visits 02 and 03 in response to results of Visit 01 (e.g. possible change of POS TARG at 0.5-1.0 arcsec level) is prudent.</i></p>									
	<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>			
(1)		HD189733	RA: 20 00 43.7130 (300.1821375d)	Proper Motion RA: -0.00018s/yr	V=7.67+/-0.01	Reference Frame: ICRS				
		Alt Name1: GSC0214100972	Dec: +22 42 39.07 (22.71085d)	Proper Motion Dec: -0.251"/yr	B-V = 0.932					
		Alt Name2: N2OE002179	Equinox: J2000	Parallax: 0.052"						
				Epoch of Position: 2000.0						
<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) HD189733	(1) HD189733	ACS/HRC, ACCUM, HRC-512	F660N	GAIN=4; CR-SPLIT=NO	POS TARG -1,0; PHASE 0.9005 TO 0.935		2.0 Secs [==>]	[1]
	<i>Comments: Expect to reach 0.55 of full well.</i>									







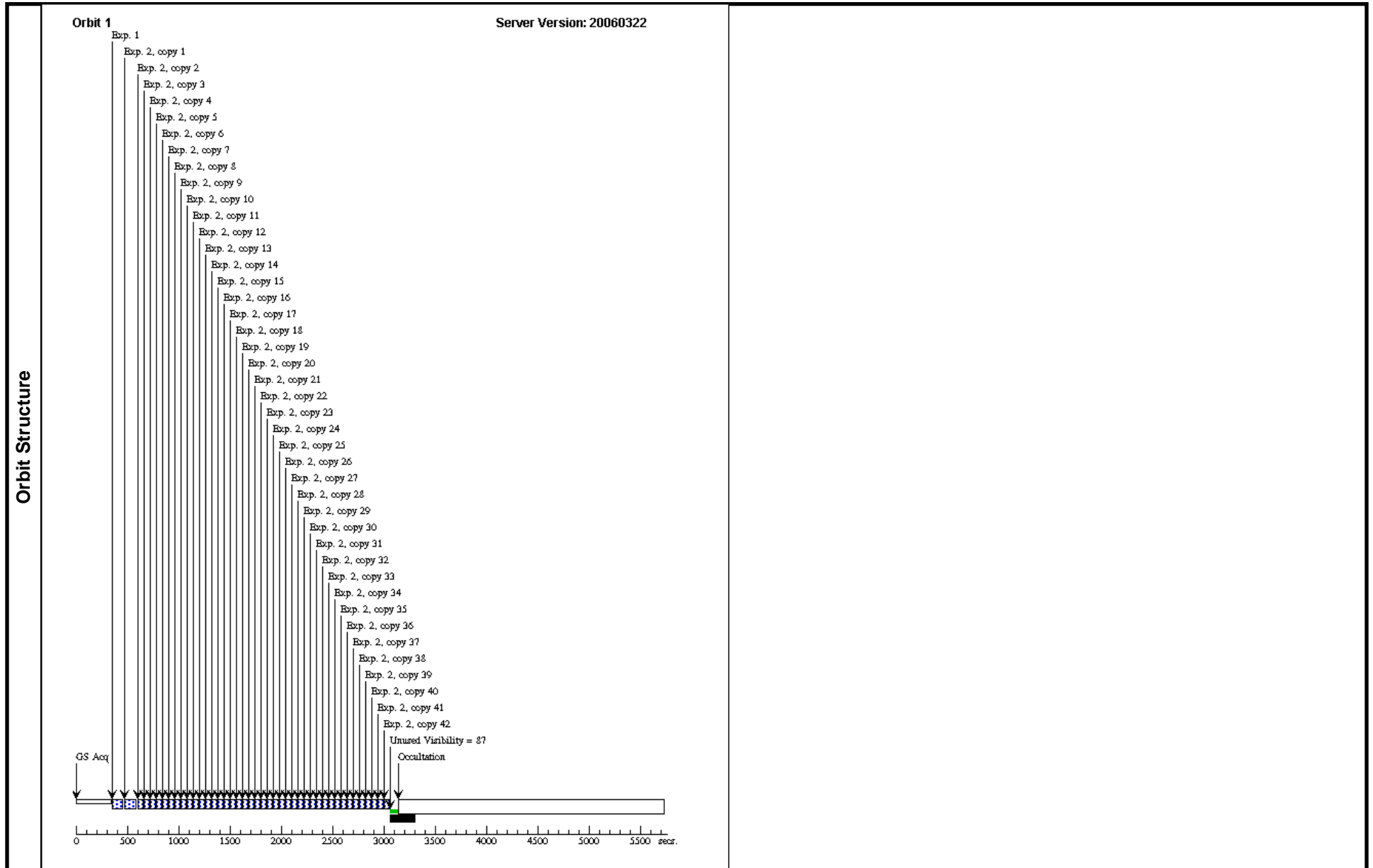


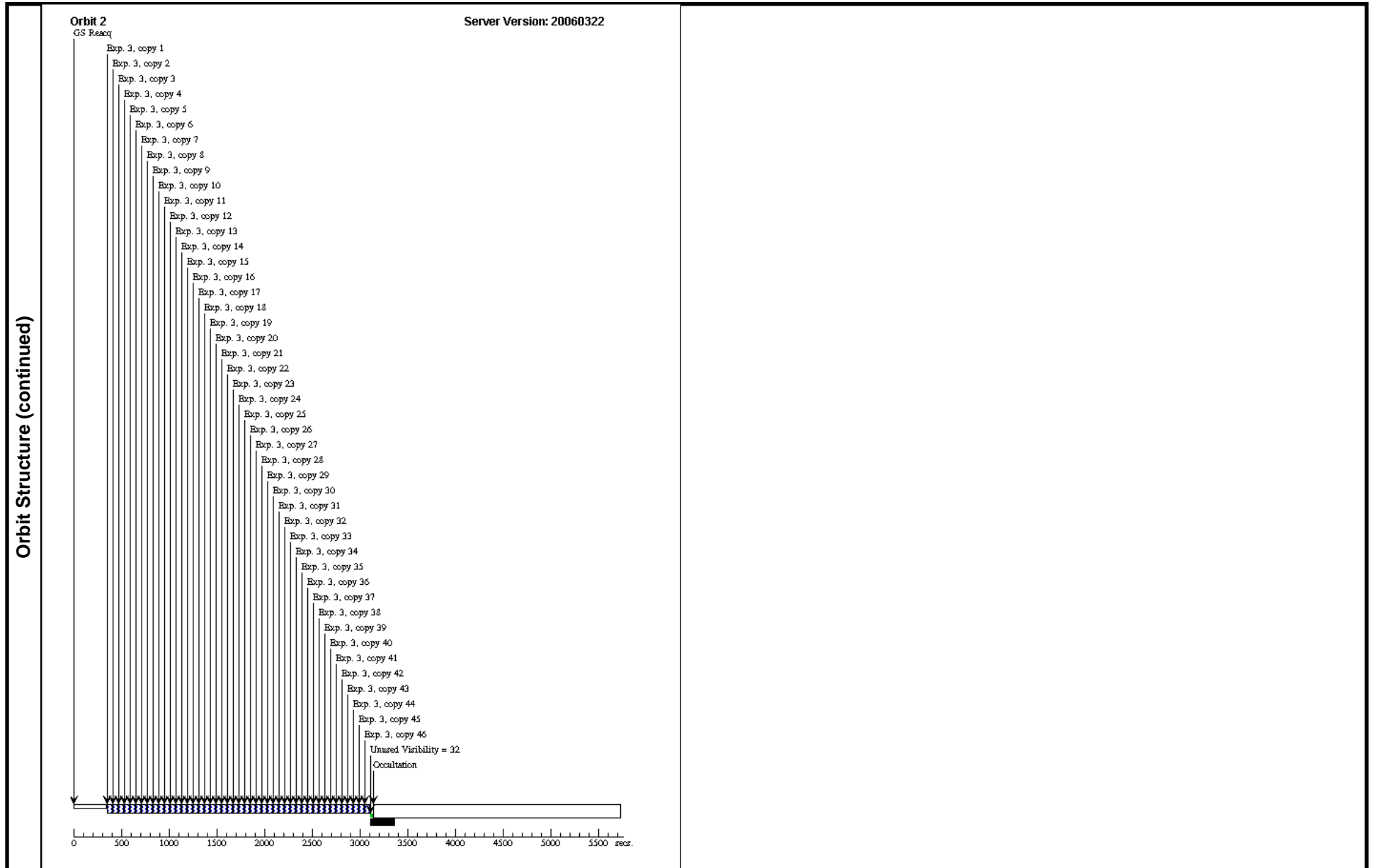


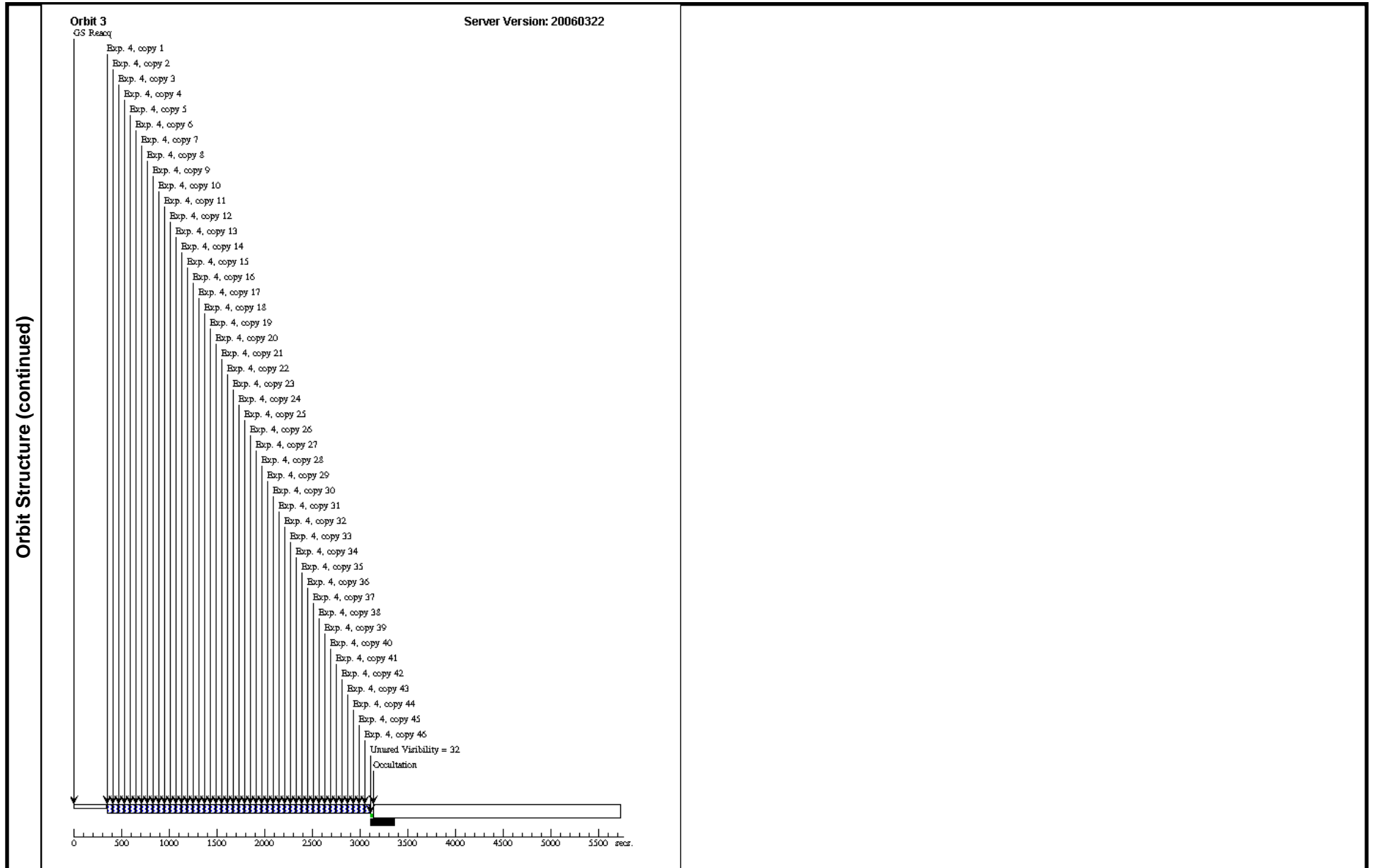
Proposal 10923 - Visit 03 - Measuring the size of the close-in transiting extrasolar planet HD 189733b

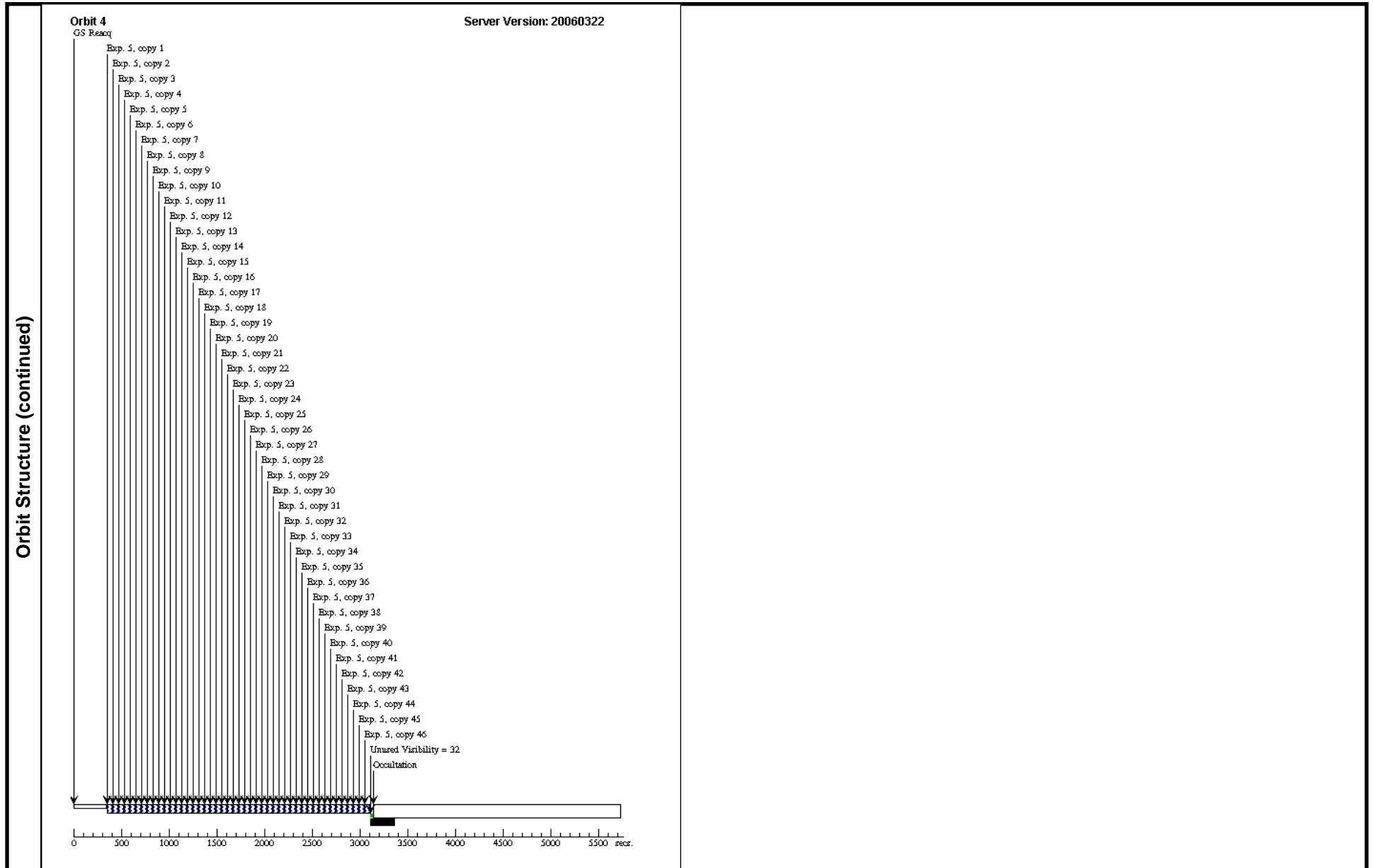
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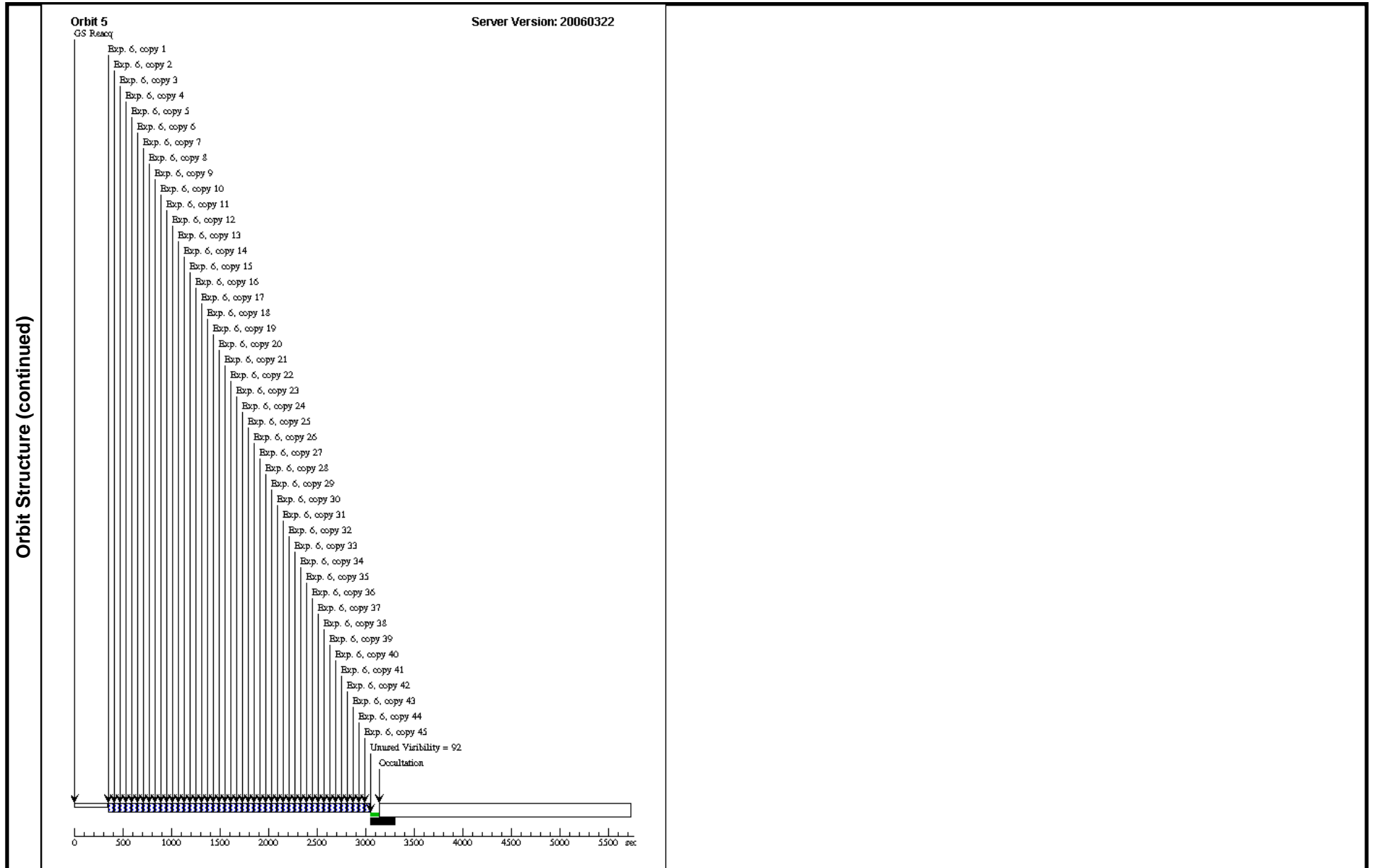
<b>Visit</b>	<b>Proposal 10923, Visit 03</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/HRC Special Requirements: Period 2.218573 D AND ZERO-PHASE JD2453629.3942; ON HOLD Comments: <i>Third of three visits.</i> <i>It is essential for the 5 orbits to schedule in one contiguous 5 orbit block.</i> <i>The visibility windows must therefore not suffer from SAA interference.</i> <i>On Hold Comments: See comments for Visit 02, which apply in full here.</i>									
	<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>			
(1)		HD189733 Alt Name1: GSC0214100972 Alt Name2: N2OE002179	RA: 20 00 43.7130 (300.1821375d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000	Proper Motion RA: -0.00018s/yr Proper Motion Dec: -0.251"/yr Parallax: 0.052" Epoch of Position: 2000.0	V=7.67+/-0.01 B-V = 0.932	Reference Frame: ICRS				
<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) HD189733	(1) HD189733	ACS/HRC, ACCUM, HRC-512	F660N	GAIN=4; CR-SPLIT=NO	POS TARG -1,0; PHASE 0.9005 TO 0 .935		2.0 Secs [==>]	[1]
Comments: <i>Expect to reach 0.55 of full well.</i>										











Proposal 10923 - Visit 04 - Measuring the size of the close-in transiting extrasolar planet HD 189733b

Tue May 16 02:20:36 GMT 2006

<b>Visit</b>	<b>Proposal 10923, Visit 04</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: ACS/HRC Special Requirements: Period 2.218573 D AND ZERO-PHASE JD2453629.3942 <i>Comments: First of three visits.</i> <i>It is essential for the five orbits to be scheduled in a contiguous five orbit block.</i> <i>The visibility windows must therefore be free of the SAA.</i>									
	<b>Fixed Targets</b>	<b>#</b>	<b>Name</b>	<b>Target Coordinates</b>	<b>Targ. Coord. Corrections</b>	<b>Fluxes</b>	<b>Miscellaneous</b>			
(1)		HD189733 Alt Name1: GSC0214100972 Alt Name2: N2OE002179	RA: 20 00 43.7130 (300.1821375d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000	Proper Motion RA: -0.00018s/yr Proper Motion Dec: -0.251"/yr Parallax: 0.052" Epoch of Position: 2000.0	V=7.67+/-0.01 B-V = 0.932	Reference Frame: ICRS				
<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) HD189733	ACS/HRC, ACCUM, HRC-512	F660N	GAIN=4; CR-SPLIT=NO	POS TARG -1,0; PHASE 0.9138 TO 0 .9218		2.0 Secs [==>]	[1]
<i>Comments: Expect to reach 0.55 of full well.</i>										

