10869 - The upper atmosphere and the escape state of the transiting very-hot-Jupiter HD189733b

Cycle: 15, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) HD-189733	ACS/SBC	4	18-Jan-2008 21:16:03.0	yes
02	(1) HD-189733	ACS/SBC	4	18-Jan-2008 21:16:24.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(1) HD-189733	ACS/SBC	3	18-Jan-2008 21:16:39.0	yes
04	(1) HD-189733	WFPC2	1	18-Jan-2008 21:16:45.0	yes

12 Total Orbits Used

ABSTRACT

The observation of the HD209458b transits in Lyman-alpha revealed that the atmosphere of this planet is escaping. These observations raised the question of the evaporation state of hot-Jupiters. Is the evaporation specific to HD209458b or general to hot-Jupiters? What is the evaporation mechanism, and how does the escape rate depend on the planetary system characteristics?

The recent discovery of HD189733b, a planet transiting a bright and nearby K0 star (V=7.7), offers the unprecedented opportunity to answer these questions. Indeed, among the stars harboring transiting planets, HD189733 presents the largest apparent brightness in Lyman-alpha, providing capabilities to constrain the escape rate to high accuracy.

With ACS/PR110L we will observe stellar emission lines to search for atmospheric absorptions during the transits. HD189733b being a very short period planet orbiting a nearby late type star with bright chromospheric emission lines, it is by far the best target to make significant progress in that field.

OBSERVING DESCRIPTION

We will observe 3 transits of HD189733b by using 2 visits of 4 HST orbits each and 1 visit of 3 HST orbits.

At each HST orbit, we propose to observe 4 times 250 seconds with PR110L at 2 dithering positions.

For each HST orbit, first we take a F115LP image to calibrate the wavelength zero point. With an exposure time of 60s, this image will have a S/N ratio of about 30. The remaining time is used to observe at Lyman-alpha using PR110L with 4 separate exposures of 250 s. At each HST orbit, this sequence is repeated twice at two dithering positions.

For each visit, the time constraints are given by a phase requirement calculated to allow a full HST orbit observation to be executed before and after

the planetary transit as seen in Lyman-alpha. We estimated that the first exposure of the first orbit of Visits #1 and #2 must be taken at a phase in the range 0.935-0965; the first exposure of the first orbit of Visit #3 must be taken at a phase in the range 0.962-0.976.

The Visit #4 is used to perfom WFPC observations of the HD189733 field to perfom the BOP check. This is done by images using F160BW filter with 15 degree partial rotation (F160BN15) for the largest field of view, and using F218W filter images.

Visit

Proposal 10869, Visit 01, completed Sat Jan 19 02:16:48 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: Period 2.218574 D AND ZERO-PHASE JD2453629.3942

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1-2), (3-4), (5-6), (7-8)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-189733	RA: 20 00 43.7133 (300.1821388d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000		V=7.67	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

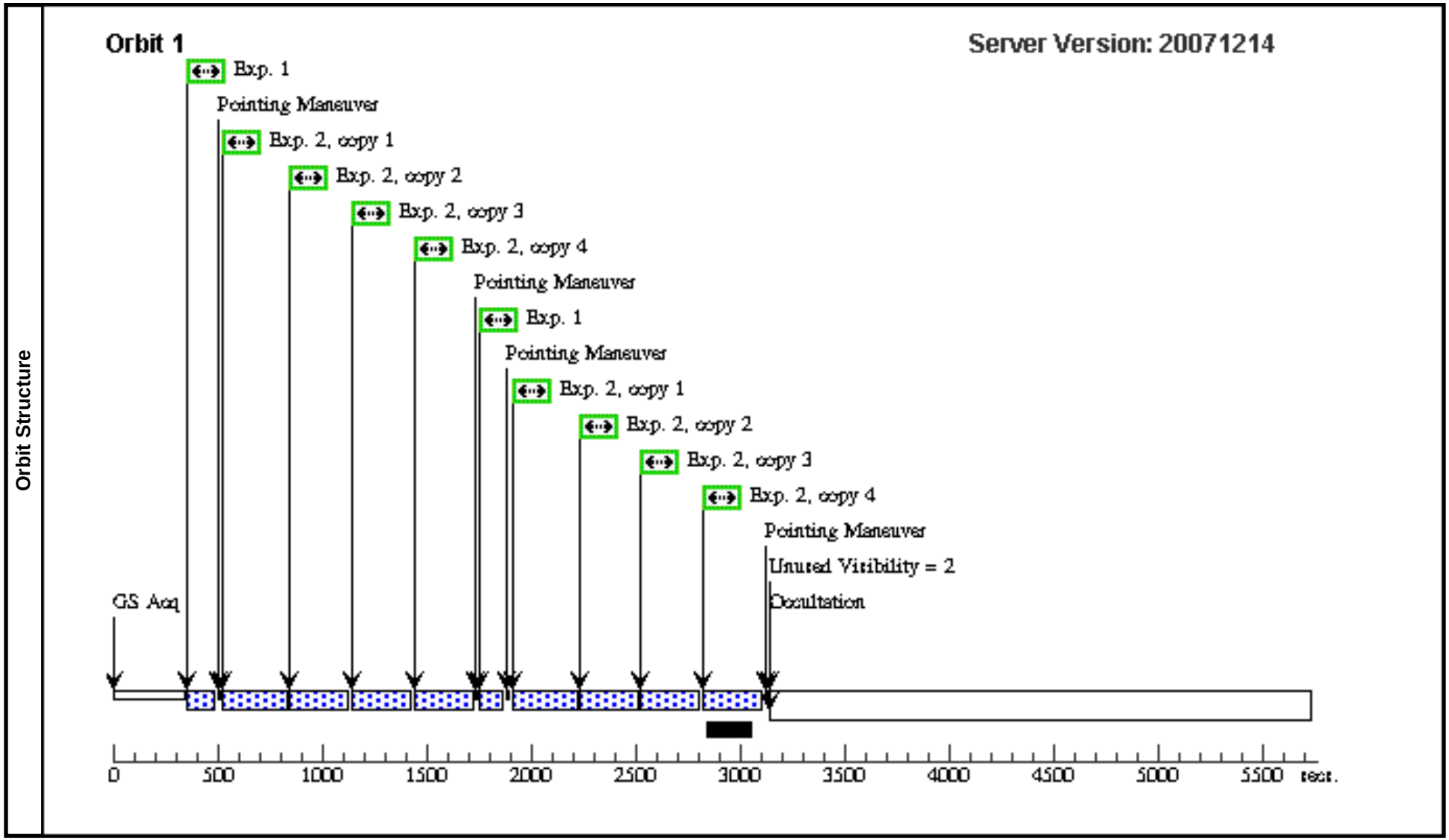
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP		PHASE 0.935 TO 0.965	Pattern 1-2 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[1]***
2		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 1-2 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[1]***
3		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 3-4 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[2]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
4		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 3-4 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[2]***
5		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 5-6 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[3]***
6		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 5-6 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[3]***
7		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 7-8 (1)	60.0 Secs	
								[==>69.0 Secs (Pattern 1)] *[==>69.0 Secs (Pattern 2)]*	***[4]***

Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
8		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 7-8 (1)	250.0 Secs X 4	
								[==>259.0 Secs (Pattern 1, Copy 1)] *[==>259.0 Secs (Pattern 1, Copy 2)]* *[==>259.0 Secs (Pattern 1, Copy 3)]* *[==>259.0 Secs (Pattern 1, Copy 4)]* *[==>259.0 Secs (Pattern 2, Copy 1)]* *[==>259.0 Secs (Pattern 2, Copy 2)]* *[==>259.0 Secs (Pattern 2, Copy 3)]* *[==>259.0 Secs (Pattern 2, Copy 4)]*	***[4]***


Orbit Structure
Orbit 1
Server Version: 20071214
Exp. 1
Pointing Maneuver
Exp. 2, copy 1
Exp. 2, copy 2
Exp. 2, copy 3
Exp. 2, copy 4
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 2, copy 1
Exp. 2, copy 2
Exp. 2, copy 3
Exp. 2, copy 4
Pointing Maneuver
Unused Visibility = 2
Occultation
GS Acq
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500
1000
1500
2000
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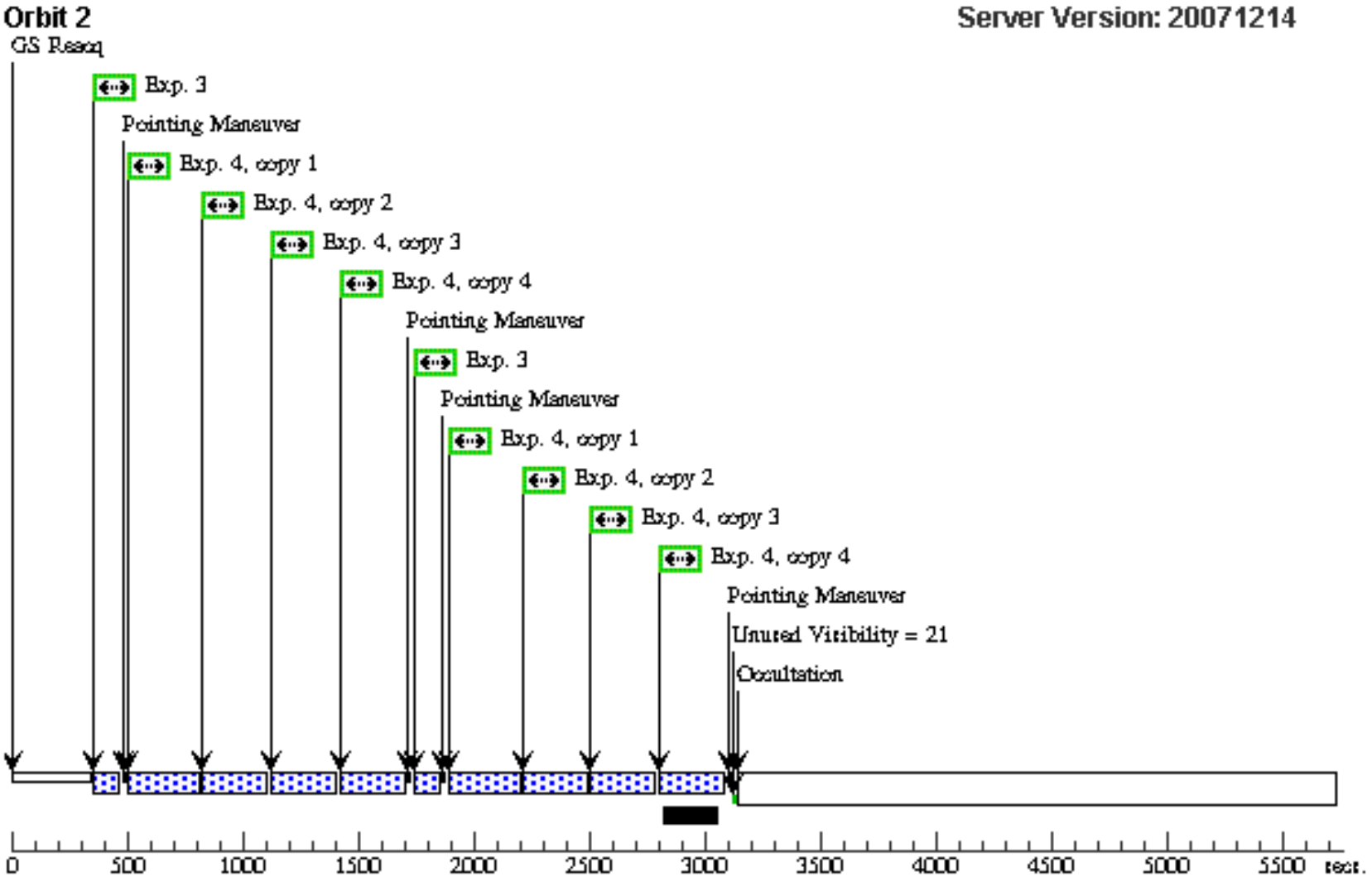
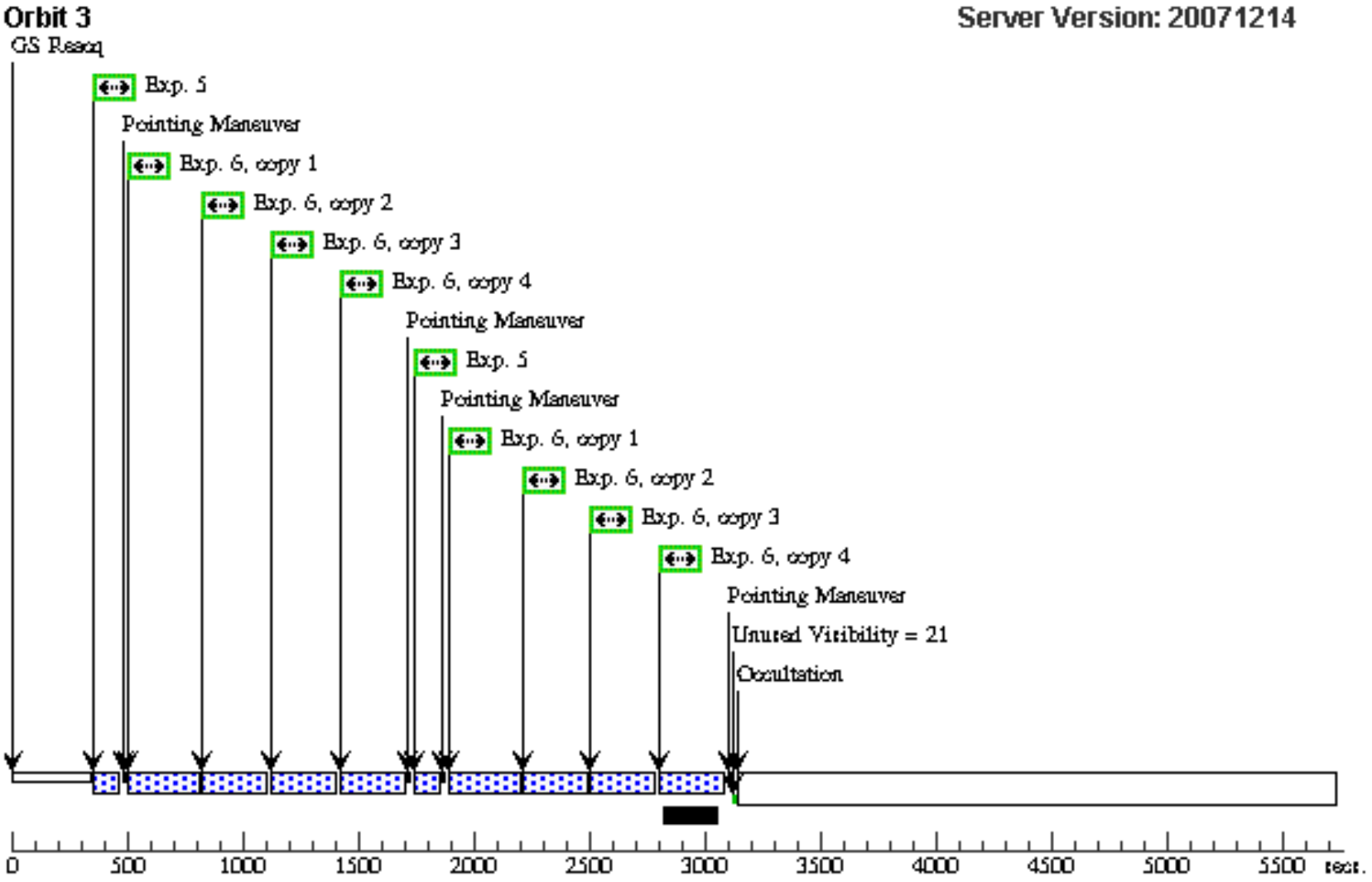
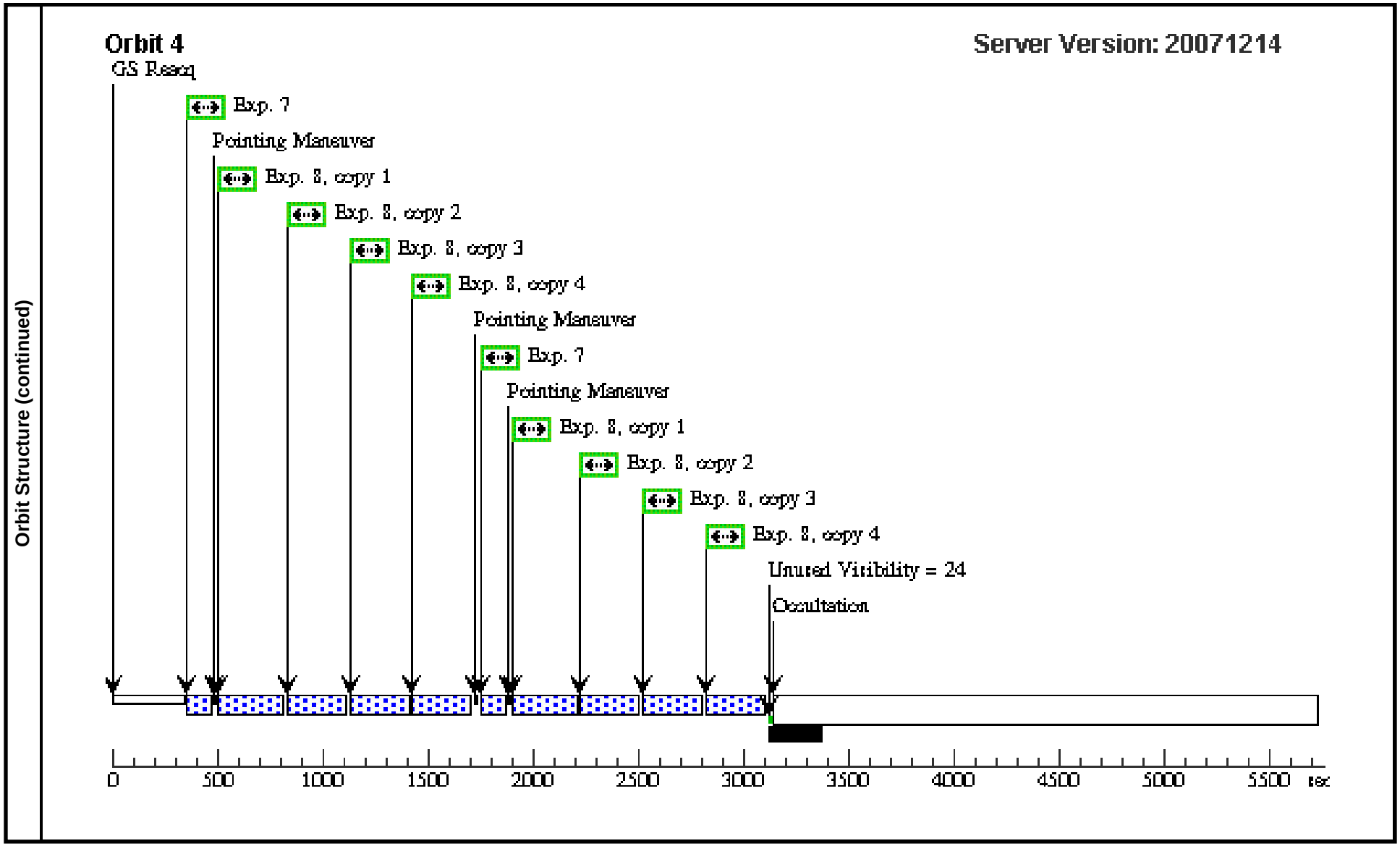
3500
4000
4500
5000
5500
sec.

Orbit Structure (continued)



Orbit Structure (continued)




Orbit Structure (continued)
Orbit 4
Server Version: 20071214
GS Reacq
Exp. 7
Pointing Maneuver
Exp. 8, copy 1
Exp. 8, copy 2
Exp. 8, copy 3
Exp. 8, copy 4
Pointing Maneuver
Exp. 7
Pointing Maneuver
Exp. 8, copy 1
Exp. 8, copy 2
Exp. 8, copy 3
Exp. 8, copy 4
Unused Visibility = 24
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10869, Visit 02, completed Sat Jan 19 02:16:51 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: Period 2.218574 D AND ZERO-PHASE JD2453629.3942

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1-2), (3-4), (5-6), (7-8)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-189733	RA: 20 00 43.7133 (300.1821388d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000		V=7.67	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

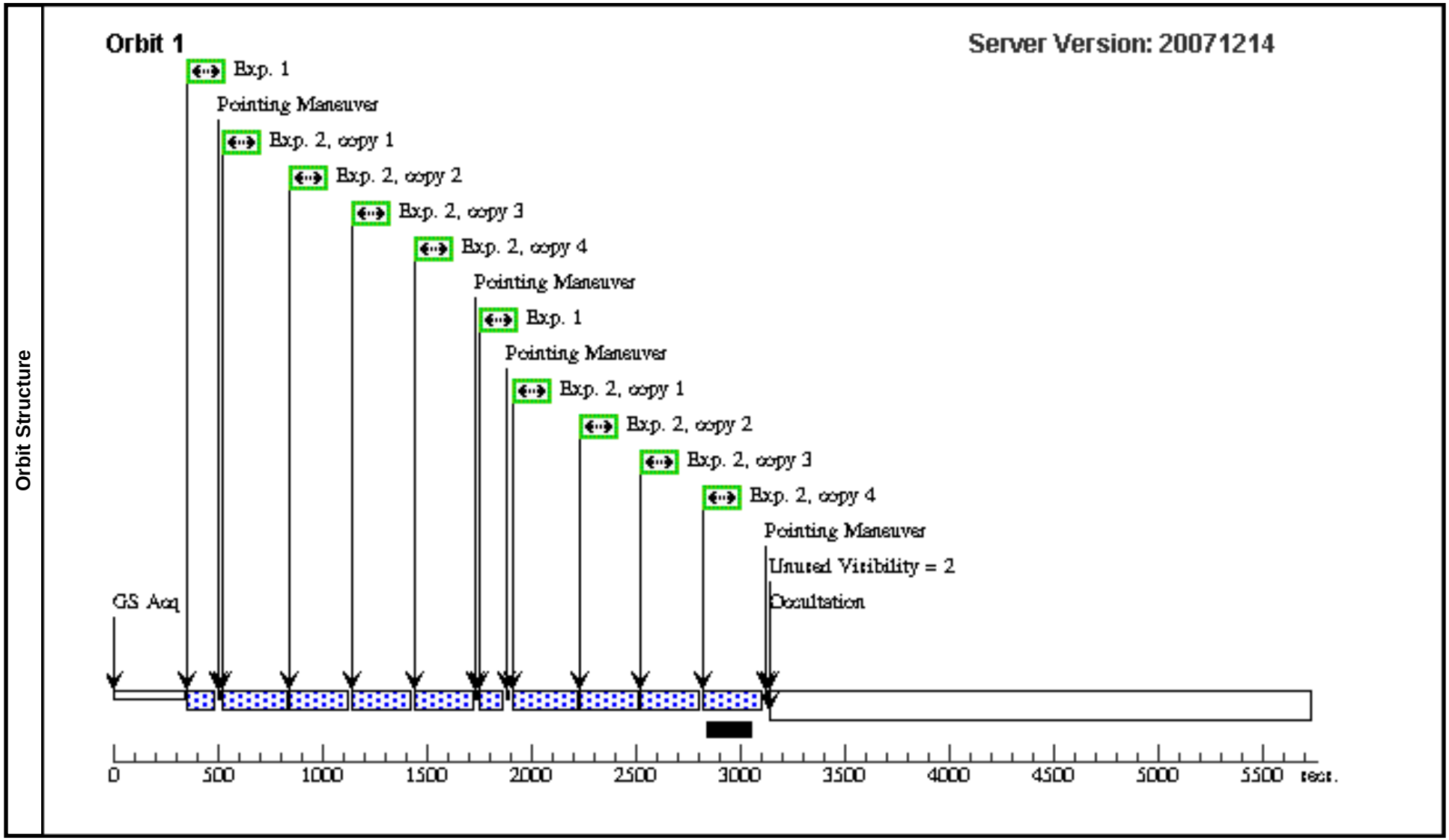
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP		PHASE 0.935 TO 0.965	Pattern 1-2 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[1]***
2		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 1-2 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[1]***
3		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 3-4 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[2]***

Exposures (continued)

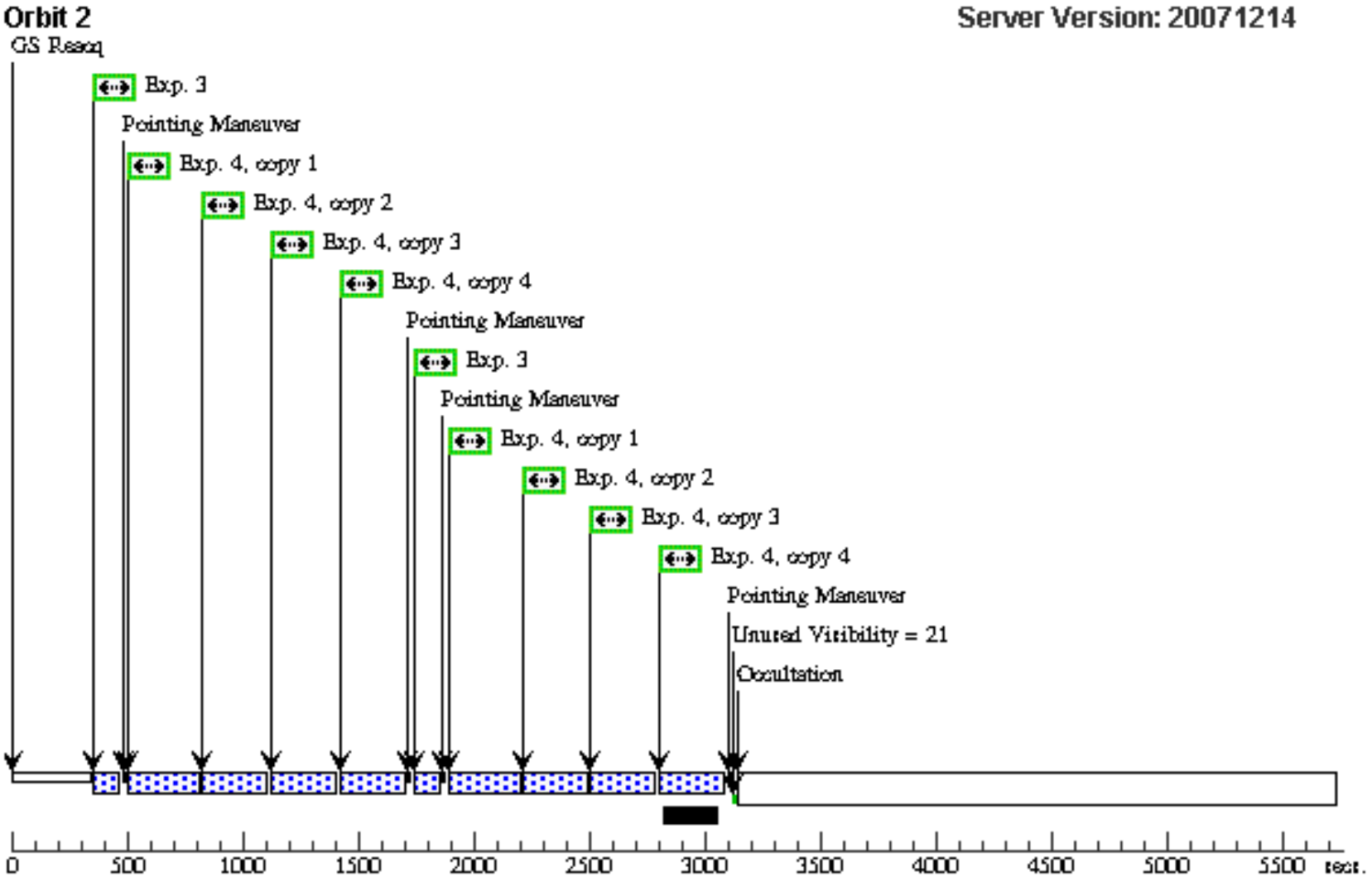
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
4		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 3-4 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[2]***
5		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 5-6 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[3]***
6		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 5-6 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[3]***
7		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 7-8 (1)	60.0 Secs	
								[==>69.0 Secs (Pattern 1)] *[==>69.0 Secs (Pattern 2)]*	***[4]***

Exposures (continued)

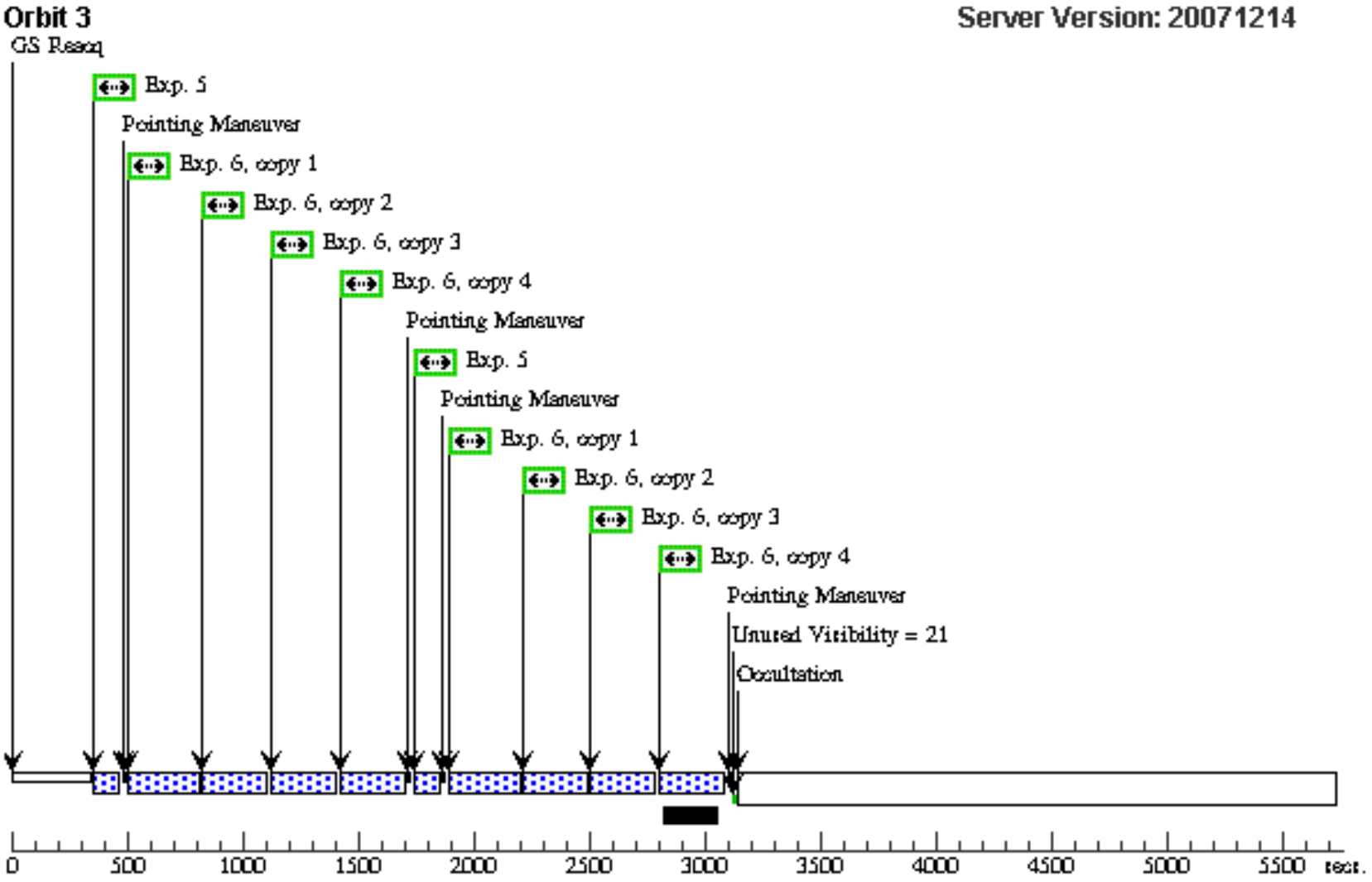
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
8		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 7-8 (1)	250.0 Secs X 4	
								[==>259.0 Secs (Pattern 1, Copy 1)] *[==>259.0 Secs (Pattern 1, Copy 2)]* *[==>259.0 Secs (Pattern 1, Copy 3)]* *[==>259.0 Secs (Pattern 1, Copy 4)]* *[==>259.0 Secs (Pattern 2, Copy 1)]* *[==>259.0 Secs (Pattern 2, Copy 2)]* *[==>259.0 Secs (Pattern 2, Copy 3)]* *[==>259.0 Secs (Pattern 2, Copy 4)]*	***[4]***

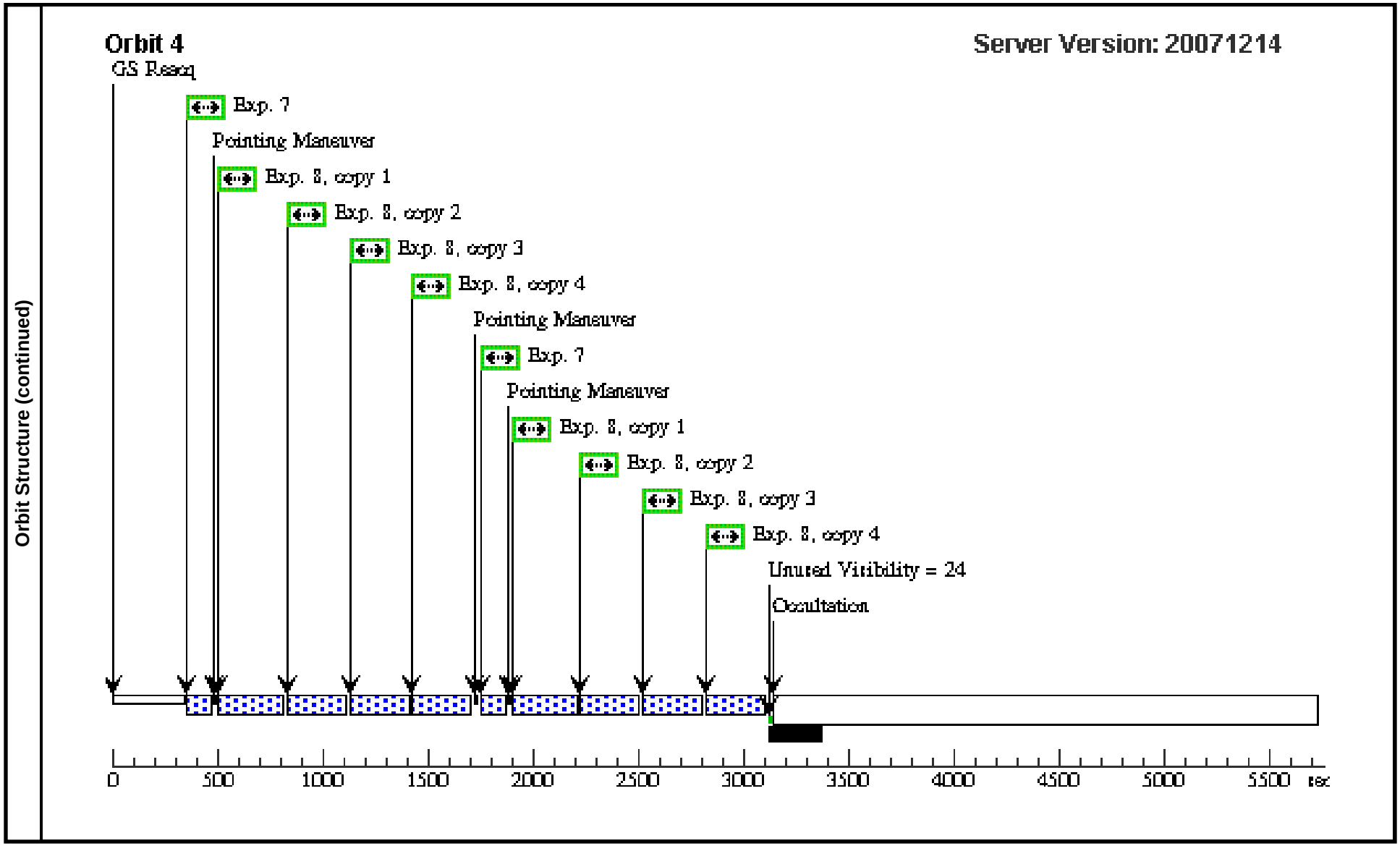

Orbit Structure
Orbit 1
Server Version: 20071214
Exp. 1
Pointing Maneuver
Exp. 2, copy 1
Exp. 2, copy 2
Exp. 2, copy 3
Exp. 2, copy 4
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 2, copy 1
Exp. 2, copy 2
Exp. 2, copy 3
Exp. 2, copy 4
Pointing Maneuver
Unused Visibility = 2
Occultation
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.

Orbit Structure (continued)



Orbit Structure (continued)




Orbit Structure (continued)
Orbit 4
Server Version: 20071214
GS Reacq
Exp. 7
Pointing Maneuver
Exp. 8, copy 1
Exp. 8, copy 2
Exp. 8, copy 3
Exp. 8, copy 4
Pointing Maneuver
Exp. 7
Pointing Maneuver
Exp. 8, copy 1
Exp. 8, copy 2
Exp. 8, copy 3
Exp. 8, copy 4
Unused Visibility = 24
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10869, Visit 03, scheduling Sat Jan 19 02:16:53 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: Period 2.218581 D AND ZERO-PHASE JD2453931.12048

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-SBC-DITHER-LINE Purpose=DITHER Number Of Points=2 Point Spacing=0.472 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=44.4 Angle Between Sides= Center Pattern=false		(1-2), (3-4), (5-6)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-189733	RA: 20 00 43.7133 (300.1821388d) Dec: +22 42 39.07 (22.71085d) Equinox: J2000		V=7.67	Reference Frame: ICRS

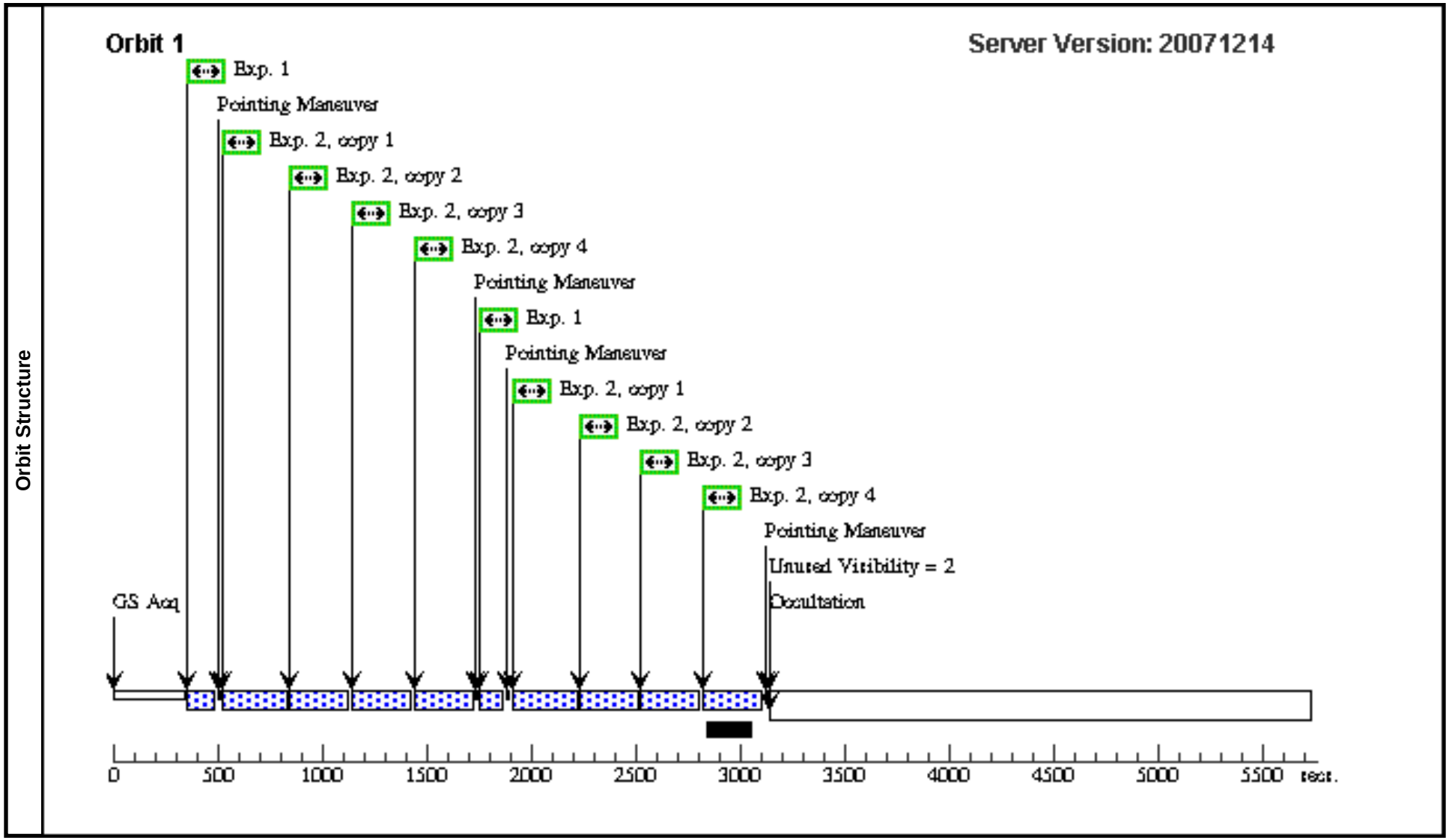
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

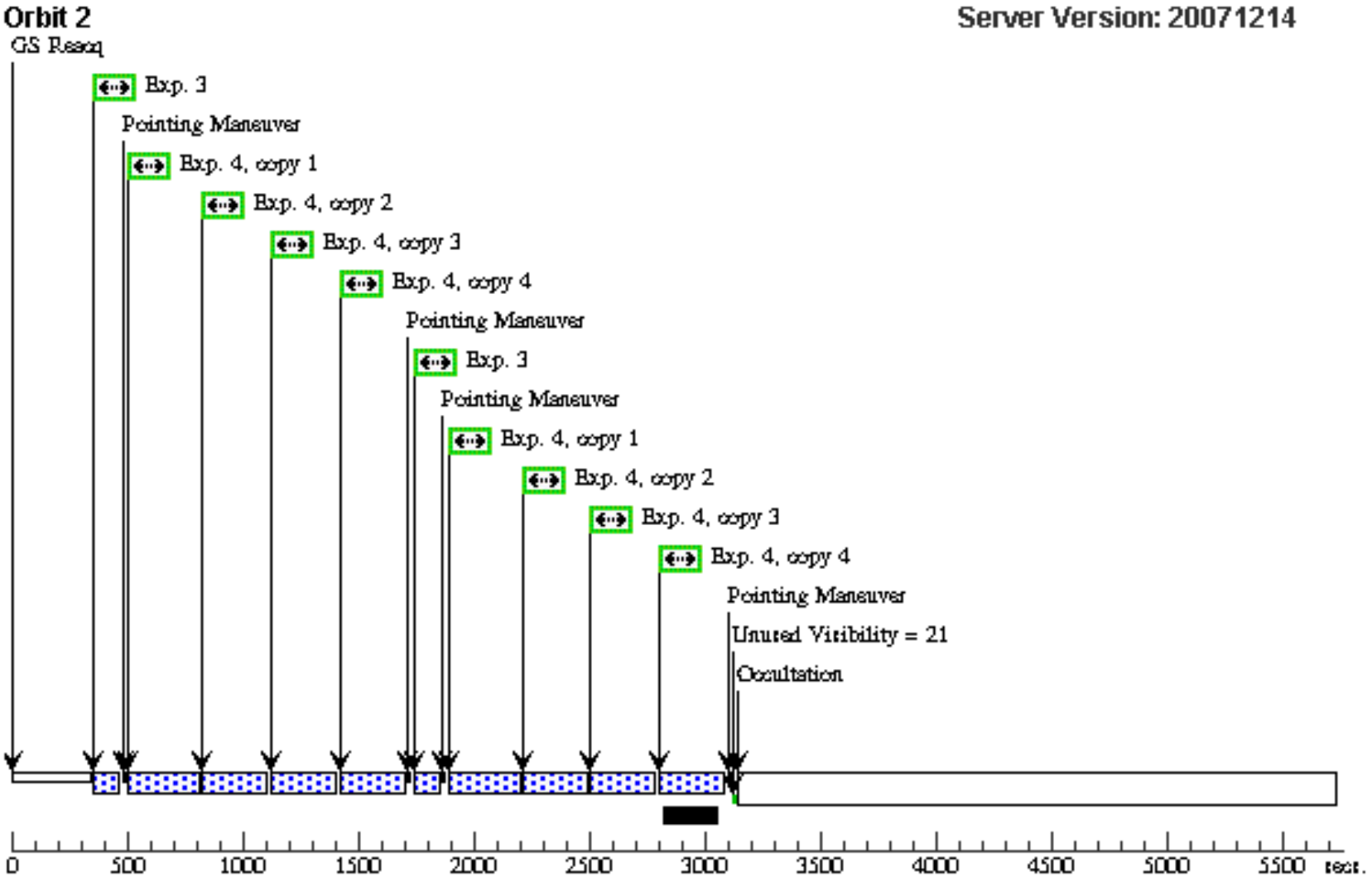
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP		PHASE 0.9603 TO 0.9653	Pattern 1-2 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[1]***
2		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 1-2 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[1]***
3		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 3-4 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[2]***

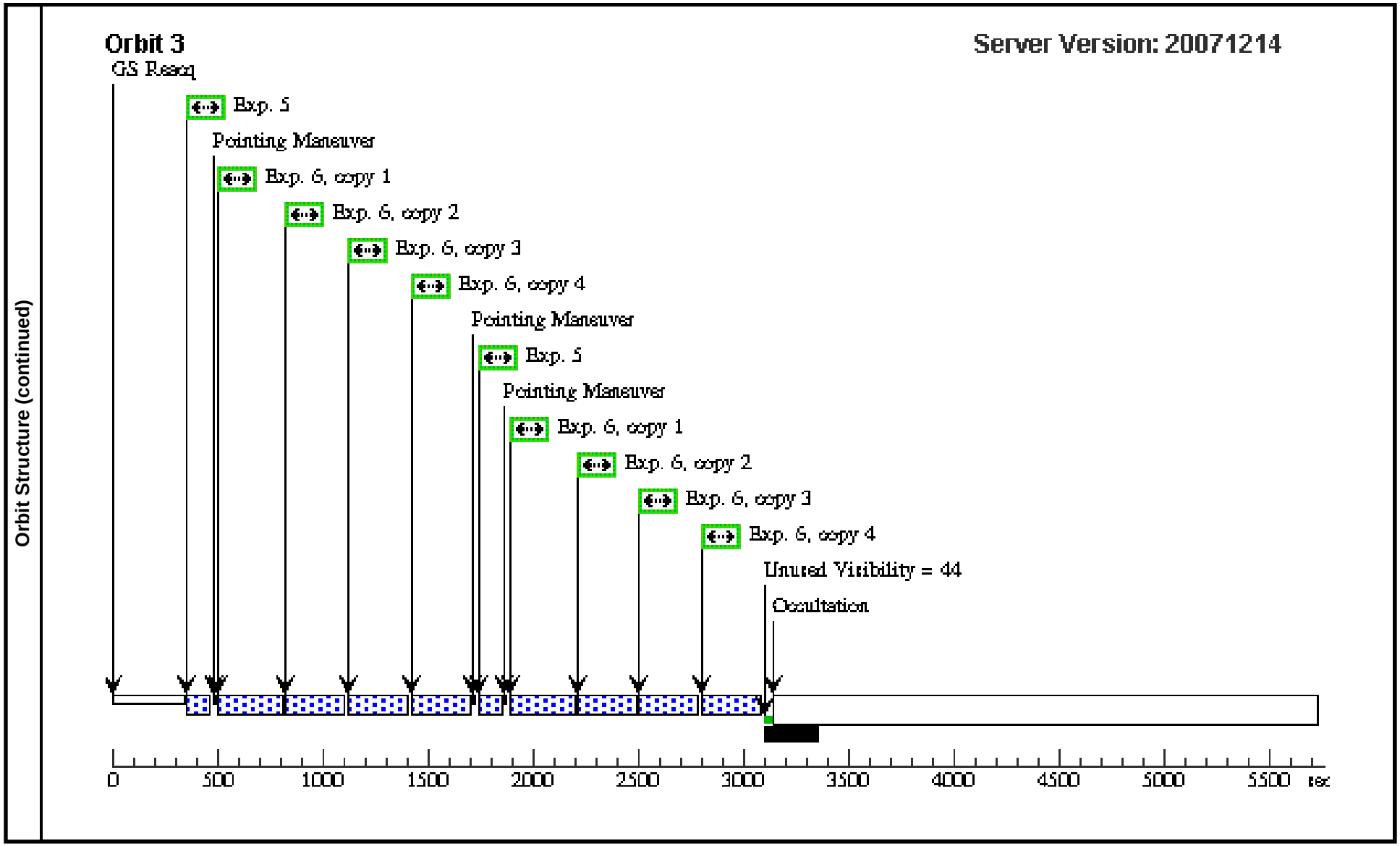
Exposures (continued)

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
4		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 3-4 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[2]***
5		(1) HD-189733	ACS/SBC, ACCUM, SBC	F115LP			Pattern 5-6 (1)	60.0 Secs	
								[==>67.0 Secs (Pattern 1)] *[==>67.0 Secs (Pattern 2)]*	***[3]***
6		(1) HD-189733	ACS/SBC, ACCUM, SBC	PR110L			Pattern 5-6 (1)	250.0 Secs X 4	
								[==>257.0 Secs (Pattern 1, Copy 1)] *[==>257.0 Secs (Pattern 1, Copy 2)]* *[==>257.0 Secs (Pattern 1, Copy 3)]* *[==>257.0 Secs (Pattern 1, Copy 4)]* *[==>257.0 Secs (Pattern 2, Copy 1)]* *[==>257.0 Secs (Pattern 2, Copy 2)]* *[==>257.0 Secs (Pattern 2, Copy 3)]* *[==>257.0 Secs (Pattern 2, Copy 4)]*	***[3]***


Orbit Structure
Orbit 1
Server Version: 20071214
Exp. 1
Pointing Maneuver
Exp. 2, copy 1
Exp. 2, copy 2
Exp. 2, copy 3
Exp. 2, copy 4
Pointing Maneuver
Exp. 1
Pointing Maneuver
Exp. 2, copy 1
Exp. 2, copy 2
Exp. 2, copy 3
Exp. 2, copy 4
Pointing Maneuver
Unused Visibility = 2
Occultation
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec.

Orbit Structure (continued)




Orbit Structure (continued)
Orbit 3
Server Version: 20071214
GS Reacq
Exp. 5
Pointing Maneuver
Exp. 6, copy 1
Exp. 6, copy 2
Exp. 6, copy 3
Exp. 6, copy 4
Pointing Maneuver
Exp. 5
Pointing Maneuver
Exp. 6, copy 1
Exp. 6, copy 2
Exp. 6, copy 3
Exp. 6, copy 4
Unused Visibility = 44
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10869, Visit 04, completed Sat Jan 19 02:16:54 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: (none)

Comments: Visit of 1 orbit for BOP check.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFPC2-BOX	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=26.56505		
	Number Of Points=4	Angle Between Sides=143.1301		
	Point Spacing=0.559017	Center Pattern=false		
	Line Spacing=0.559017			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-189733	RA: 20 00 43.7133 (300.1821388d)		V=7.67	Reference Frame: ICRS
		Dec: +22 42 39.07 (22.71085d)			
		Equinox: J2000			

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) HD-189733	WFPC2, IMAGE, F160BN15	F160BN15	CR-SPLIT=DEF		Pattern 1-1 (2)	50.0 Secs	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	
2		(1) HD-189733	WFPC2, IMAGE, WF3	F218W	CR-SPLIT=DEF		Pattern 2-2 (2)	30.0 Secs	
								[==>(Pattern 1)]	***[1]***
								[==>(Pattern 2)]	
								[==>(Pattern 3)]	
								[==>(Pattern 4)]	

Orbit Structure