11676 - A Deep ACS Study of the Spiral Outflow from the Extreme Carbon Star, CRL3068

Cycle: 17, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) AFGL-3068	ACS/WFC	3	24-Jul-2008 21:02:53.0	yes
02	(1) AFGL-3068	ACS/WFC	4	24-Jul-2008 21:03:01.0	yes

7 Total Orbits Used

ABSTRACT

At optical wavelengths, the extreme carbon star, AFGL3068, exhibits a remarkable spiral morphology in its dense, outflowing, circumstellar envelope, showing at least 5 windings of its externally illuminated dust shell around the invisible central star. Near-IR imaging with the Keck Telescope shows that this is a binary system with ~100 AU separation, so the spiral structure seen in the circumstellar outflow is apparently caused by the binary interaction. We propose to obtain relatively deep images of this spiral dust structure with the F475W and F606W filters in order to: 1) image more distant windings of the spiral structure, if they are present, and thereby explore the history of the mass loss rate, and 2) refine the details of the spiral density distribution of dust, for comparison with our existing dynamical & radiative transfer models of gas flow within a binary system

containing a star undergoing spherical mass loss. With the proposed imaging in two filters, we will also have the color information for comparison with our models of the external illumination of the dusty envelope by Galactic starlight. Comparable dust "arcs" have been observed in a variety of other post-AGB stars, planetary and preplanetary nebulae, but none is as highly organized, as continuous, nor as clearly defined as the dust structure in AFGL3068. By understanding this favorable case, we hope to gain insights into this whole class of objects.

OBSERVING DESCRIPTION

This observation is designed to obtain relatively deep images of a single target -- the extreme carbon star AFGL3068 -- in two filters. An integration of four orbits will be done in the F606W filter in one visit and an integration of three orbits will be done in the F475W filter in a second visit, both using the ACS with the WFC1 aperture. The mass-losing carbon star has a binary companion with a separation of 0.1 arcsec, so the circumstellar outflow forms a spiral pattern, seen earlier in snapshot observations; the goal of these observations is to follow the archimedean spiral out to a radial distance of 16 arcseconds from the binary, which corresponds to 7 or 8 windings of the spiral. A standard dither pattern will be used for the observations at both wavelengths, with cosmic ray splits taken at each position.

REAL TIME JUSTIFICATION

A bright star located about 20 arcseconds from the target star projects diffraction spikes across the array, so ORIENT constraints have been set so that these spikes miss the target source area as much as possible. A large ghost from this bright star leads to additional ORIENT constraints to prevent it from landing on the source area. In addition, because the diffraction spikes from the bright star cannot be completely avoided, the two visits are grouped within 72 hours so that the spikes at the two wavelengths fall at approximately the same place.

Visit

Proposal 11676, Visit 01, implementation Fri Jul 25 01:03:10 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 11D TO 33 D; ORIENT 99D TO 134 D; GROUP 01,02 WITHIN 72H

Comments: A bright star with prominent diffraction spikes in our snapshot image of this source lies ~20" to the Northeast of our target in position angle -24 degrees. Because the overall diameter of our target is at least 10", it is critical to minimize their effect, and that of bleeding along the Y direction of the array, by orienting the visit so that the source falls near the center (within ~ +/- 12 D) of the clear quadrants bordered by the diffraction spikes or the Y direction. Two of the four possible quadrants are discluded in order to avoid the ghost of the bright star evident in the snapshot images.

The two visits are grouped together with a 72-hour timing constraint so that the diffraction spikes fall at nearly the same place at the two wavelengths being observed, thus minimizing the effects of these spikes on the ratio map.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-BOX	Coordinate Frame=POS-TARG		(1)
	Purpose=DITHER	Pattern Orientation=20.67		
	Number Of Points=4	Angle Between Sides=69.05		
	Point Spacing=0.265	Center Pattern=false		
	Line Spacing=0.187			

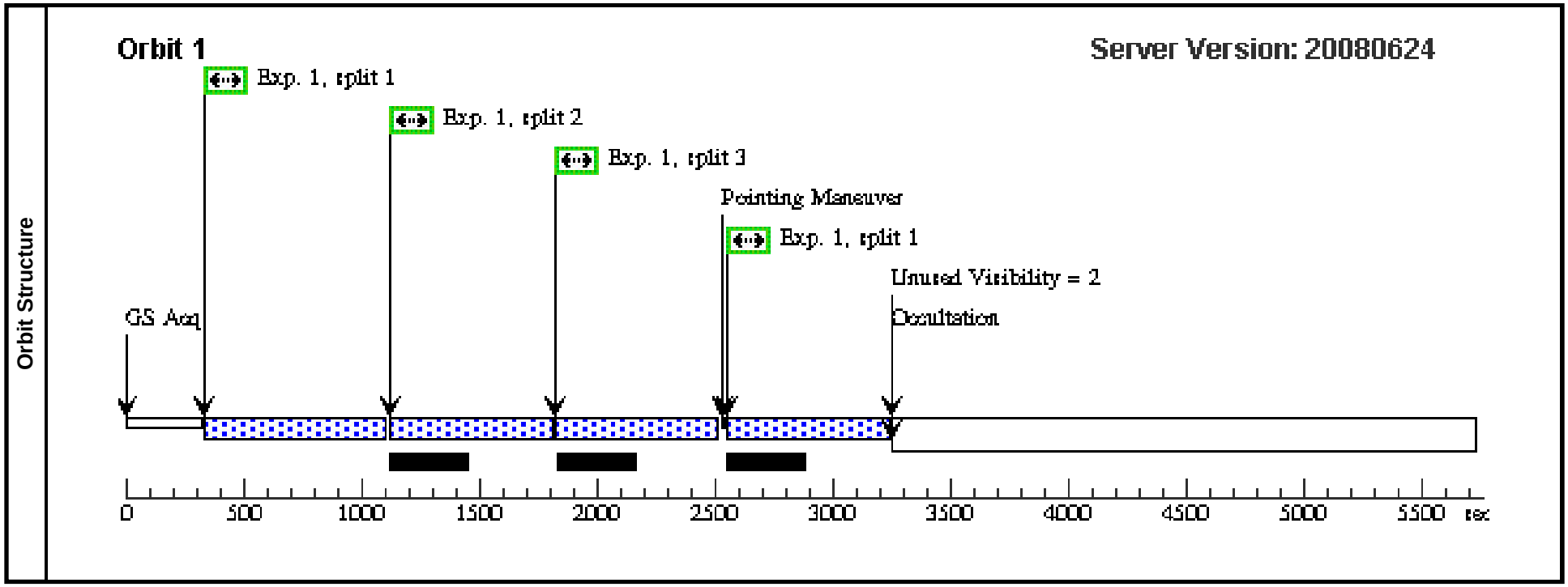
Fixed Targets

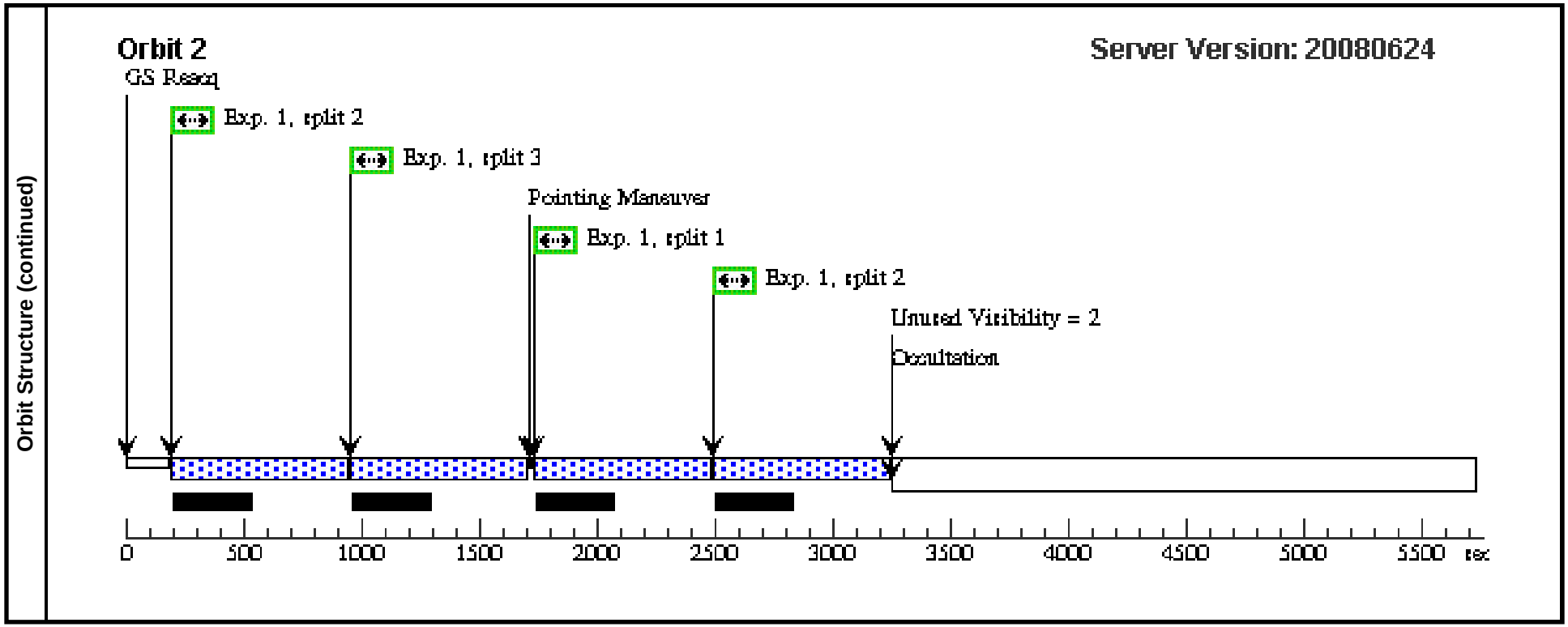
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	AFGL-3068	RA: 23 19 12.3900 (349.8016250d)		V=19.6	Reference Frame: ICRS
	Alt Name1: CRL3068	Dec: +17 11 35.40 (17.19317d)			
		Equinox: J2000			

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

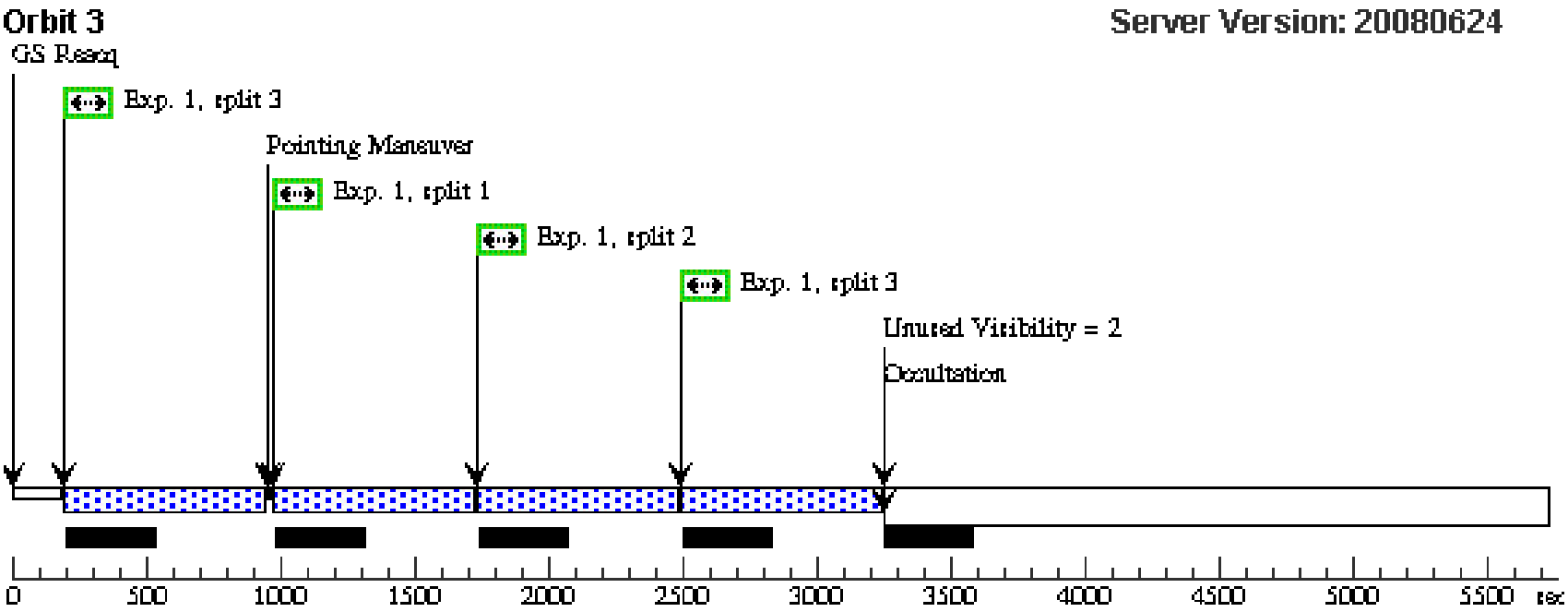
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F475W exposure	(1) AFGL-3068	ACS/WFC, ACCUM, WFC1	F475W	CR-SPLIT=3		Pattern 1-1 (1)	1680 Secs	
								[==>567.0 Secs (Pattern 1, Split 1)]	***[1]***
								[==>567.0 Secs (Pattern 1, Split 2)]	
								[==>567.0 Secs (Pattern 1, Split 3)]	
								[==>567.0 Secs (Pattern 2, Split 1)]	
								[==>622.0 Secs (Pattern 2, Split 2)]	***[2]***
								[==>622.0 Secs (Pattern 2, Split 3)]	
								[==>622.0 Secs (Pattern 3, Split 1)]	
								[==>622.0 Secs (Pattern 3, Split 2)]	
								[==>622.0 Secs (Pattern 3, Split 3)]	***[3]***
								[==>622.0 Secs (Pattern 4, Split 1)]	
								[==>622.0 Secs (Pattern 4, Split 2)]	
								[==>622.0 Secs (Pattern 4, Split 3)]	


Orbit Structure
Orbit 1
Server Version: 20080624
Exp. 1, split 1
Exp. 1, split 2
Exp. 1, split 3
Pointing Maneuver
Exp. 1, split 1
Unused Visibility = 2
GS Acq
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec


Orbit Structure (continued)
Orbit 2
Server Version: 20080624
GS Reacq
Exp. 1, split 2
Exp. 1, split 3
Pointing Maneuver
Exp. 1, split 1
Exp. 1, split 2
Unused Visibility = 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Orbit Structure (continued)



Visit

Proposal 11676, Visit 02, implementation Fri Jul 25 01:03:11 GMT 2008

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: ORIENT 11D TO 33 D; ORIENT 99D TO 134 D

Comments: A bright star with prominent diffraction spikes in our snapshot image of this source lies ~20" to the Northeast of our target in position angle -24 degrees. Because the overall diameter of our target is at least 10", it is critical to minimize their effect, and that of bleeding along the Y direction of the array, by orienting the visit so that the source falls near the center (within ~ +/- 12 D) of the clear quadrants bordered by the diffraction spikes or the Y direction. Two of the four possible quadrants are discluded in order to avoid the ghost of the bright star evident in the snapshot images.

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Exposures

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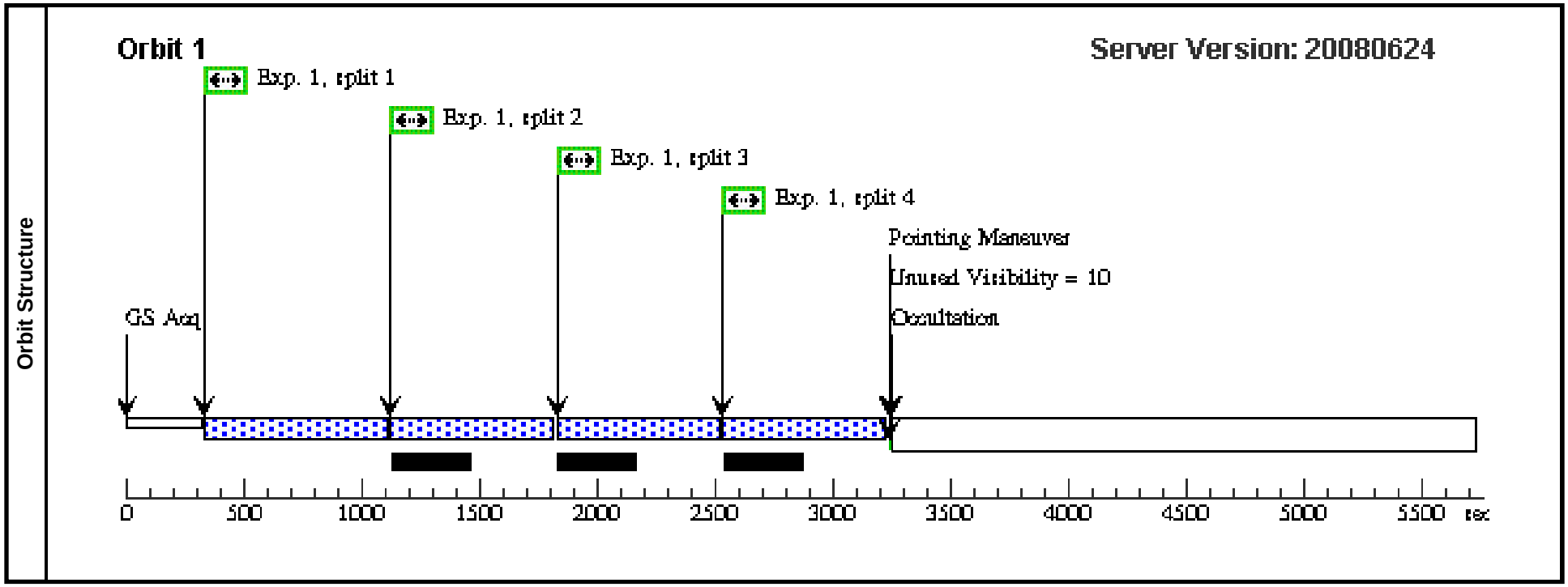
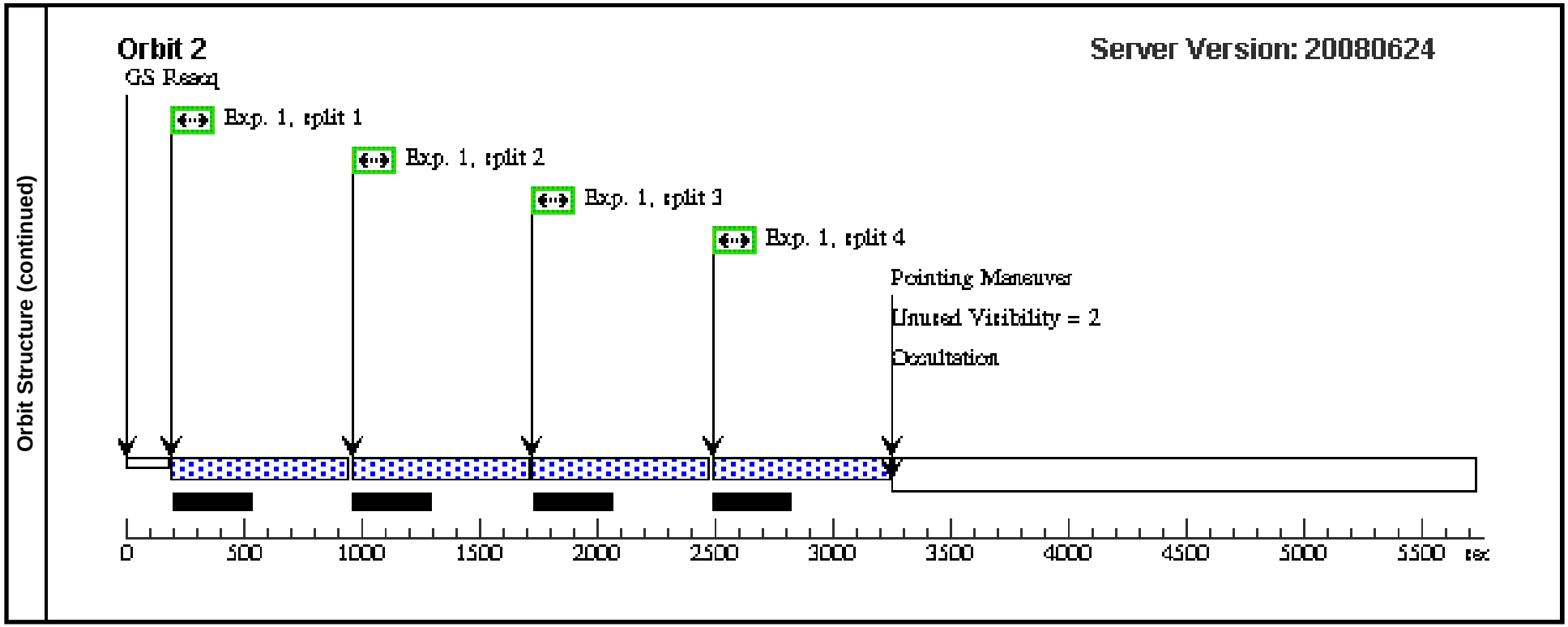
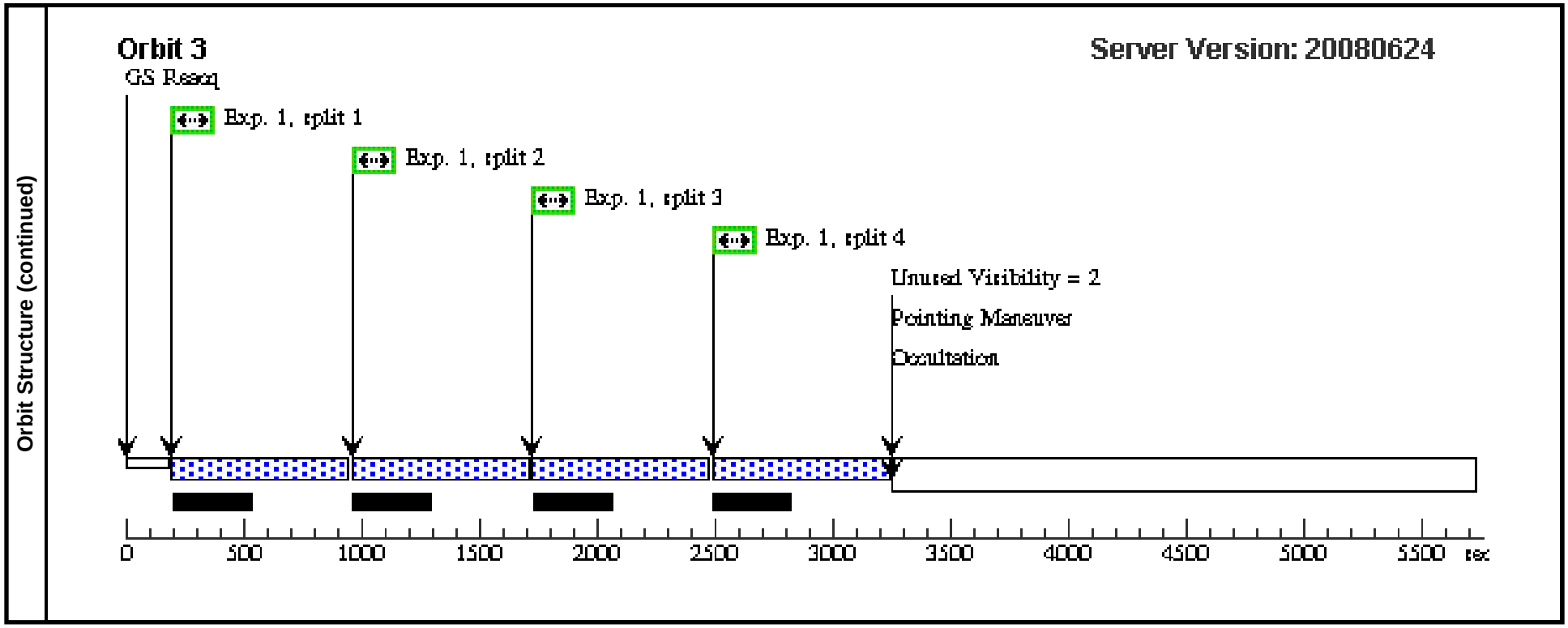
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 1, Split 3)]	
								[==>(Pattern 1, Split 4)]	
								[==>627.0 Secs (Pattern 2, Split 1)]	***[2]***
								[==>627.0 Secs (Pattern 2, Split 2)]	
								[==>627.0 Secs (Pattern 2, Split 3)]	
								[==>627.0 Secs (Pattern 2, Split 4)]	
								[==>627.0 Secs (Pattern 3, Split 1)]	***[3]***
								[==>627.0 Secs (Pattern 3, Split 2)]	
								[==>627.0 Secs (Pattern 3, Split 3)]	
								[==>627.0 Secs (Pattern 3, Split 4)]	
								[==>627.0 Secs (Pattern 4, Split 1)]	***[4]***
								[==>627.0 Secs (Pattern 4, Split 2)]	
								[==>627.0 Secs (Pattern 4, Split 3)]	
								[==>627.0 Secs (Pattern 4, Split 4)]	


Orbit Structure
Orbit 1
Server Version: 20080624
Exp. 1, split 1
Exp. 1, split 2
Exp. 1, split 3
Exp. 1, split 4
Pointing Maneuver
Unused Visibility = 10
Occultation
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec


Orbit Structure (continued)
Orbit 2
Server Version: 20080624
GS Reacq
Exp. 1, split 1
Exp. 1, split 2
Exp. 1, split 3
Exp. 1, split 4
Pointing Maneuver
Unused Visibility = 2
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec


Orbit Structure (continued)
Orbit 3
Server Version: 20080624
GS Reacq
Exp. 1, split 1
Exp. 1, split 2
Exp. 1, split 3
Exp. 1, split 4
Unused Visibility = 2
Pointing Maneuver
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Orbit Structure (continued)