10795 - The Largest Galaxies in the Local Universe: New Light on Disk Galaxy Formation?

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) SDSSJ092843.86+590021.6	ACS/WFC	2	21-May-2007 18:05:35.0	yes
02	(2) SDSSJ161017.06+531455.2	ACS/WFC	2	21-May-2007 18:05:42.0	yes
03	(3) SDSSJ020707.48-082726	WFPC2	4	21-May-2007 18:05:48.0	yes
04	(3) SDSSJ020707.48-082726	WFPC2	4	21-May-2007 18:06:02.0	yes

12 Total Orbits Used

ABSTRACT

In the standard scenario of disk galaxy formation in a hierarchical Universe, large disks form late via the accretion of either hot or cold gas. Direct observational evidence for such late accretion-driven disk formation has not been forthcoming. In this proposal, we describe the discovery of a rare new type of galaxy that may be examples of massive disks in the process of assembly. We have identified a sample of three such galaxies selected from the SDSS DR4. They are extremely large (diameters over 100 kpc) and highly luminous systems with amorphous structures (no obvious spiral arms or bulges). They are larger than the largest normal spirals in the survey, and have significantly bluer colors, lower metallicities, lower dust extinctions, higher UV luminosities and higher total star formation rates than the most massive ordinary spirals. We request HST images in the rest-frame near-UV and red to provide detailed maps of the underlying structure of these galaxies as well as the distribution of the young stars. The interstellar medium of these galaxies is evidently quite different from that of normal large spirals and starburst galaxies and they may be experiencing a different mode of star formation. We believe they are worthy of further investigation with the high-resolution imaging capabilities of HST.

OBSERVING DESCRIPTION

General Considerations

We propose to observe 3 giant blue amorphous galaxies with the ACS WFC in two bands. We will use the F435W filter to trace the young star forming population. These images correspond to a rest-frame band centered at ~3400 Angstrom (below the 4000 Angstrom break, and dominated by light from stars younger than ~100 Myr). We will use the F814W filter (rest-frame ~6500 Angstroms) to map out the older (> Gyr) population of stars and elucidate the underlying structure of these galaxies. We have chosen these two specific filters to maximimize sensitivity and provide a large wavelength range to increase our sensitivity to variations in the stellar population.

It is important to emphasize that the extremely blue colors of these galaxies imply that the amount of dust extinction in these galaxies is modest, ensuring that the images will provide reliable information about the distribution of young stars. These images will resolve structures as small as ~0.4 kpc at the median redshift of our sample (z ~ 0.29). These galaxies have half-light diameters of ~40 to 50 kpc, so the images should provide exquisite detail.

Feasibility

Our goal is achieve adequate signal-to-noise for compact (sub-arcsec) relatively high surface brightness features. We are proposing elsewhere to obtain the deep ground-based images to be used to study the faint outer regions of these galaxies. In what follows, we will couch our estimates in terms of the S/N per ACS resolution element (~0.1 arcsec) for a region having a surface brightness equal to the mean value interior to the galaxy half-light radius (e.g. the effective surface brightness).

F435W: The galaxies have effective surface brightnesses in this band ranging from 1 to 2x10^-18 erg s^-1 cm^-2 Angstrom^-1 arcsec^-2. In a single orbit with two CR-Split observations the ACS ETC yields a S/N of 2.5 to 4 per 2-by-2 WFC pixel region.

F814W: The galaxies have effective surface brightnesses in this band ranging from 1.0 to 1.5x10^-18 erg s^-1 cm^-2 Angstrom^-1 arcsec^-2. In a single orbit with two CR-Split observations the ACS ETC yields a S/N of 8.9 to 12.2 per 2-by-2 WFC pixel region.

ADDITIONAL COMMENTS

Cycle 16 modifications:

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Visits 03 and 04 observe SDSSJ020707 for 4 orbits each in F450W and F814W with WFPC2. The aimpoint is PC, and we use a 4 point WFPC2 DITHER BOX pattern for every two orbits of observing time. Each 800 s exposure is split into two 400 s exposures.

Visit

Proposal 10795, Visit 01, completed Mon May 21 17:06:05 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.28 Angle Between Sides= Center Pattern=false		(1), (2)

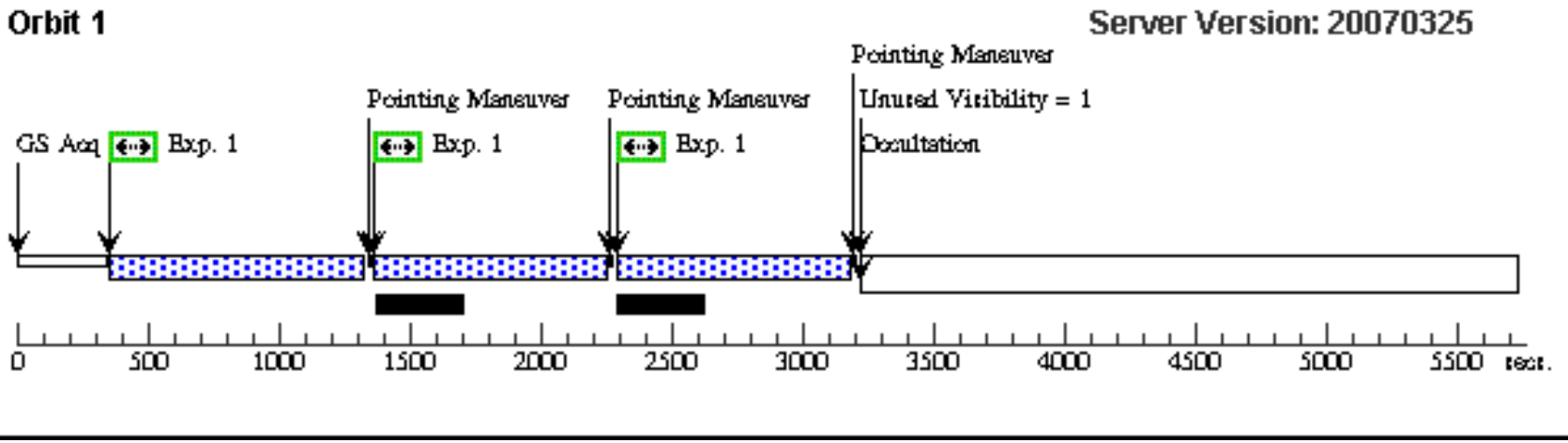
Fixed Targets

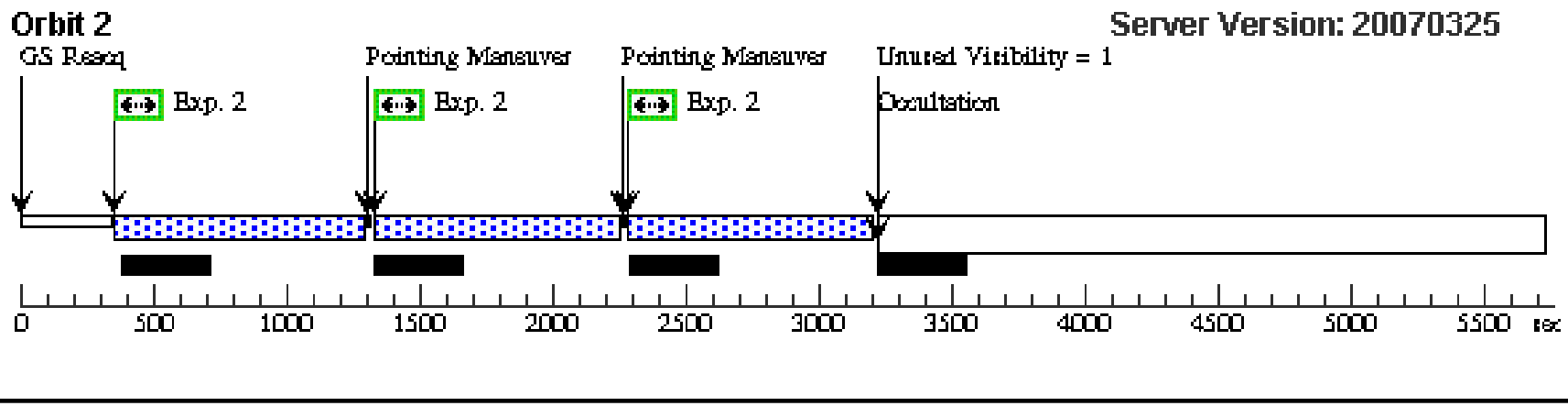
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ092843.86+590021.6	RA: 09 28 43.8655 (142.1827729d) Dec: +59 00 21.60 (59.00600d) Equinox: J2000		V=17.8+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SDSSJ092843.86+590021.6	ACS/WFC, ACCUM, WFC1	F435W	CR-SPLIT=NO		Pattern 1-1 (1)	767.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2		(1) SDSSJ092843.86+590021.6	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO		Pattern 2-2 (1)	796.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 10795, Visit 02, completed Mon May 21 17:06:06 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/WFC

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=ACS-WFC-DITHER-LINE Purpose=DITHER Number Of Points=3 Point Spacing=3.011 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=85.28 Angle Between Sides= Center Pattern=false		(1), (2)

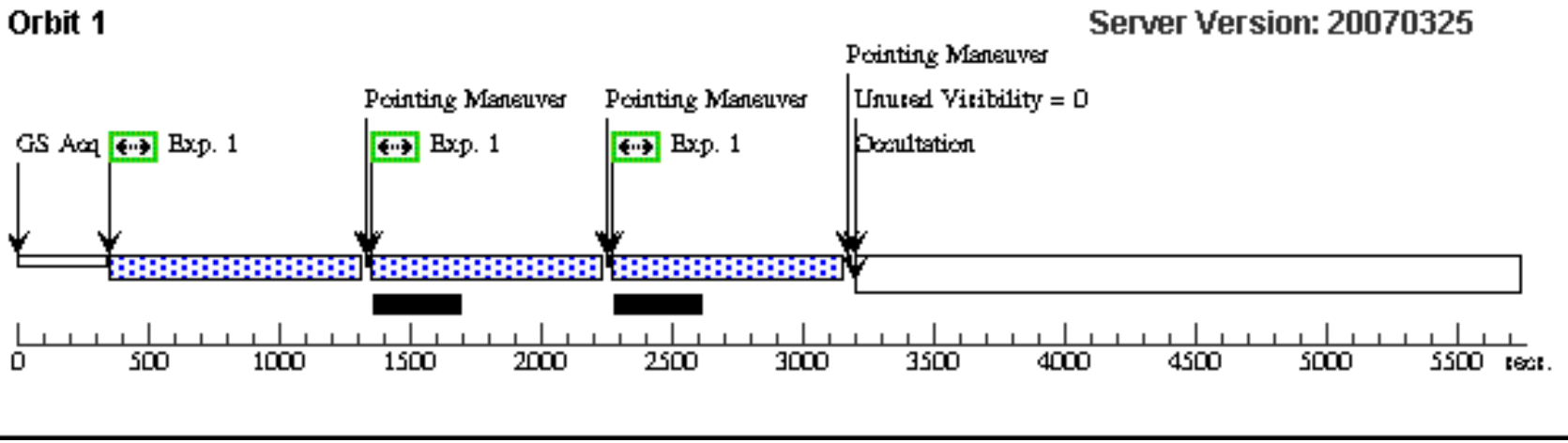
Fixed Targets

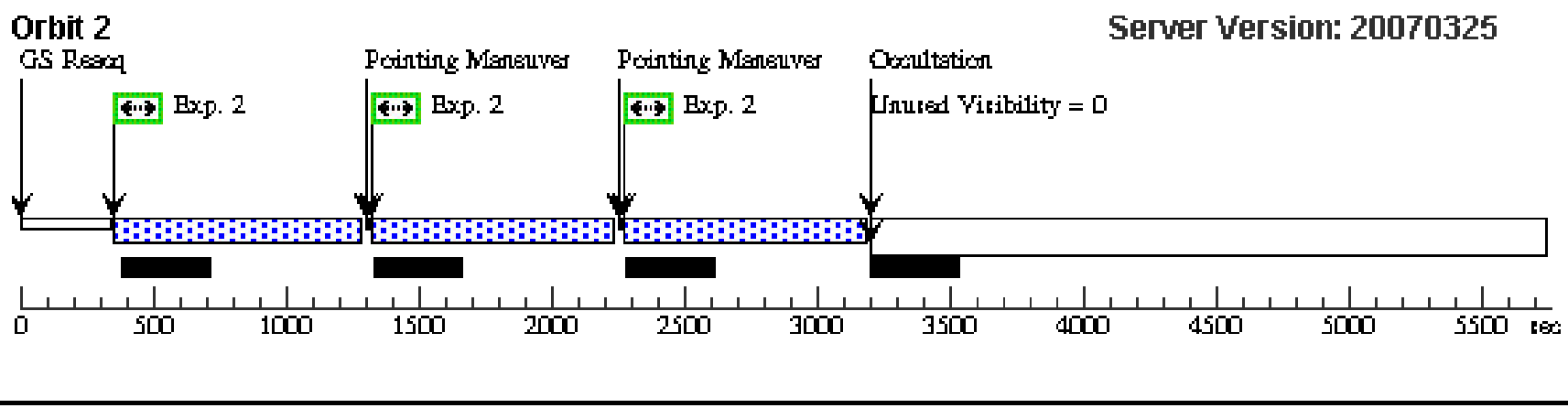
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SDSSJ161017.06+531455.2	RA: 16 10 17.0400 (242.5710000d) Dec: +53 14 54.96 (53.24860d) Equinox: J2000		V=18.1+/-0.1	Reference Frame: ICRS

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) SDSSJ161017.06+531455.2	ACS/WFC, ACCUM, WFC1	F435W	CR-SPLIT=NO		Pattern 1-1 (1)	760.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
2		(2) SDSSJ161017.06+531455.2	ACS/WFC, ACCUM, WFC1	F814W	CR-SPLIT=NO		Pattern 2-2 (1)	789.0 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[2]***

Orbit Structure





Visit

Proposal 10795, Visit 03, implementation Mon May 21 17:06:06 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFPC2-BOX	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=26.57		
	Number Of Points=4	Angle Between Sides=143.13		
	Point Spacing=0.559	Center Pattern=false		
	Line Spacing=0.559			

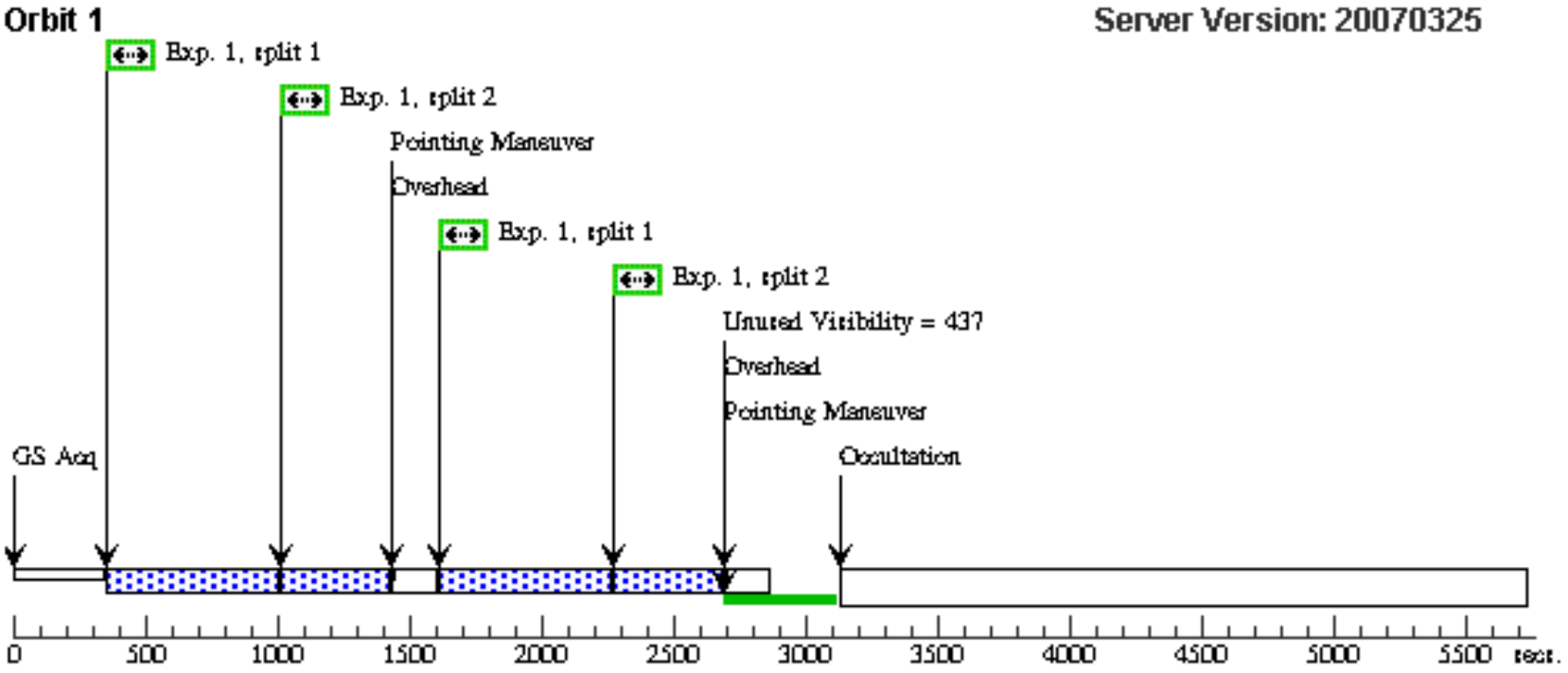
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSSJ020707.48-082726	RA: 02 07 7.4880 (31.7812000d) Dec: -08 27 25.92 (-8.45720d) Equinox: J2000		V=17.8+/-0.1	Reference Frame: ICRS

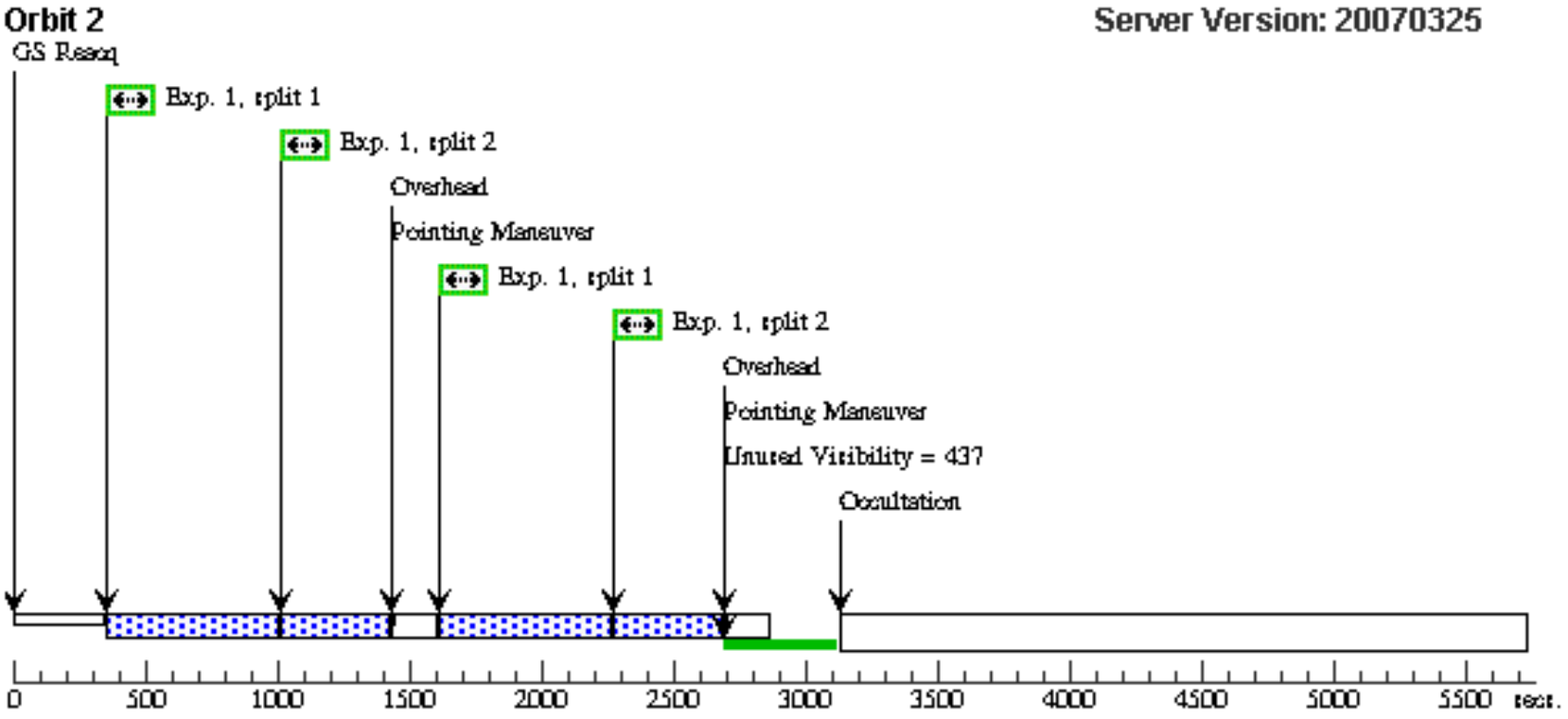
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	0207_F450W_1	(3) SDSSJ020707.48-082726	WFPC2, IMAGE, PC1	F450W			Pattern 1-1 (2)	800.0 Secs	
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
								[==>(Pattern 3, Split 1)]	***[2]***
								[==>(Pattern 3, Split 2)]	
								[==>(Pattern 4, Split 1)]	
								[==>(Pattern 4, Split 2)]	
2	0207_F450W_2	(3) SDSSJ020707.48-082726	WFPC2, IMAGE, PC1	F450W			Pattern 2-2 (2)	800.0 Secs	
								[==>(Pattern 1, Split 1)]	***[3]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
								[==>(Pattern 3, Split 1)]	***[4]***
								[==>(Pattern 3, Split 2)]	
								[==>(Pattern 4, Split 1)]	
								[==>(Pattern 4, Split 2)]	

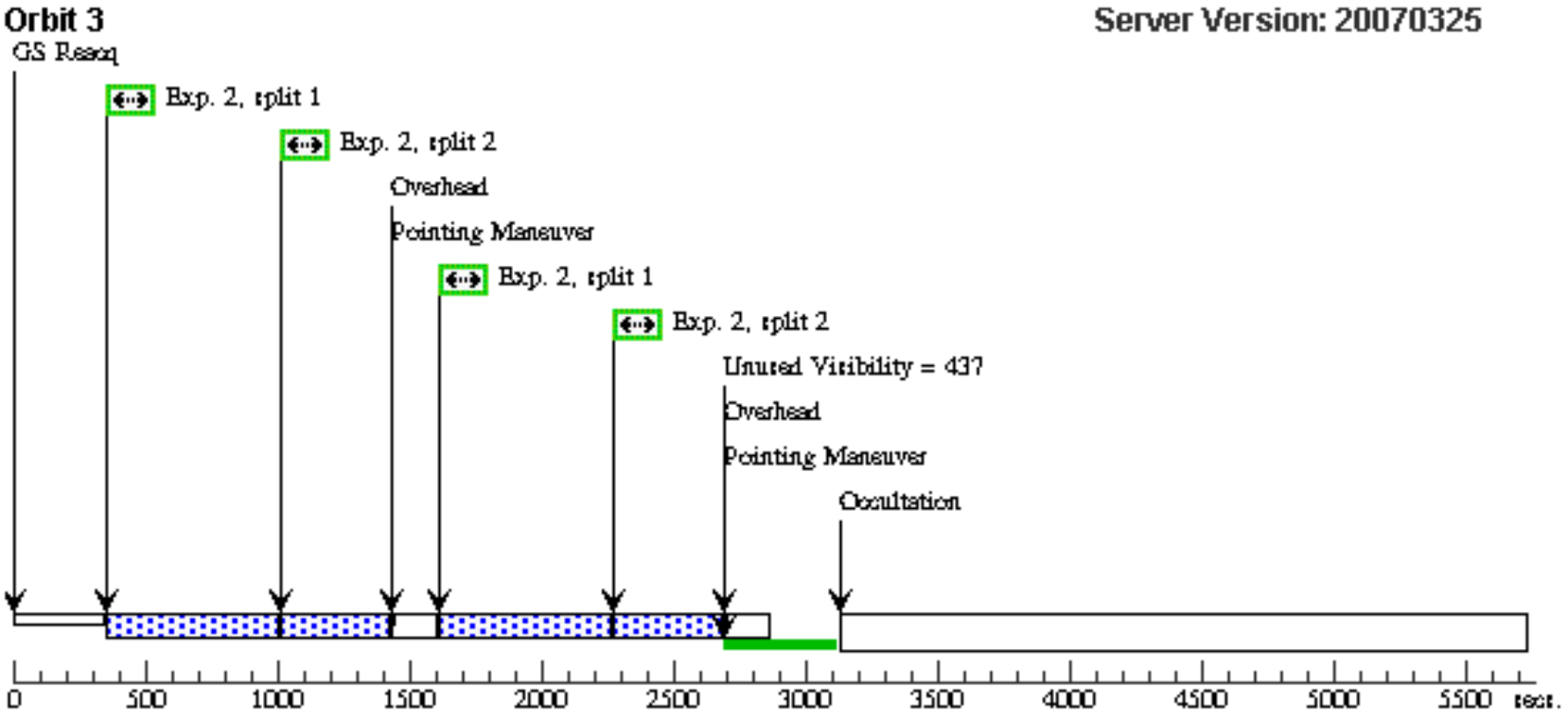
Orbit Structure

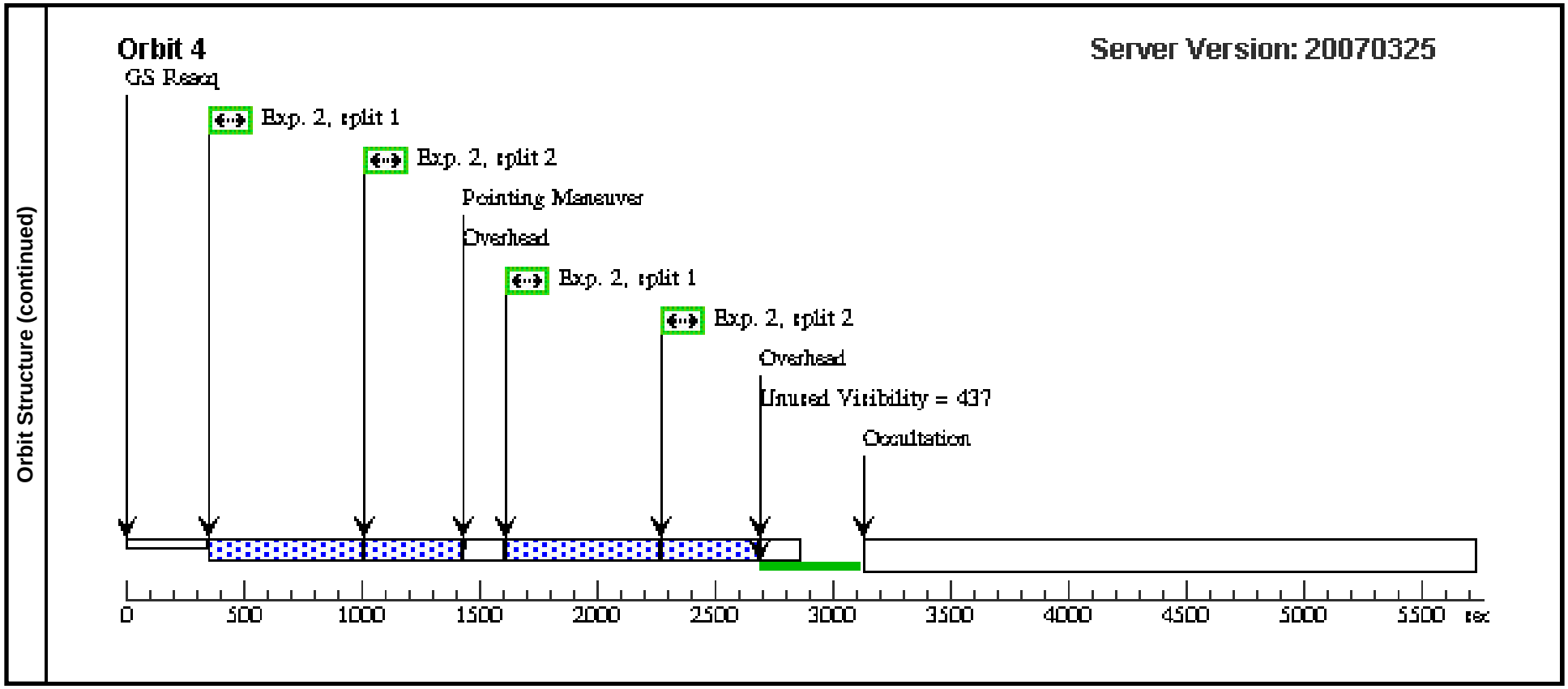


Orbit Structure (continued)



Orbit Structure (continued)




Orbit Structure (continued)
Orbit 4
Server Version: 20070325
GS Reacq
Exp. 2, split 1
Exp. 2, split 2
Pointing Maneuver
Overhead
Exp. 2, split 1
Exp. 2, split 2
Overhead
Unused Visibility = 437
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 10795, Visit 04 Mon May 21 17:06:09 GMT 2007

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: SAME ORIENT AS 03

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=WFPC2-BOX	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=26.57		
	Number Of Points=4	Angle Between Sides=143.13		
	Point Spacing=0.559	Center Pattern=false		
	Line Spacing=0.559			

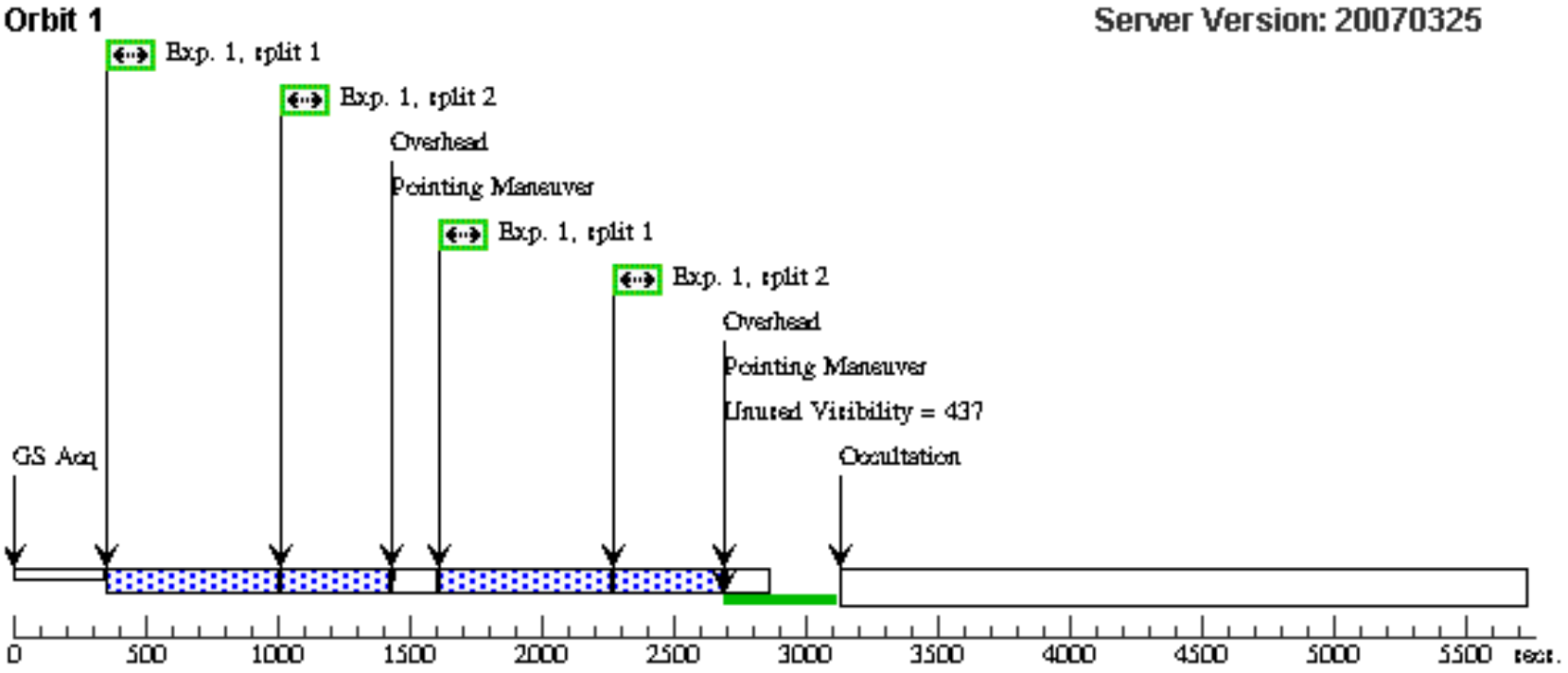
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSSJ020707.48-082726	RA: 02 07 7.4880 (31.7812000d) Dec: -08 27 25.92 (-8.45720d) Equinox: J2000		V=17.8+/-0.1	Reference Frame: ICRS

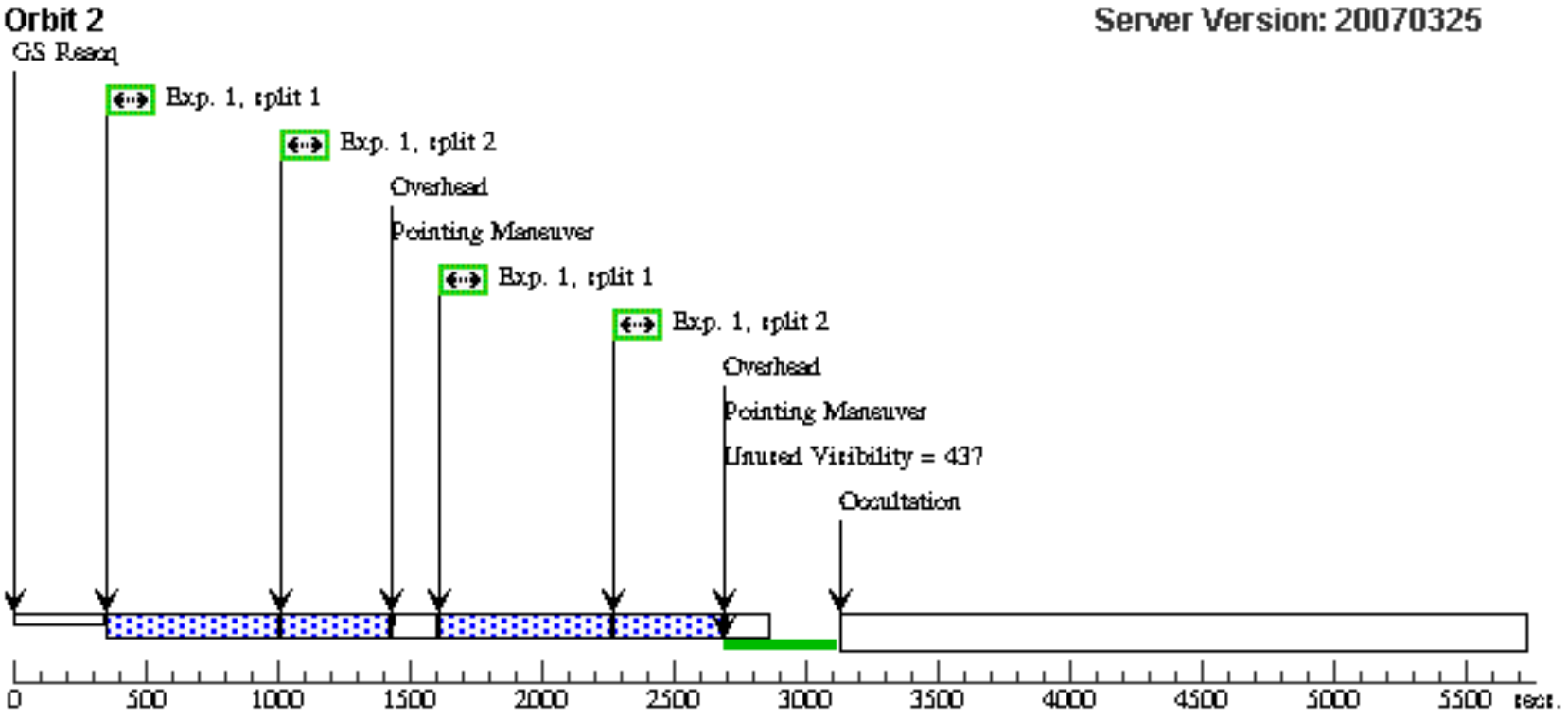
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	0207_F814W_1	(3) SDSSJ020707.48-082726	WFPC2, IMAGE, PC1	F814W			Pattern 1-1 (2)	800.0 Secs	
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
								[==>(Pattern 3, Split 1)]	***[2]***
								[==>(Pattern 3, Split 2)]	
								[==>(Pattern 4, Split 1)]	
								[==>(Pattern 4, Split 2)]	
2	0207_F814W_2	(3) SDSSJ020707.48-082726	WFPC2, IMAGE, PC1	F814W			Pattern 2-2 (2)	800.0 Secs	
								[==>(Pattern 1, Split 1)]	***[3]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
								[==>(Pattern 3, Split 1)]	***[4]***
								[==>(Pattern 3, Split 2)]	
								[==>(Pattern 4, Split 1)]	
								[==>(Pattern 4, Split 2)]	

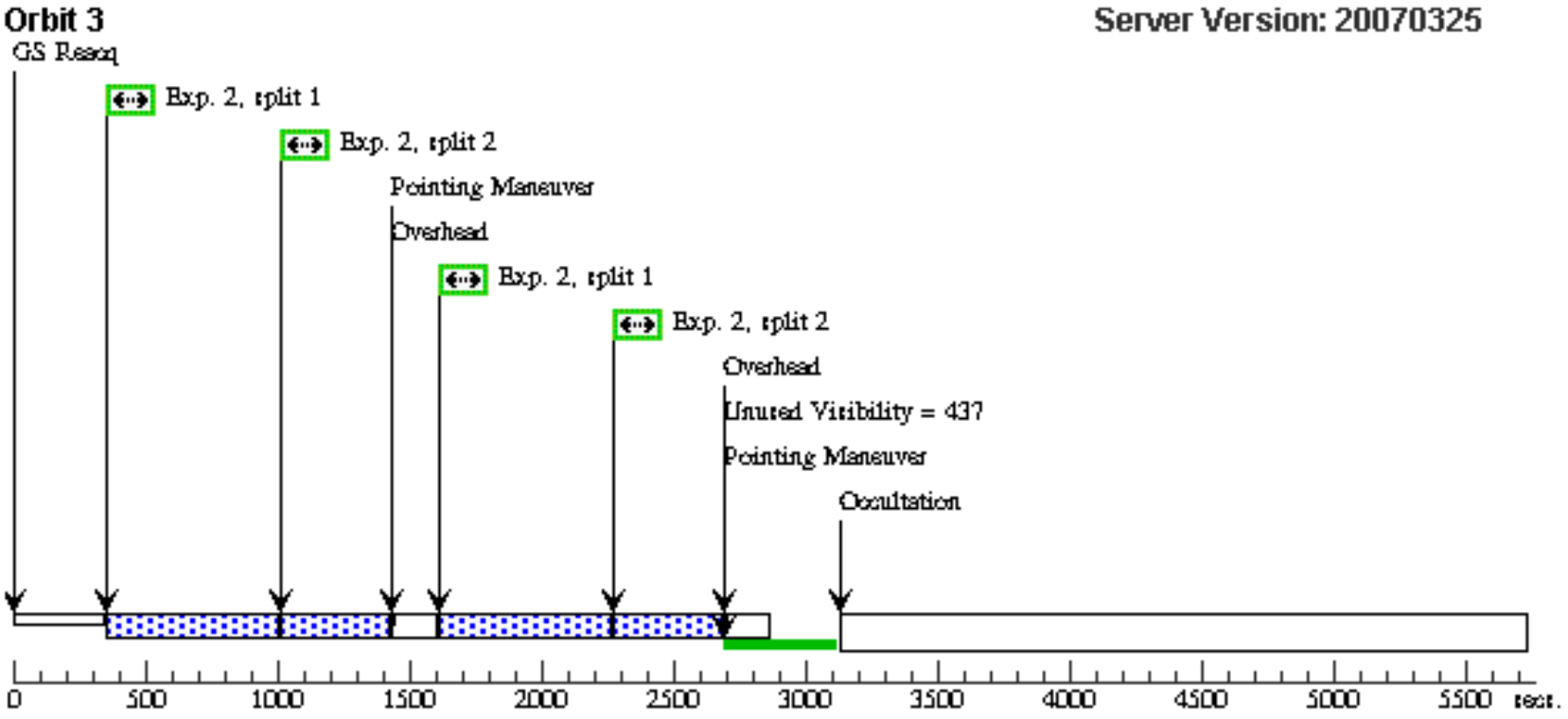
Orbit Structure

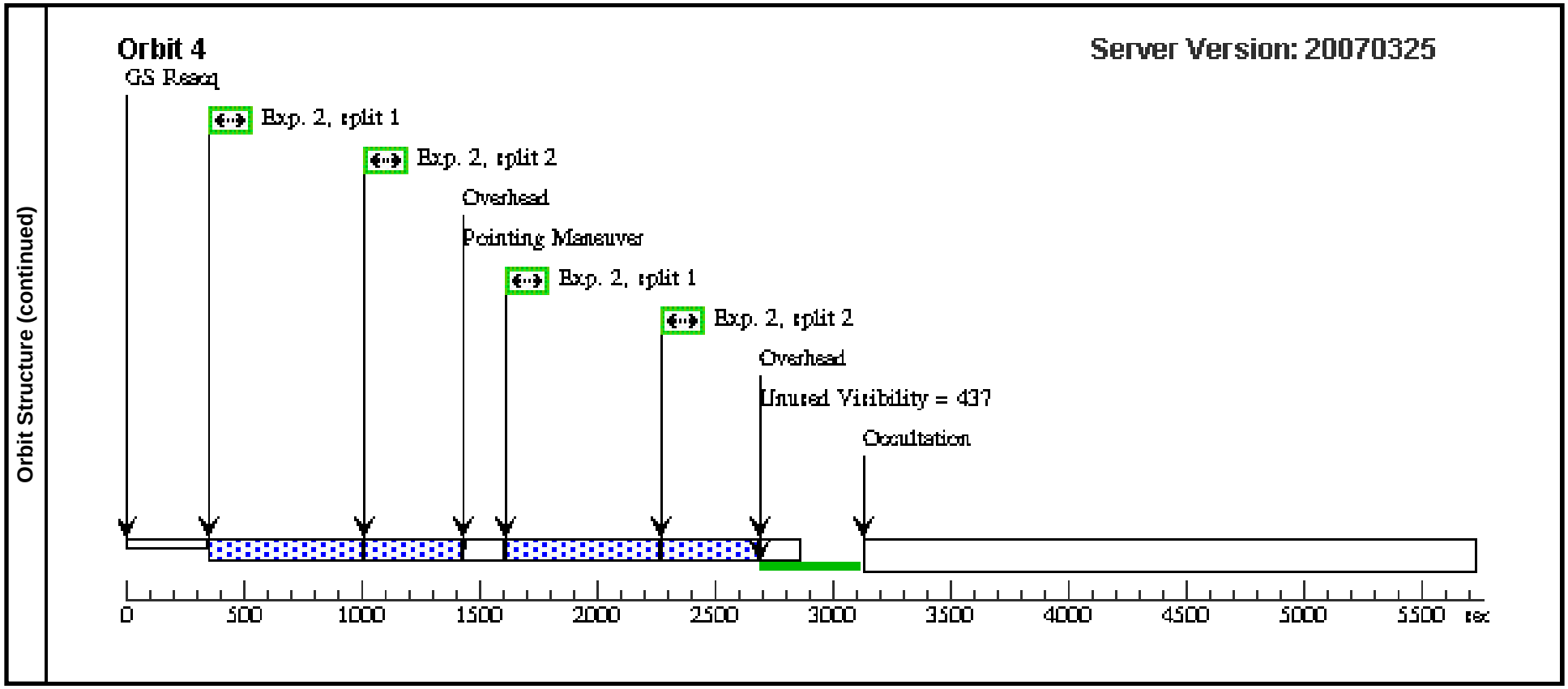


Orbit Structure (continued)



Orbit Structure (continued)




Orbit Structure (continued)
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Server Version: 20070325
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Exp. 2, split 1
Exp. 2, split 2
Overhead
Pointing Maneuver
Exp. 2, split 1
Exp. 2, split 2
Overhead
Unused Visibility = 437
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec