



11208 - The co-evolution of spheroids and black holes in the last six billion years

Cycle: 16, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>	<i>E-Mail</i>
Prof. Tommaso L. Treu (PI)	University of California - Santa Barbara	tt@physics.ucsb.edu
Dr. Jong-Hak Woo (CoI)	University of California - Santa Barbara	woo@physics.ucsb.edu
Prof. Matthew A. Malkan (CoI)	University of California - Los Angeles	malkan@astro.ucla.edu
Prof. Roger D. Blandford (CoI)	Stanford University	rdb3@stanford.edu

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
06	(6) J163252+263749	NIC2	2	10-Jun-2009 21:07:31.0	yes
09	(9) J015516-094556	NIC2	2	10-Jun-2009 21:07:35.0	yes
10	(10) J143955+355305	NIC2	2	10-Jun-2009 21:07:38.0	yes
12	(12) 152655-003243	NIC2	2	10-Jun-2009 21:07:41.0	yes
14	(14) J150015+322940	NIC2	2	10-Jun-2009 21:07:43.0	yes
15	(15) J034230-052319	NIC2	2	10-Jun-2009 21:07:46.0	yes
01	(1) J083655+075712	WFC3/IR	1	10-Jun-2009 21:07:48.0	yes
02	(2) J110642+614146	WFC3/IR	1	10-Jun-2009 21:07:51.0	yes
03	(3) J002006-005016	WFC3/IR	1	10-Jun-2009 21:07:53.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
04	(4) J093211+433813.1	WFC3/IR	1	10-Jun-2009 21:07:55.0	yes
05	(5) J094853+363121	WFC3/IR	1	10-Jun-2009 21:07:57.0	yes
07	(7) J155228+562236	WFC3/IR	1	10-Jun-2009 21:08:00.0	yes
08	(8) J111415-005920	WFC3/IR	1	10-Jun-2009 21:08:02.0	yes
11	(11) J125631-023131	WFC3/IR	1	10-Jun-2009 21:08:04.0	yes
13	(13) J100728+392652	WFC3/IR	1	10-Jun-2009 21:08:06.0	yes

21 Total Orbits Used

ABSTRACT

The masses of giant black holes are correlated with the luminosities, masses, and velocity dispersions of the bulges of their host galaxies. This empirical correlation of phenomena on widely different scales (from pcs to kpcs) suggests that the formation and evolution of galaxies and central black holes are closely linked. In Cycle 13, we have started a campaign to map directly the co-evolution of spheroids and black-holes by measuring in observationally favorable redshift windows the empirical correlations connecting their properties. By focusing on Seyfert 1s, where the nucleus and the stars contribute comparable fractions of total light, black hole mass and bulge dispersion are obtained from Keck spectroscopy. HST is required for accurate measurement of the non stellar AGN continuum, the morphology of the galaxy, and the structural parameters of the bulge. The results at $z=0.36$ indicate a surprisingly fast evolution of bulges in the past 4 Gyrs (significant at the 95%CL), in the sense that bulges were significantly smaller for a given black hole mass. Also, the large fraction of mergers and disturbed galaxies (4+2 out of 20) identifies gas-rich mergers as the mechanisms responsible for bulge-growth. Going to higher redshift -- where evolutionary trends should be stronger -- is needed to confirm these tantalizing results. We propose therefore to push our investigation to the next suitable redshift window $z=0.57$ (lookback-time 6 Gyrs). Fifteen objects are the minimum number required to map the evolution of the empirical correlations between bulge properties and black-hole mass, and to achieve a conclusive detection of evolution (>99%CL).

OBSERVING DESCRIPTION

Our goal is to obtain high resolution photometry of a sample of 15 Seyfert 1s at $z=0.57\pm 0.01$ for which central black hole masses and bulge velocity dispersions are obtained from the ground. We need to determine the luminosity of the bulge and of the central point source, in order to extend our measurement of the M-L and M- σ relationships by 50% in lookback time. We aim to measure bulge L with accuracy better than 0.2 dex, i.e. small with respect to the intrinsic uncertainty on the black hole mass (0.4 dex) from virial mass estimates. Measuring the nuclear luminosity to 20% is needed to obtain unbiased estimates of the broad line region, and hence of the black hole mass. In addition, we will also derive effective radii (R_e) and effective surface brightnesses (SBe) for the bulges, in order to derive their dynamical masses ($\sigma^2 R_e$) and probe the evolution of relationships involving more than one variable.

Strategy

The following strategy is based on our previous successful experience (Cycle 13).

Camera. NIC-2 on NICMOS is the camera of choice, providing superior sensitivity to the NIC-1 camera at the low surface brightness levels needed to do bulge/disk decomposition, and better PSF sampling

than NIC-3. PSF sampling will be further improved by obtaining dithered exposures with semi-integer pixel offsets (4 positions per pixel). This will also enable robust cosmic ray/defects removal. Note that the contrast between the central point source and the host galaxy in our sample is far more favorable than in other HST studies of QSOs hosts, where the AGN typically outshines the galaxy by a factor of 10 or more. Furthermore going to longer wavelength improves the contrast, since the host is redder than the nucleus. Therefore, in our case the modelling of the wings of the PSF is not nearly as crucial to obtain accurate parameters for the host galaxy. The residual PSF related uncertainties are estimated as described below.

Filter. To minimize the size of the PSF, and preserving high sensitivity, we select the F110W filter. This filter is close in wavelength to the rest frame 5100Å continuum -- used to estimate the size of the broad line region.

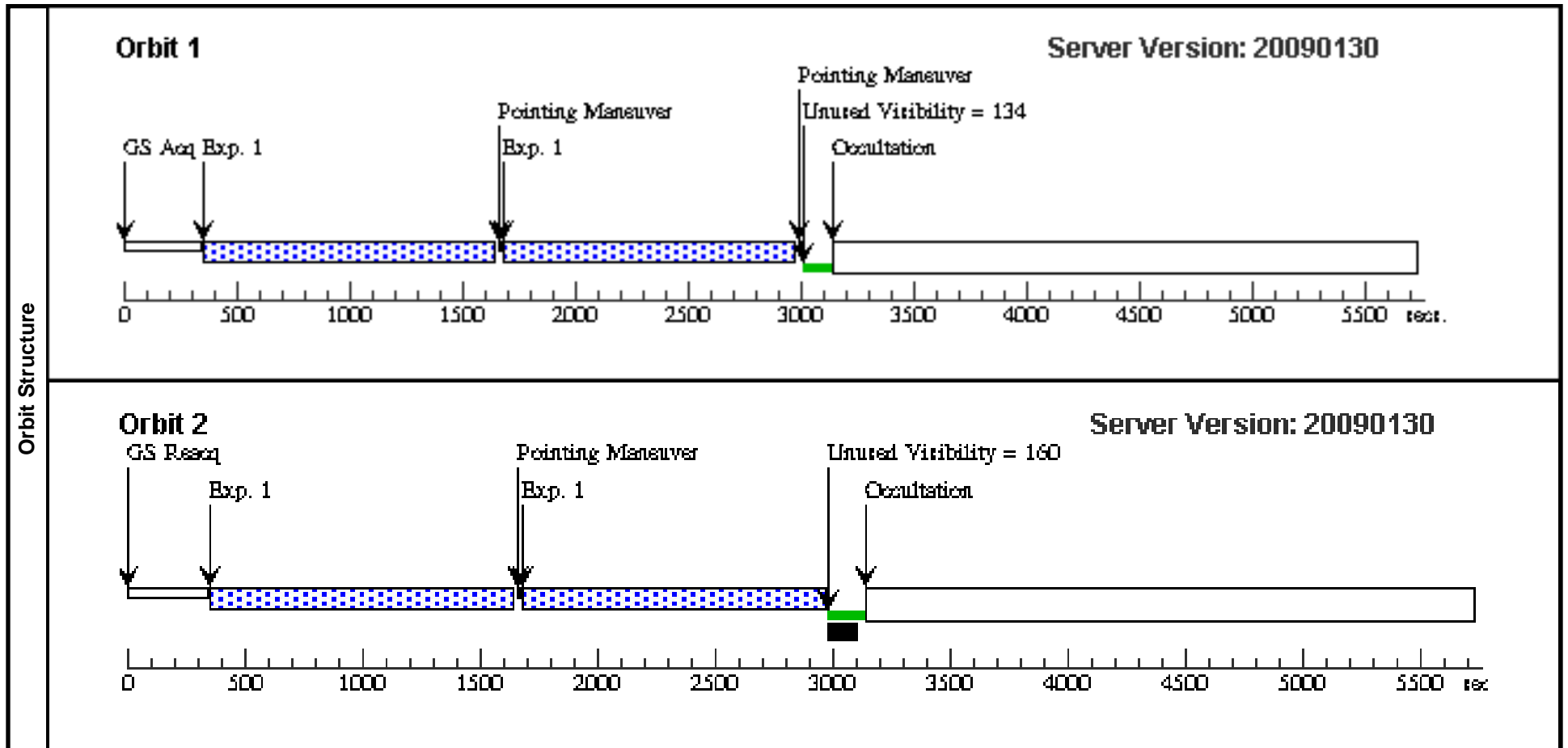
Exposure time. The depth of the observations is chosen to obtain data of comparable quality to the ones we have obtained at $z=0.36$, which is adequate to meet our goals. Based on our previous extensive experience with structural parameters of distant bulges and AGN (e.g. Hunt et al. 1999; Treu et al. 2001), and confirmed by our study from Cycle 13 data (T07), the limiting factor is the signal to noise at the relatively low surface brightness typical of the disk and the outer bulge, i.e. $F775W \sim 22$ mag arcsec⁻² at $z=0.36$. The intrinsic spatial

resolution differs slightly between $z=0.36$ and $z=0.57$, but in any case is sufficient to resolve typical bulges (effective diameter $6\sim\text{kpc}$) with NICMOS, even taking into account the slightly larger PSF at F110W than at F775W. Given cosmological dimming, we expect the surface brightness of our sources at $z=0.57$ to be fainter than that of those at $z=0.36$ by a factor $(1.36/1.57)^4\sim 0.56$, corresponding to $0.6\text{ mag arcsec}^{-2}$. Using a range of spectral energy distributions for the stellar and nuclear component we estimate that F775W $\sim 22\text{ mag arcsec}^{-2}$ at $z=0.36$, corresponds to F110W ~ 21.3 (Vega) at $z=0.57$. According to the NICMOS ETC, 4133s are needed in order to obtain a signal-to-noise ratio of 10 per NIC2 pixel at this surface brightness. The same exposures will image the central point source at $S/N > 200$, allowing for accurate determination of its luminosity, and the wings of the PSF. This is somewhat better than we obtained at cycle 13 ($S/N=10$ per 2×2 ACS pixel) to compensate for the larger amount of defects on the NICMOS detectors as compared to ACS. The exposure time corresponds to two orbits per object, including overhead. We will obtain our data in four separate pointings dithered by semi-integer pixels to help sampling the PSF and removing defects.

Proposal 11208 - Visit 06 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:09 GMT 2009

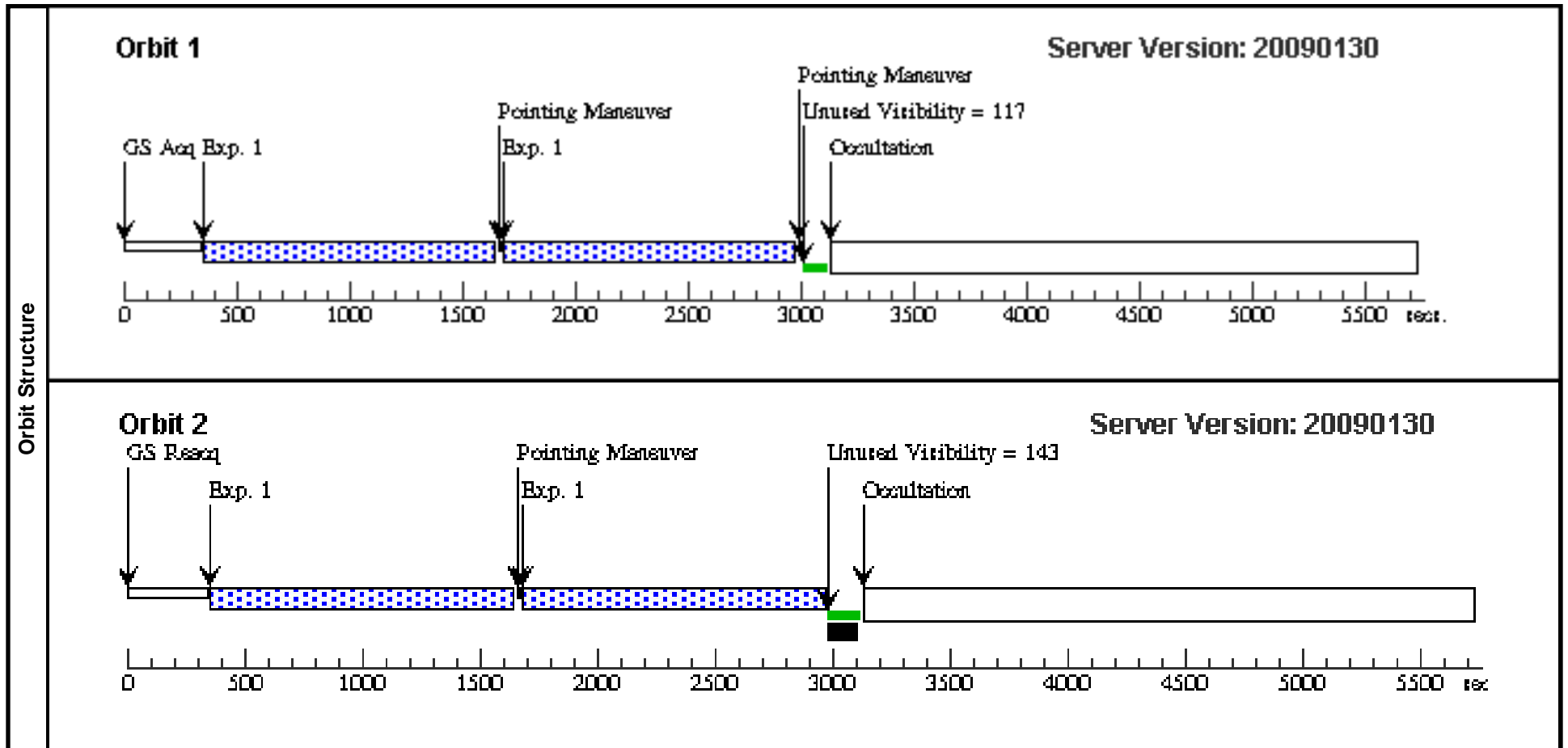
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	(6)	J163252+263749	RA: 16 32 52.4160 (248.2184000d) Dec: +26 37 49.11 (26.63031d) Equinox: J2000		V=18.7+/-0.5	Reference Frame: SDSS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
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Proposal 11208 - Visit 09 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:11 GMT 2009

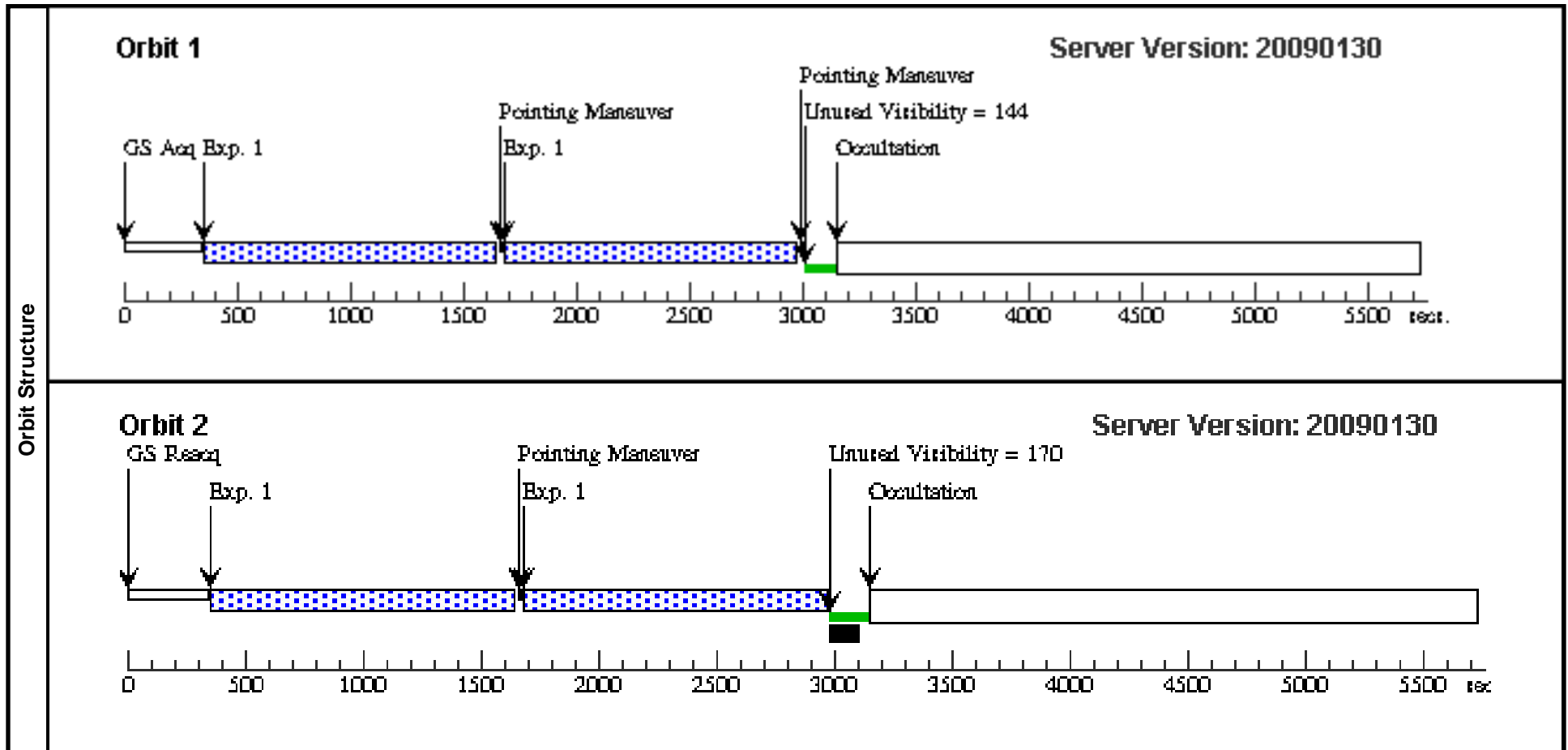
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	(9)	J015516-094556	RA: 01 55 16.1760 (28.8174000d) Dec: -09 45 55.98 (-9.76555d) Equinox: J2000		V=20.1+/-0.5	Reference Frame: SDSS				
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	1	(9) J015516-094556	NIC2, MULTIACCUM, NIC2	F110W	SAMP-SEQ=STEP1 28; NSAMP=19	GS ACQ SCENARI O BASE1TNS	Pattern 1, Exps 1-1 (1)		[=>(Pattern 1)]	[1]
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Proposal 11208 - Visit 10 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:11 GMT 2009

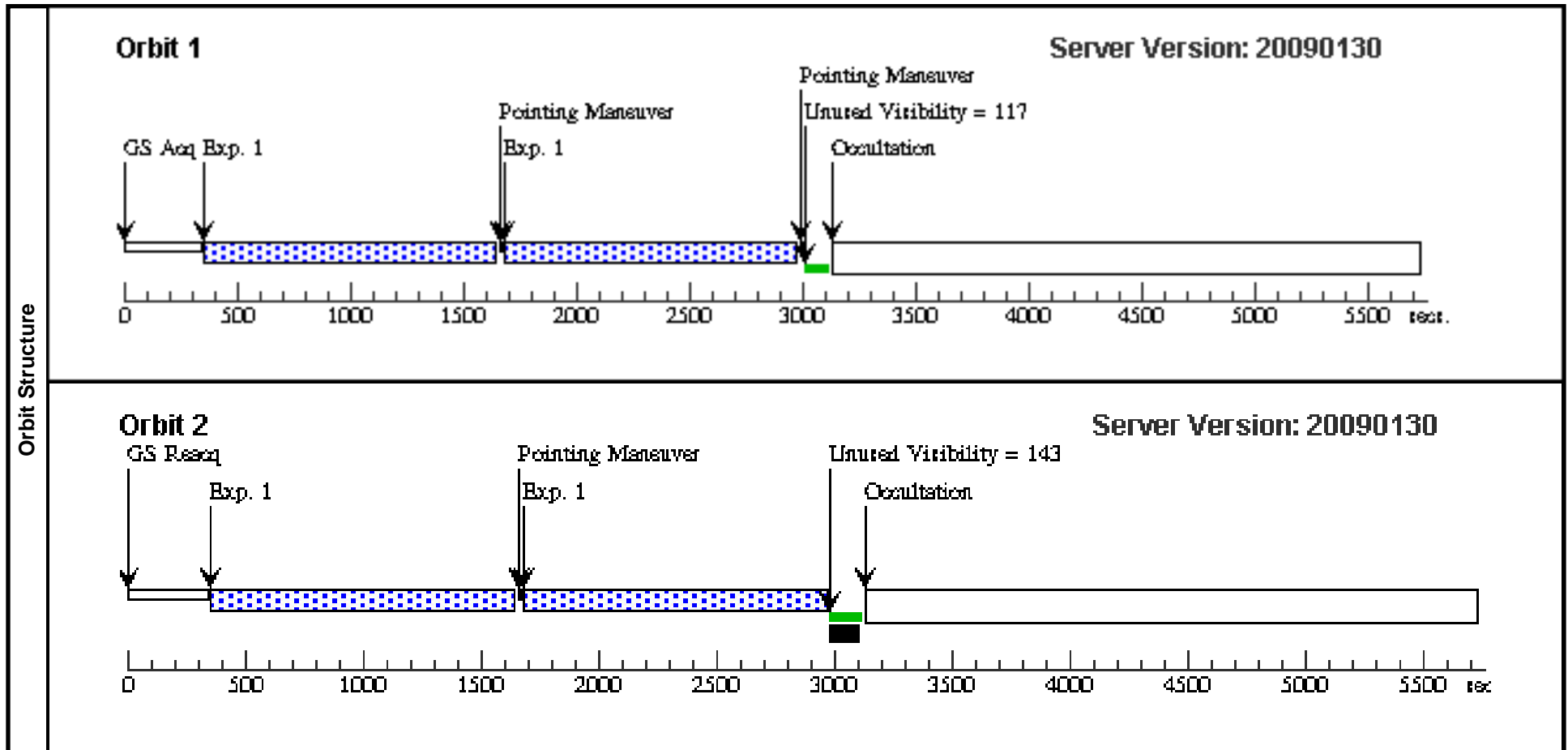
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	(10)	J143955+355305	RA: 14 39 55.1070 (219.9796125d) Dec: +35 53 5.36 (35.88482d) Equinox: J2000		V=19+/-0.5	Reference Frame: SDSS				
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	1		(10) J143955+355305	NIC2, MULTIACCUM, NIC2	F110W	SAMP-SEQ=STEP1 28; NSAMP=19	GS ACQ SCENARI O BASE1TNS	Pattern 1, Exps 1-1 (1)	[==>(Pattern 1)]	[1]
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Proposal 11208 - Visit 12 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:11 GMT 2009

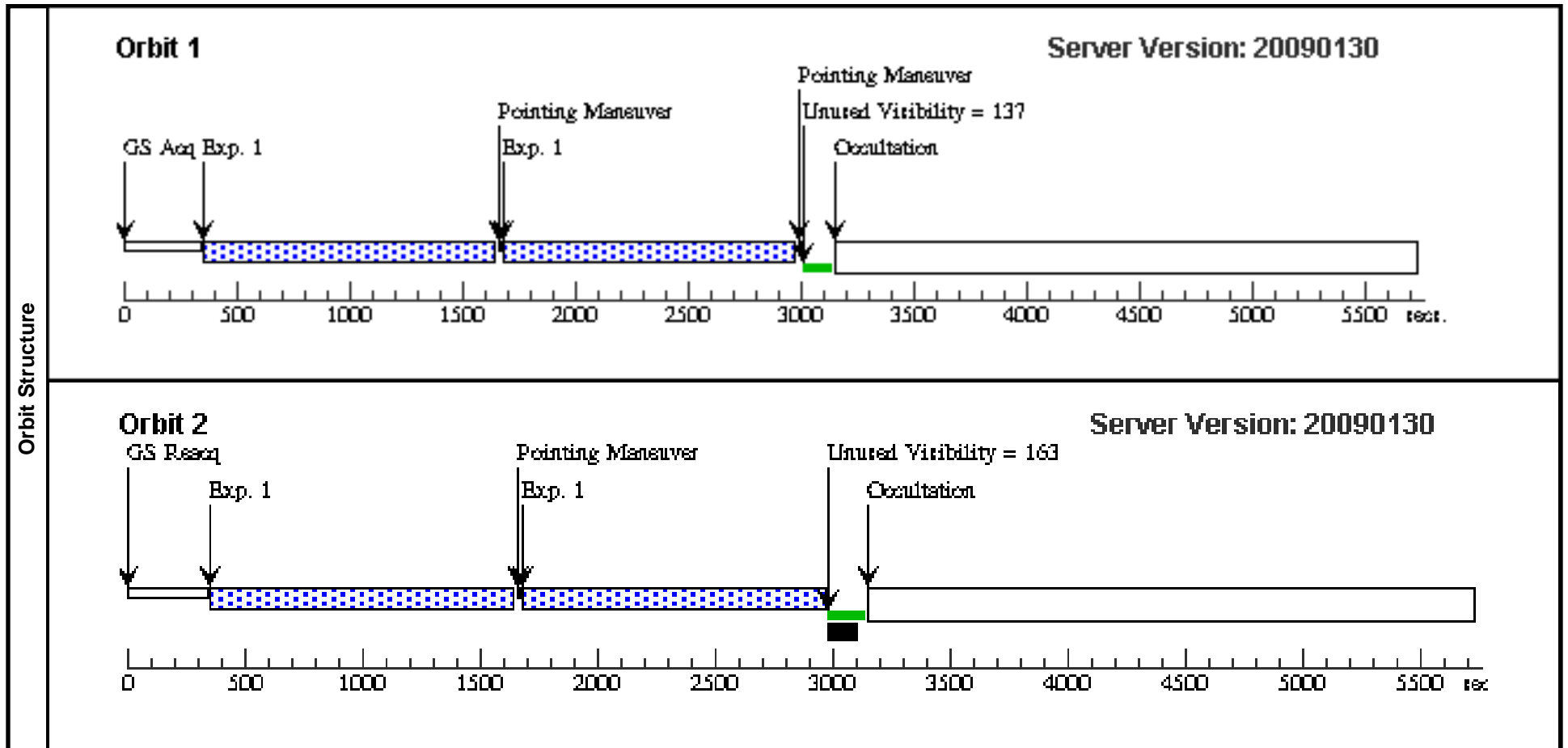
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(12)	152655-003243	RA: 15 26 54.9320 (231.7288833d) Dec: -00 32 43.30 (-.54536d) Equinox: J2000		V=20.1+/-0.5	Reference Frame: SDSS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(12) 152655-003243	NIC2, MULTIACCUM, NIC2	F110W	SAMP-SEQ=STEP1 28; NSAMP=19	GS ACQ SCENARI O BASE1TNS	Pattern 1, Exps 1-1 (1)	[==>(Pattern 1)]	[1]
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Proposal 11208 - Visit 14 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:12 GMT 2009

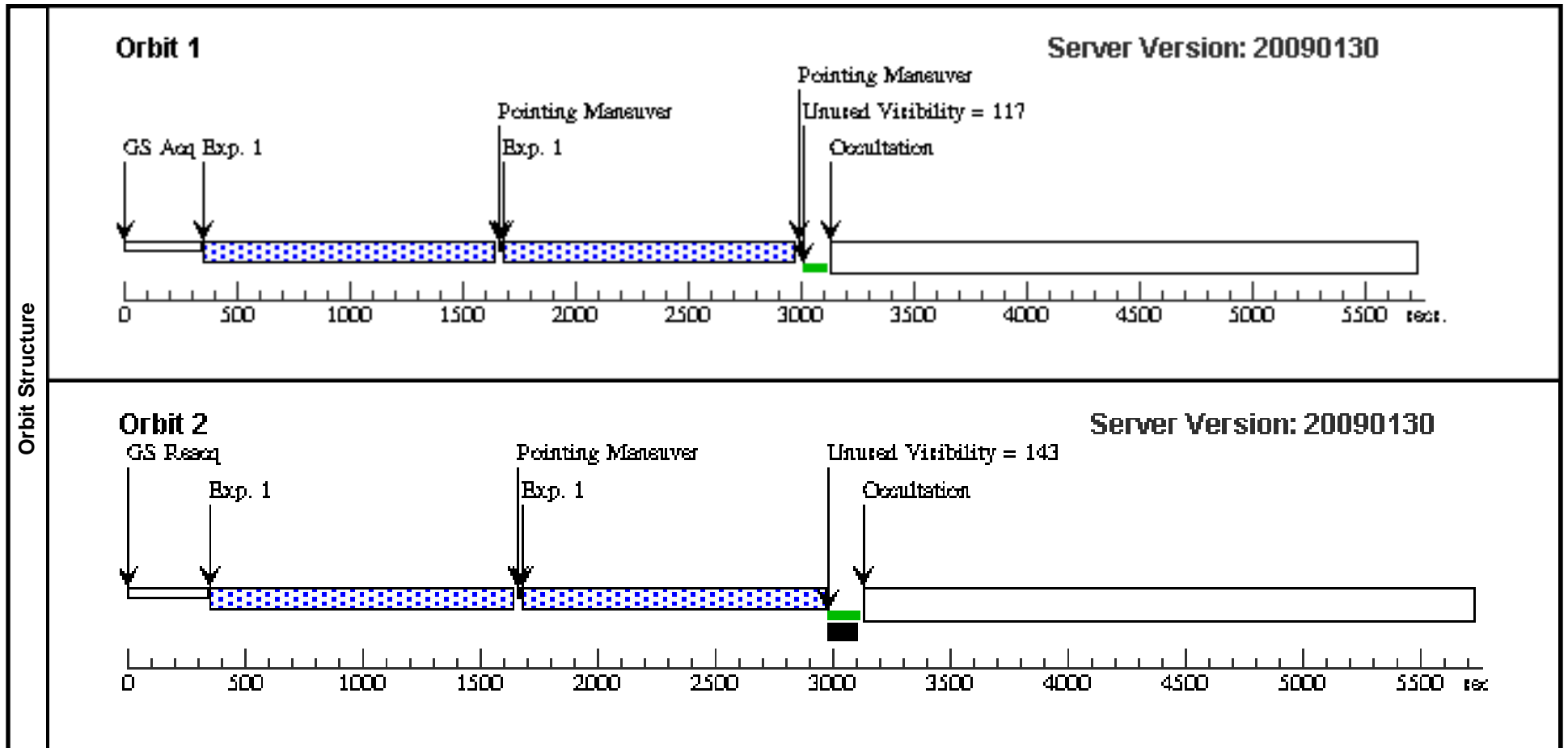
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Diagnosics										
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(14)	J150015+322940	RA: 15 00 14.8130 (225.0617208d) Dec: +32 29 40.40 (32.49456d) Equinox: J2000		V=19.6+/-0.5	Reference Frame: SDSS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
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Proposal 11208 - Visit 15 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:12 GMT 2009

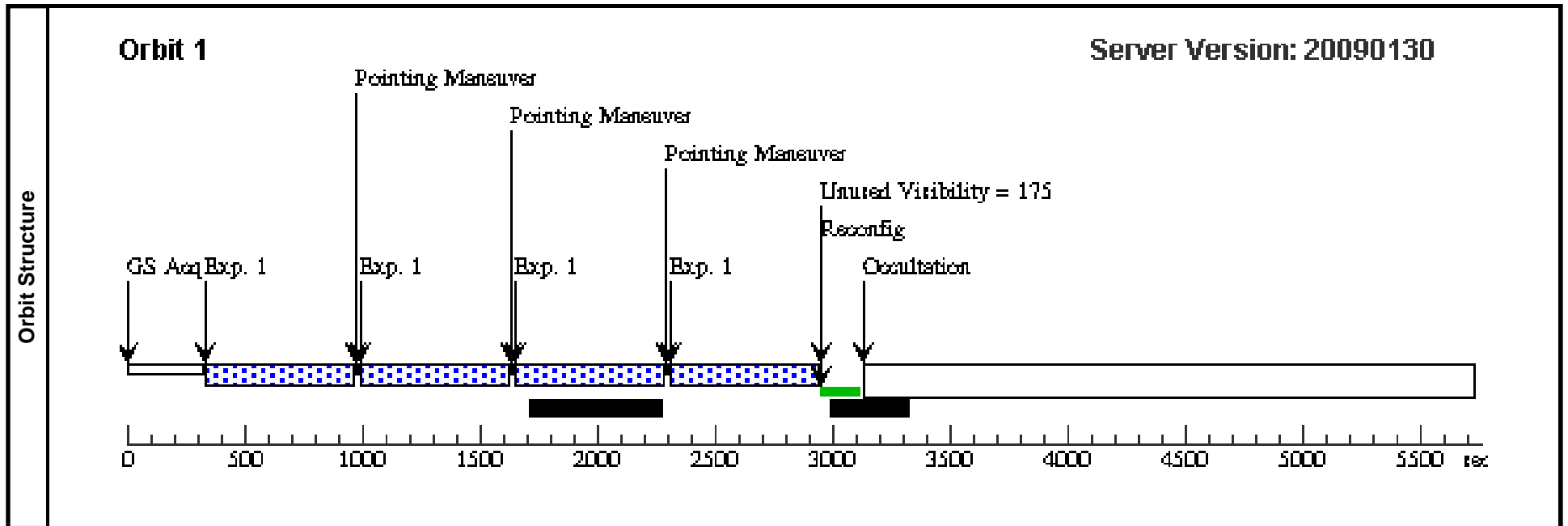
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(15)	J034230-052319	RA: 03 42 29.7040 (55.6237667d) Dec: -05 23 19.49 (-5.38875d) Equinox: J2000		V=18.7+/-0.5	Reference Frame: SDSS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(15) J034230-052319	NIC2, MULTIACCUM, NIC2	F110W	SAMP-SEQ=STEP1 28; NSAMP=19	GS ACQ SCENARI O BASE1TNS	Pattern 1, Exps 1-1 (1)	[==>(Pattern 1)]	[1]
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Proposal 11208 - Visit 01 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:12 GMT 2009

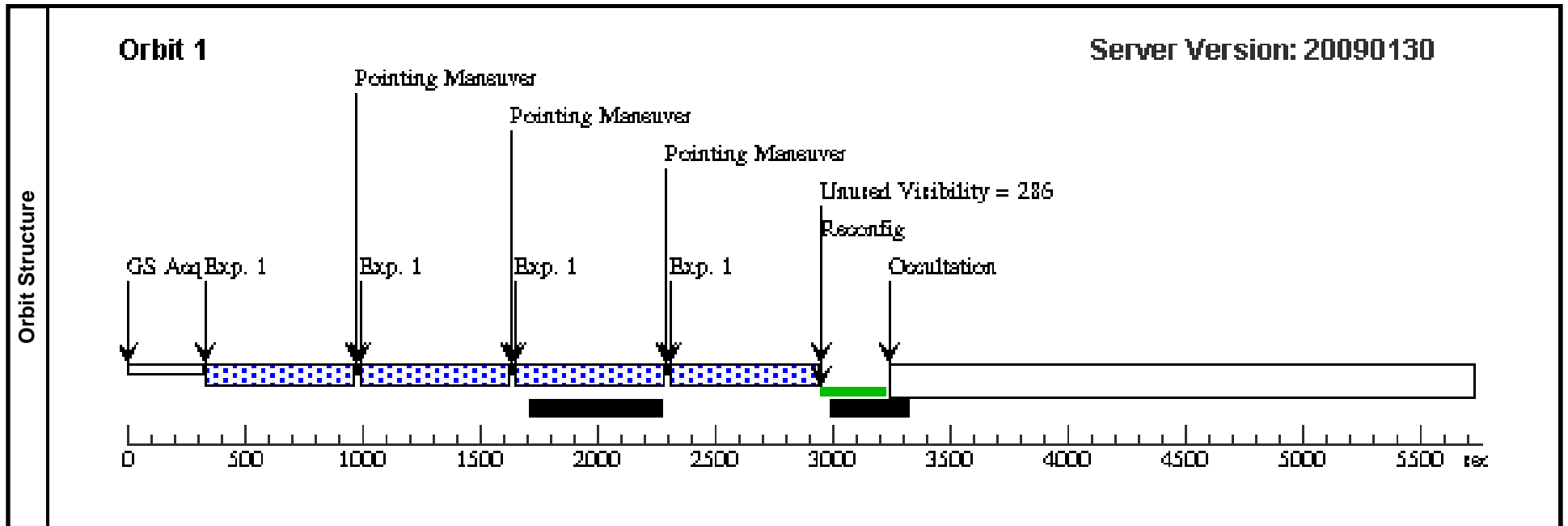
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Diagnosics											
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Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
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Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1		(1) J083655+075712	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00		Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]		[1]



Proposal 11208 - Visit 02 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:12 GMT 2009

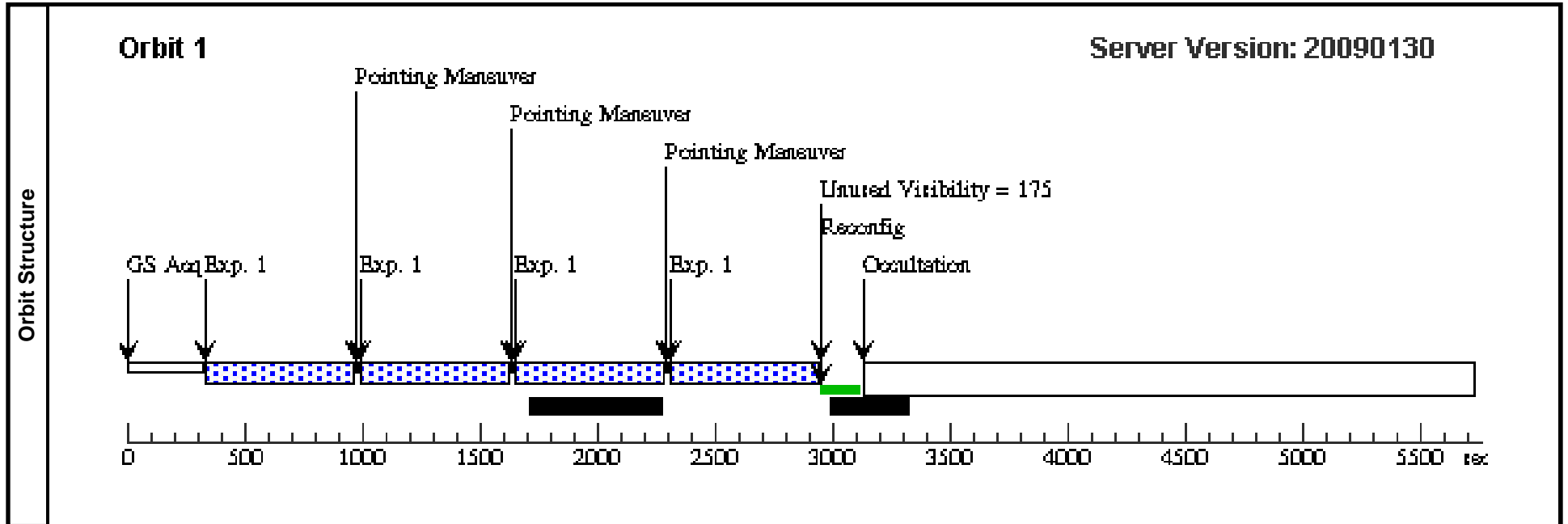
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Diagnosics											
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Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(2)	J110642+614146	RA: 11 06 41.8650 (166.6744375d) Dec: +61 41 46.50 (61.69625d) Equinox: J2000				V=18.9+/-0.5		Reference Frame: SDSS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1		(2) J110642+614146	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00		Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]		[1]



Proposal 11208 - Visit 03 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:13 GMT 2009

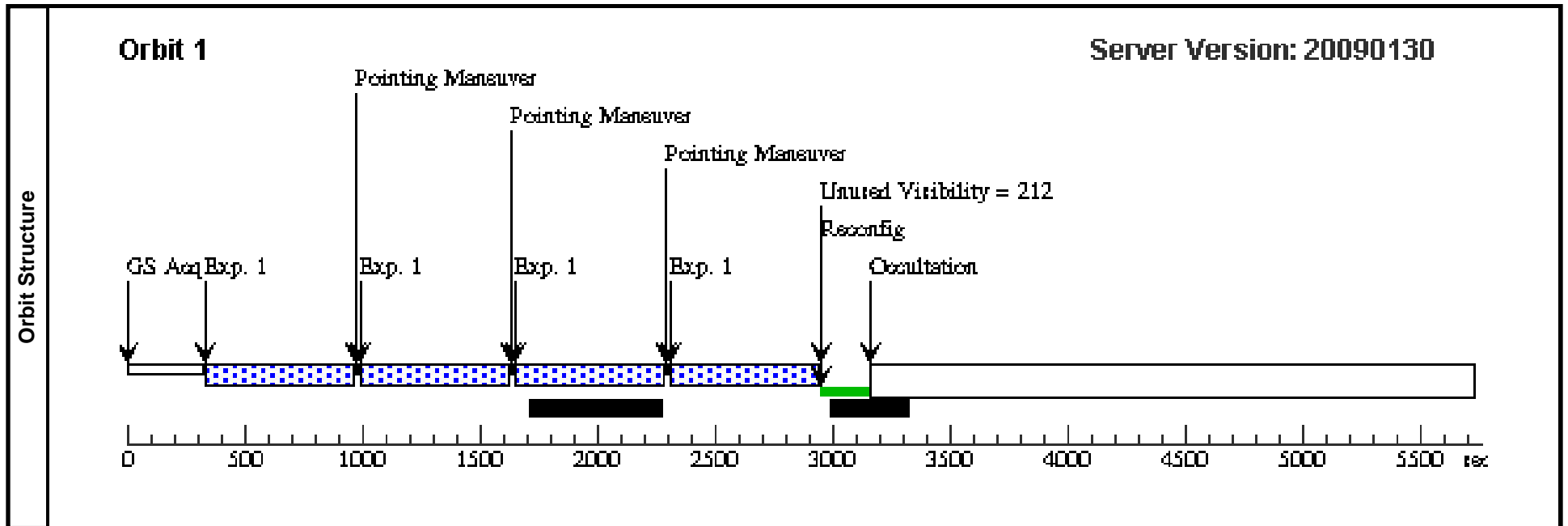
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Diagnosics										
Patterns	#	Primary Pattern	Secondary Pattern	Exposures						
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Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(3)	J002006-005016	RA: 00 20 5.6990 (5.0237458d) Dec: -00 50 16.34 (-.83787d) Equinox: J2000		V=19.6+/-0.5	Reference Frame: SDSS				
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1	(3) J002006-005016	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00			Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



Proposal 11208 - Visit 04 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:13 GMT 2009

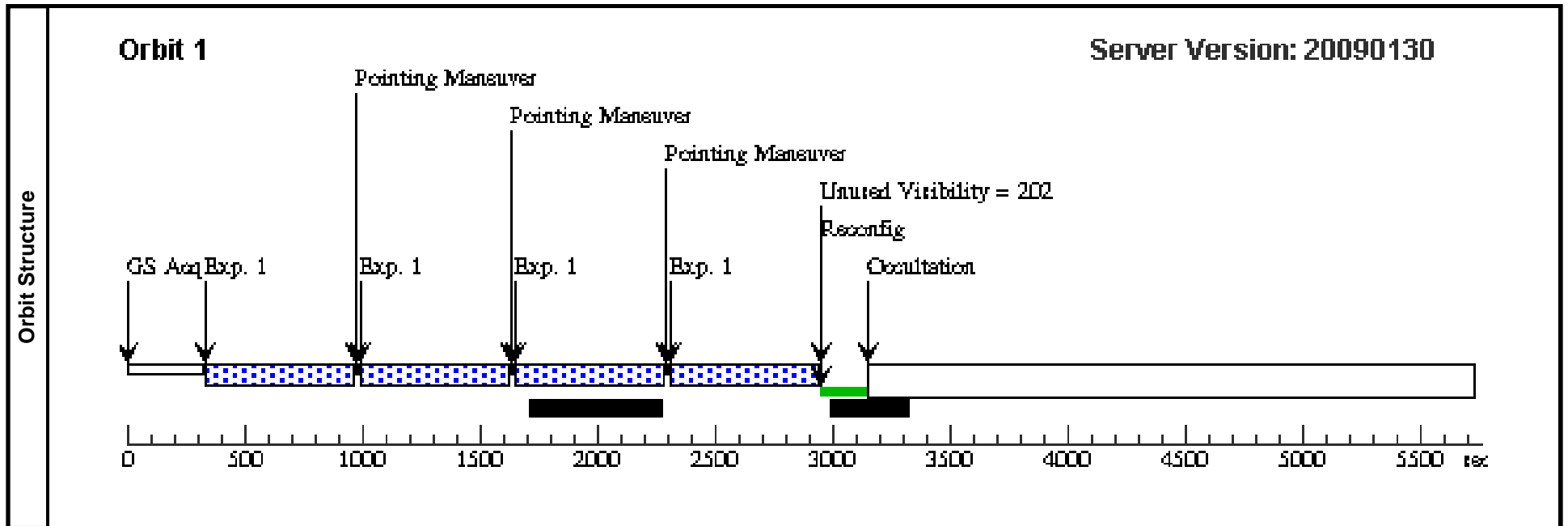
Visit	Proposal 11208, Visit 04, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: GYRO MODE 3GOBAD									
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Diagnosics										
Patterns	#	Primary Pattern				Secondary Pattern			Exposures	
	(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365		Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false					(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes	Miscellaneous		
	(4)	J093211+433813.1	RA: 09 32 10.9640 (143.0456833d) Dec: +43 38 13.10 (43.63697d) Equinox: J2000				V=20.1+/-0.5	Reference Frame: SDSS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(4) J093211+433813.1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00		Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



Proposal 11208 - Visit 05 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:14 GMT 2009

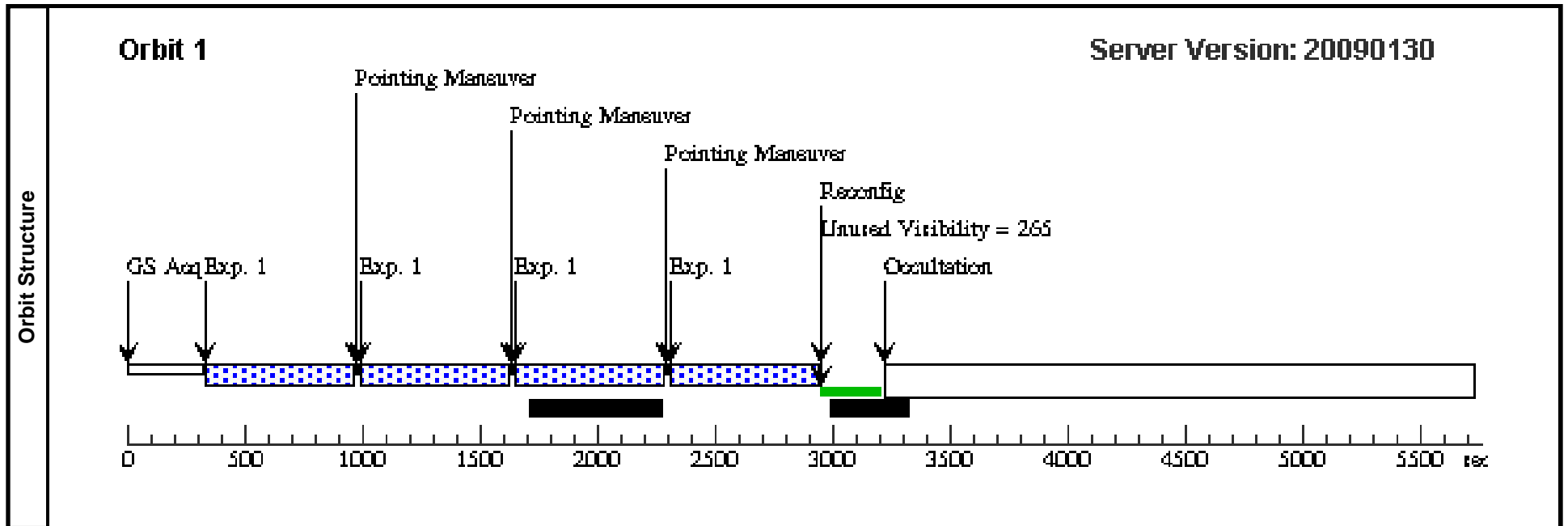
Visit	Proposal 11208, Visit 05, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: GYRO MODE 3GOBAD; ORIENT 348D TO 56 D; ORIENT 78D TO 146 D; ORIENT 168D TO 236 D; ORIENT 258D TO 326 D										
	(Visit 05) Warning (Form): Gyro Mode overrides default value of 2G.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365		Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false						(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(5)	J094853+363121	RA: 09 48 52.7380 (147.2197417d) Dec: +36 31 20.53 (36.52237d) Equinox: J2000				V=19+/-0.5		Reference Frame: SDSS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1		(5) J094853+363121	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00		Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]		[1]



Proposal 11208 - Visit 07 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:15 GMT 2009

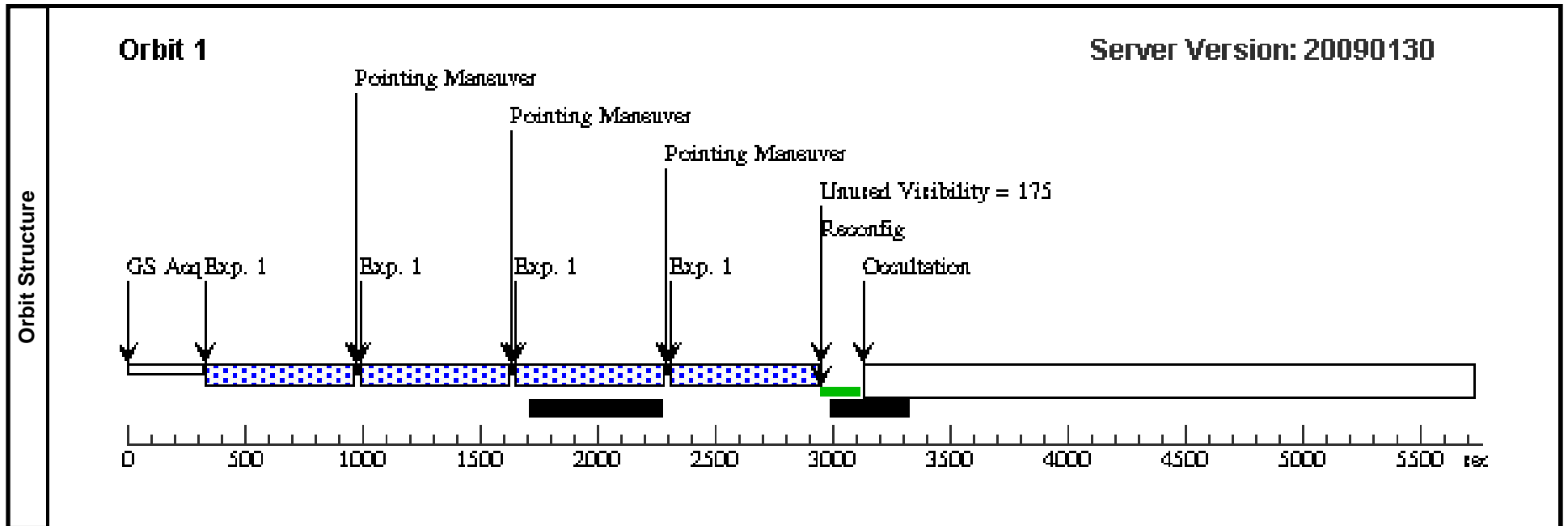
Visit	Proposal 11208, Visit 07, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: GYRO MODE 3GOBAD; ORIENT 292D TO 0.0 D; ORIENT 22D TO 90 D; ORIENT 112D TO 180 D; ORIENT 202D TO 270 D										
	(Visit 07) Warning (Form): Gyro Mode overrides default value of 2G.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern			Exposures		
	(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365		Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false					(1)		
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(7)	J155228+562236	RA: 15 52 27.8210 (238.1159208d) Dec: +56 22 36.47 (56.37680d) Equinox: J2000				V=19+/-0.5	Reference Frame: SDSS			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1		(7) J155228+562236	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00		Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]		[1]



Proposal 11208 - Visit 08 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:15 GMT 2009

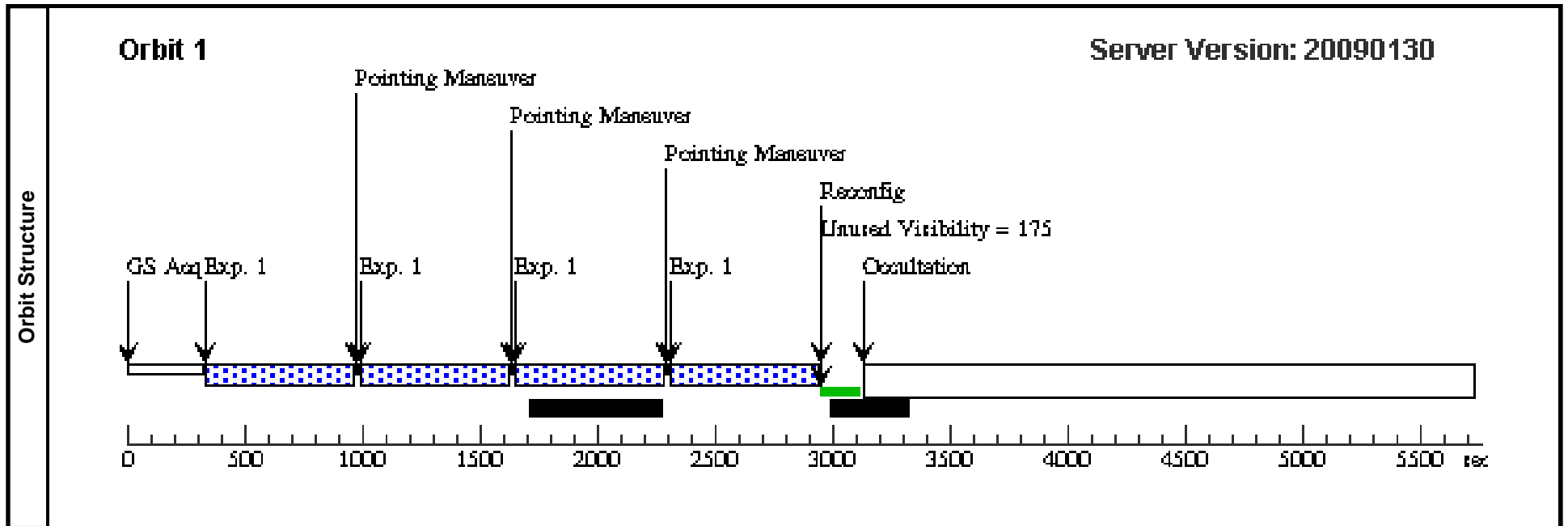
Visit	Proposal 11208, Visit 08, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: GYRO MODE 3GOBAD; ORIENT 332D TO 40 D; ORIENT 62D TO 130 D; ORIENT 152D TO 220 D; ORIENT 242D TO 310 D									
	(Visit 08) Warning (Form): Gyro Mode overrides default value of 2G.									
Diagnosics										
Patterns	#	Primary Pattern				Secondary Pattern			Exposures	
	(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365	Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false						(1)	
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(8)	J111415-005920	RA: 11 14 15.8310 (168.5659625d) Dec: -00 59 20.41 (-.98900d) Equinox: J2000			V=19.6+/-0.5	Reference Frame: SDSS			
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
	1		(8) J111415-005920	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00	GS ACQ SCENARI O BASE1B3	Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]	[1]



Proposal 11208 - Visit 11 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:15 GMT 2009

Visit	Proposal 11208, Visit 11, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: GYRO MODE 3GOBAD; ORIENT 352D TO 60 D; ORIENT 82D TO 150 D; ORIENT 172D TO 240 D; ORIENT 262D TO 330 D										
	(Visit 11) Warning (Form): Gyro Mode overrides default value of 2G.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365		Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false						(1)	
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(11)	J125631-023131	RA: 12 56 31.8930 (194.1328875d) Dec: -02 31 30.62 (-2.52517d) Equinox: J2000				V=18.8+/-0.5		Reference Frame: SDSS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1		(11) J125631-023131 1	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00		Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]		[1]



Proposal 11208 - Visit 13 - The co-evolution of spheroids and black holes in the last six billion years

Thu Jun 11 01:08:16 GMT 2009

Visit	Proposal 11208, Visit 13, implementation Diagnostic Status: Warning Scientific Instruments: WFC3/IR Special Requirements: GYRO MODE 3GOBAD										
	(Visit 13) Warning (Form): Gyro Mode overrides default value of 2G.										
Diagnosics											
Patterns	#	Primary Pattern				Secondary Pattern				Exposures	
	(3)	Pattern Type=WFC3-IR-DITHER-BOX-MIN Purpose=DITHER Number Of Points=4 Point Spacing=0.572 Line Spacing=0.365				Coordinate Frame=POS-TARG Pattern Orientation=18.528 Angle Between Sides=74.653 Center Pattern=false				(1)	
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Fluxes	Miscellaneous		
	(13)	J100728+392652	RA: 10 07 28.3810 (151.8682542d) Dec: +39 26 51.83 (39.44773d) Equinox: J2000					V=19.7+/-0.5	Reference Frame: SDSS		
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]		Orbit
	1		(13) J100728+392652 2	WFC3/IR, MULTIACCUM, IR	F110W	NSAMP=10; SAMP-SEQ=STEP2 00		Pattern 3, Exps 1-1 (3)	[==>(Pattern 1)] [==>(Pattern 2)] [==>(Pattern 3)] [==>(Pattern 4)]		[1]

