11013 - Continued M31 Monitoring for Black Hole X-ray Nova

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?*
15	(1) M31-BH	WFPC2	2	04-Aug-2009 21:00:39.0	yes
16	(1) M31-BH	WFPC2	2	04-Aug-2009 21:00:43.0	yes
17	(2) M31-BH-COPY	ACS/WFC	2	04-Aug-2009 21:00:47.0	yes

6 Total Orbits Used

ABSTRACT

We have been carring out a Chandra (GO+GTO) and HST (GO) program to find Black Hole X-ray Nova (BHXN) and their optical counterparts in M31 for several years. To date we have found >2 dozen BHXN and 3 HST optical counterparts for these BHXN. Our results suggest a rather high

ratio of BH to neutron star (NS) binaries, or a high duty cycle for the BHXN. We propose to continue this program, with the goal of determining the orbital period distribution and duty cycles of these BHXN. Current results yield 3 orbital periods and 3 upper limits. Our proposed observations will ~double the total number of periods and therefore yield sufficient numbers to make a first approximation of the orbital period distribution. The orbital period distribution is the fundamental observable parameter any binary stellar evolution models must match, and the duty cycle is very poorly known but directly influences the binary lifetime. M31 is the only galaxy in which this extra-galactic study of BHXN is feasible. Furthermore, the 2 HST observations will allow us to estimate the orbital period of a single super-Eddington source.

OBSERVING DESCRIPTION

We will use the ACS camera to obtain images of an active Black Hole X-ray Nova (BHXN) in M31. This BHXNe will be chosen from one of 6 Chandra-ACIS observations (5 from the AO8, plus the last observation from AO7). We will wait until a super-Eddington source is detected (Lx > 3e38 erg/s) to trigger the first HST observation, which will take place ~4 weeks later; this will capture the counterpart in a bright optical state. A second HST observation will be carried out ~6 months later to study the source in quiesence.

ADDITIONAL COMMENTS

As we will not know the exact location of our target until a Chandra observation is completed, we cannot provide final coordinates for our object until about 3 weeks prior to the first observation. As a result, we have currently supplied the coordinates of the nucleus of M31 as a hold position, to be corrected to the final position when we detect the BHXN. This detection will be within 1 degree of the M31 nucleus.

Visit

Proposal 11013, Visit 15, completed Wed Aug 05 01:00:51 GMT 2009

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFPC2-BOX	Coordinate Frame=POS-TARG		(1)
	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			

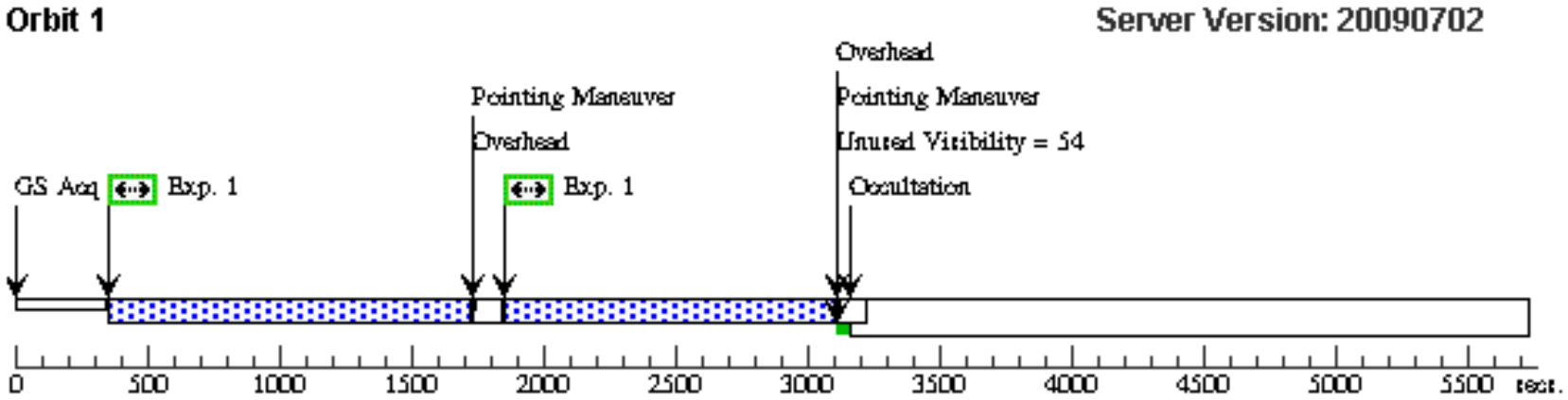
Fixed Targets

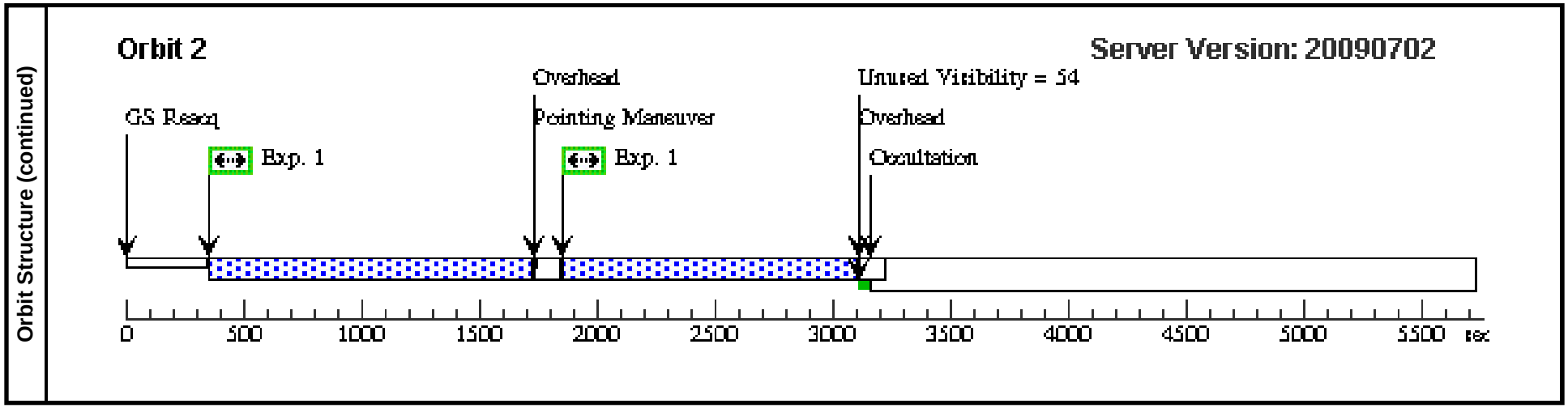
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	M31-BH	RA: 00 43 20.7100 (10.8362917d) Dec: +41 15 31.31 (41.25870d) Equinox: J2000		V=25+/-5	Reference Frame: Chandra Observation

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	BH6-on	(1) M31-BH	WFPC2, IMAGE, PC1-FIX	F439W	CR-SPLIT=NO; ATD-GAIN=15; CLOCKS=YES	GS ACQ SCENARIO BASE1T3	Pattern 1, Exps 1-1 (1)	1100.0 Secs	
								[==>1200.0 Secs (Pattern 1)] *[==>(Pattern 2)]*	***[1]***
								[==>1200.0 Secs (Pattern 3)] *[==>(Pattern 4)]*	***[2]***

Orbit Structure




Orbit Structure (continued)
Orbit 2
Server Version: 20090702
GS Reacq
Exp. 1
Overhead
Pointing Maneuver
Exp. 1
Unused Visibility = 54
Overhead
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11013, Visit 16, withdrawn Wed Aug 05 01:00:52 GMT 2009

Diagnostic Status: No Diagnostics

Scientific Instruments: WFPC2

Special Requirements: AFTER 15 BY 180.0 D TO 210.0 D

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=WFPC2-BOX	Coordinate Frame=POS-TARG		(1)
	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			

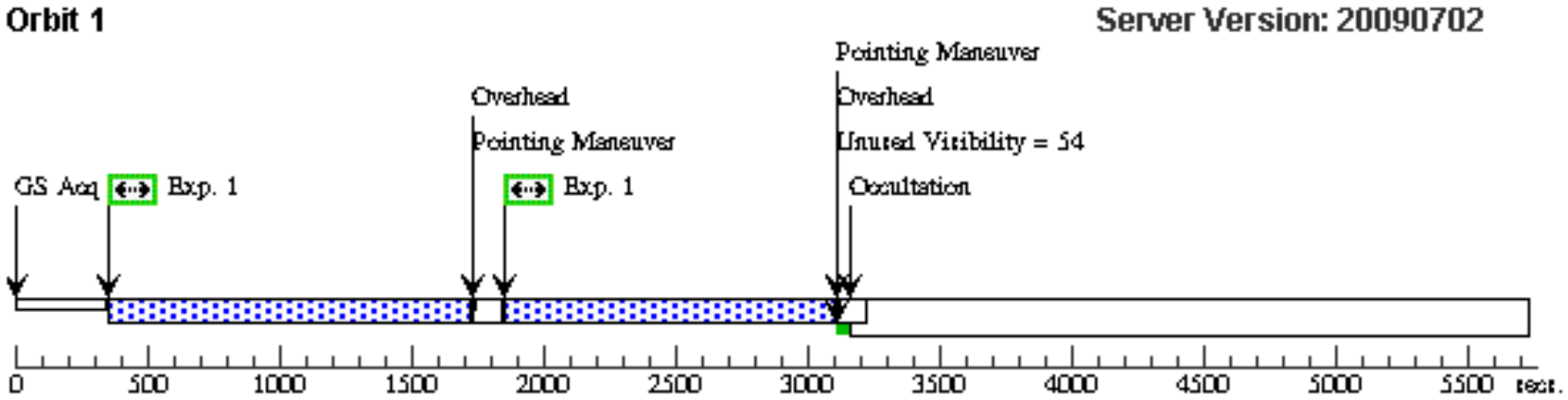
Fixed Targets

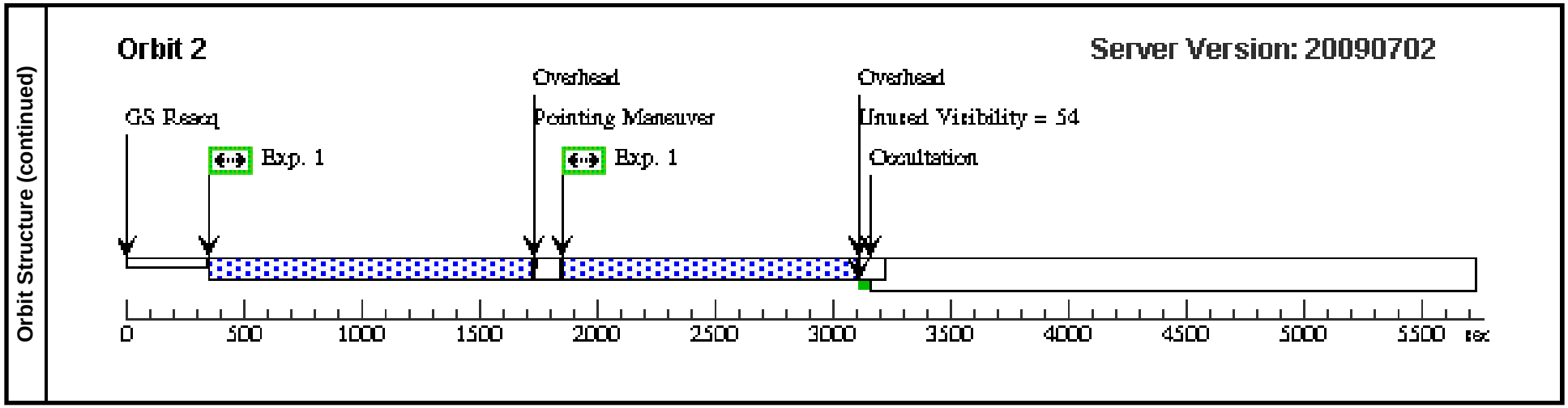
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	M31-BH	RA: 00 43 20.7100 (10.8362917d) Dec: +41 15 31.31 (41.25870d) Equinox: J2000		V=25+/-5	Reference Frame: Chandra Observation

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	BH6-off	(1) M31-BH	WFPC2, IMAGE, PC1-FIX	F439W	CR-SPLIT=NO; ATD-GAIN=15; CLOCKS=YES	GS ACQ SCENARIO BASE1T3	Pattern 1, Exps 1-1 (1)	1100.0 Secs	
								[==>1200.0 Secs (Pattern 1)] *[==>(Pattern 2)]*	***[1]***
								[==>1200.0 Secs (Pattern 3)] *[==>(Pattern 4)]*	***[2]***

Orbit Structure




Orbit Structure (continued)
Orbit 2
Server Version: 20090702
GS Reacq
Exp. 1
Overhead
Pointing Maneuver
Exp. 1
Overhead
Unused Visibility = 54
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 11013, Visit 17, implementation Wed Aug 05 01:00:52 GMT 2009

Diagnostic Status: Warning

Scientific Instruments: ACS/WFC

Special Requirements: GYRO MODE 3GOBAD; BETWEEN 22-AUG-2009:00:00:00 AND 07-SEP-2009:00:00:00

Diagnostics

(Visit 17) Warning (Form): Gyro Mode overrides default value of 2G.

Patterns

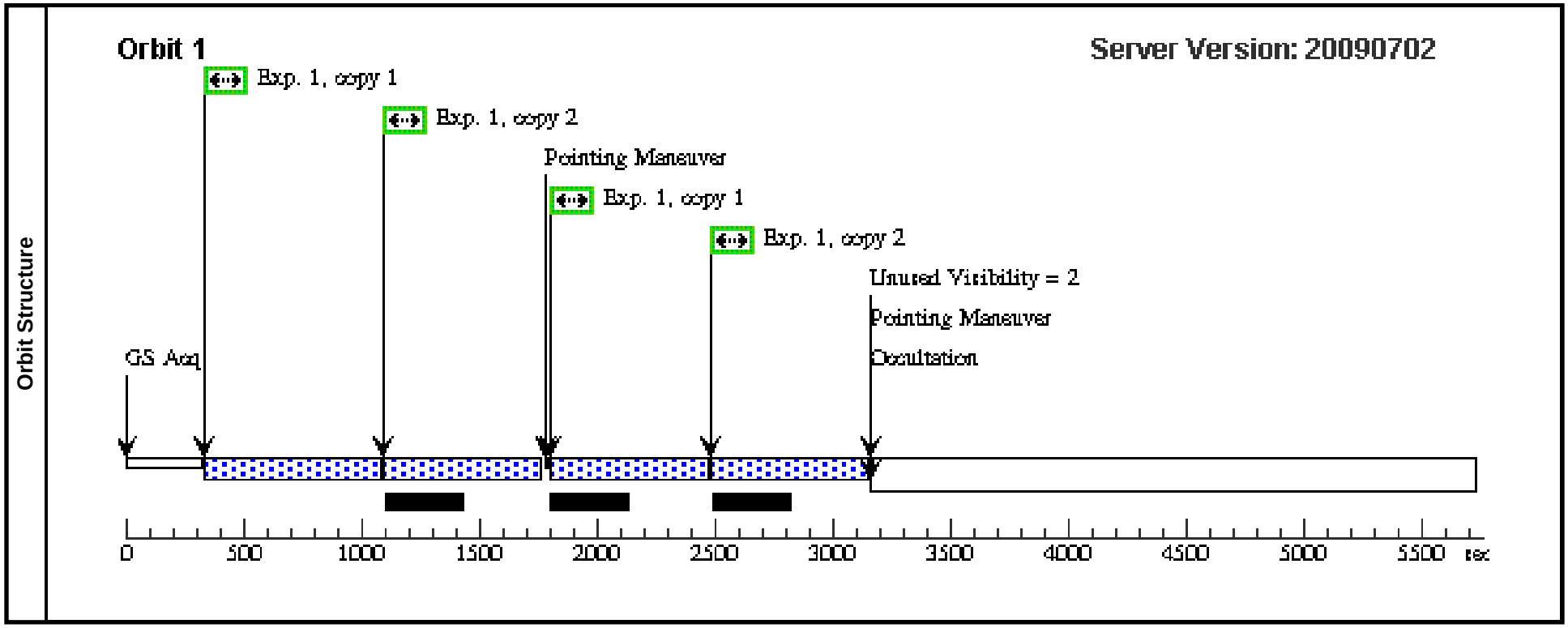
#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=ACS-WFC-DITHER-BOX Purpose=DITHER Number Of Points=4 Point Spacing=0.265 Line Spacing=0.187	Coordinate Frame=POS-TARG Pattern Orientation=20.67 Angle Between Sides=69.05 Center Pattern=false		(1)

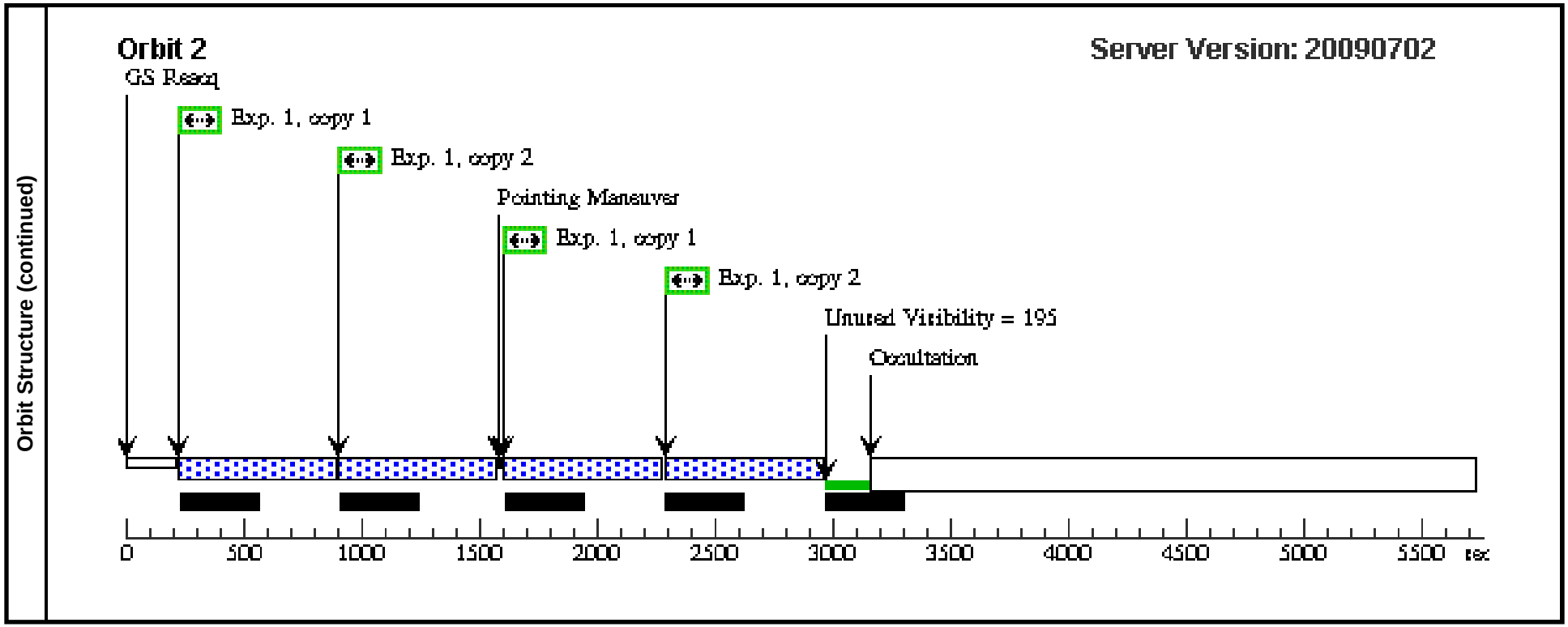
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	M31-BH-COPY	RA: 00 42 17.3060 (10.5721083d) Dec: +41 15 37.21 (41.26034d) Equinox: J2000		V=25+/-5	Reference Frame: Chandra Observation

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	BH2-on	(2) M31-BH-COPY	ACS/WFC, ACCUM, WFC	F435W	GAIN=2.0; CR-SPLIT=NO		Pattern 2, Exps 1-1 (2)	545 Secs X 2	
								[==>(Pattern 1, Copy 1)] *[==>(Pattern 1, Copy 2)]* *[==>(Pattern 2, Copy 1)]* *[==>(Pattern 2, Copy 2)]*	***[1]***
								[==>(Pattern 3, Copy 1)] *[==>(Pattern 3, Copy 2)]* *[==>(Pattern 4, Copy 1)]* *[==>(Pattern 4, Copy 2)]*	***[2]***


Orbit Structure
Orbit 1
Server Version: 20090702
Exp. 1, copy 1
Exp. 1, copy 2
Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Unused Visibility = 2
Pointing Maneuver
Occultation
GS Acq
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec


Orbit Structure (continued)
Orbit 2
Server Version: 20090702
GS Reacq
Exp. 1, copy 1
Exp. 1, copy 2
Pointing Maneuver
Exp. 1, copy 1
Exp. 1, copy 2
Unused Visibility = 195
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec