12922 - Calibrating black hole mass estimators using the enlarged sample of reverberation-mapped AGNs

Cycle: 20, 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) ARP-151	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	10-Jul-2012 23:13:55.0	yes
02	(2) MRK-50	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	10-Jul-2012 23:14:12.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(3) MRK-1310	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	10-Jul-2012 23:14:28.0	yes
04	(4) NGC-6814	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	2	10-Jul-2012 23:14:42.0	yes
05	(5) SBS1116+583A	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	10-Jul-2012 23:14:57.0	yes
06	(6) ZW229-015	STIS/CCD STIS/FUV-MAMA STIS/NUV-MAMA	3	10-Jul-2012 23:15:17.0	yes

15 Total Orbits Used

ABSTRACT

Accurate estimates of black hole masses are crucial to understanding the growth of black holes and the co- evolution of black holes and galaxies. Black hole masses can be determined in AGNs using the kinematics of the broad-line region based on the virial assumption. The velocity profiles of the Hbeta, Mg II, and CIV lines from single-epoch spectra are commonly used to infer the gas kinematics of low-z, mid-z, and high-z quasars, respectively. However, this method is well calibrated only in the local universe based on the Hbeta and Halpha lines, while high redshift results depend on the CIV- and Mg II-based mass estimators. Particularly, CIV results have been extensively debated, because of evidence for non-virial outflows and the effects of absorption. The best sample for calibrating single-epoch mass estimators is the set of reverberation-mapped AGNs with direct measurements of the BLR size, which provides a unique local baseline for determining the BLR size-luminosity relation and for calibrating UV mass estimators. We will test and calibrate single-epoch mass estimators, using the enlarged sample of reverberation-mapped AGNs by combining new data for 6 objects at M_BH < 10^7.5 M_sun, with archival data for 30 additional AGNs that have suitable previous UV observations. The enlarged sample provides an important new opportunity to better constrain and test the UV mass estimators by extending both the total sample size and the mass range over which the UV methods can be applied. We propose to obtain STIS UV and optical spectroscopy of 6 AGNs which currently lack high-quality UV spectra for measuring the C IV and Mg II line properties and UV continuum.

OBSERVING DESCRIPTION

We will use three gratings, i.e., G140L (1150-1700 A), G230L (1600-3200 A), and G430L (2900-5700 A) to observe the C IV, Mg II, and H lines as well as the important UV continuum. We collected GALEX FUV and NUV AB magnitudes and B band magnitude from our LAMP photometry (Walsh et al. 2009) for exposure time calculations (see Table 1). Based on the STIS ETC, we calculated the exposure time to achieve S/N15-20 per resolution element at continuum (1350 A, 3000 A, and 5100 A, respectively) to securely measure the line width (FWHM and line dispersion) after subtracting the continuum. For a source with FUV=17, NUV=17, and B=17, the required exposure time is 1800 sec with G140L, 1400 sec with G230L, and 250 sec with G430L using the 52X0.2 slit. Thus, for bright objects in our sample (see Table 1), 2 orbits can provide the entire FUV to optical spectra, including guide star and target acquisition, and 8 min. and 5 min. overhead for MAMA and CCD exposures, respectively. For 3 fainter objects with FUV18, longer exposure time is necessary to the same S/N, and we request 3 orbits for these objects. Considering potential variability of the UV continuum (a factor of 2) and S/N requirements, we ask for a total of 15 orbits for the sample of 6 AGNs.

For the STIS CCD observations, we will use the recommended E1 aperture position to minimize CTE losses. We will obtain either 2 or 3 dithered exposures in each grating setting (dithered along the slit) in order to optimally clean cosmic-ray hits and bad pixels, and our STIS CCD exposures will be < 1000 sec each, as recommended in the STIS handbook.

Visit

Proposal 12922, Visit 01 Wed Jul 11 03:15:26 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=3 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(2), (3)
(2)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(4)

Fixed Targets

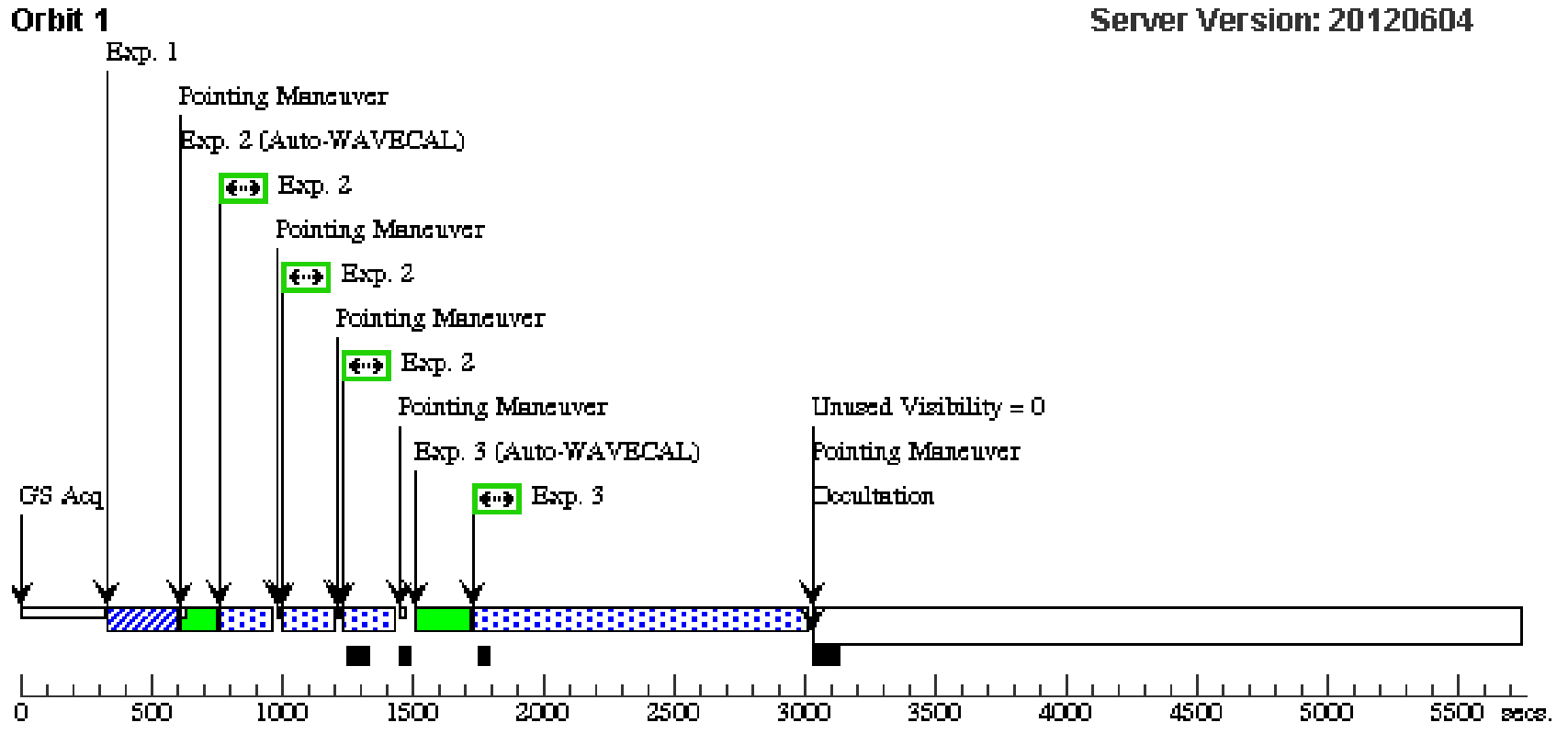
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	ARP-151	RA: 11 25 36.1680 (171.4007000d) Dec: +54 22 57.00 (54.38250d) Equinox: J2000		V=15.48	Reference Frame: ICRS

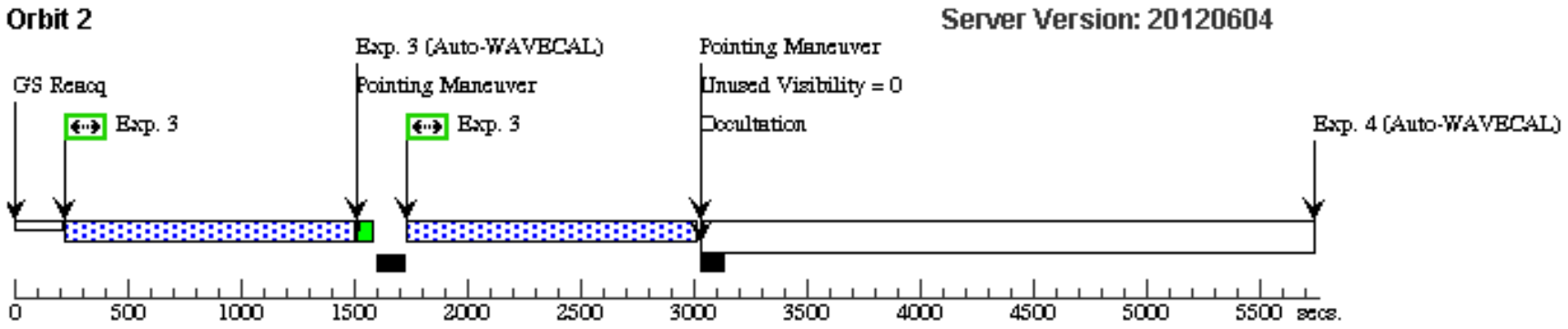
Comments: This object was generated by the targetselector and retrieved from the NED database.

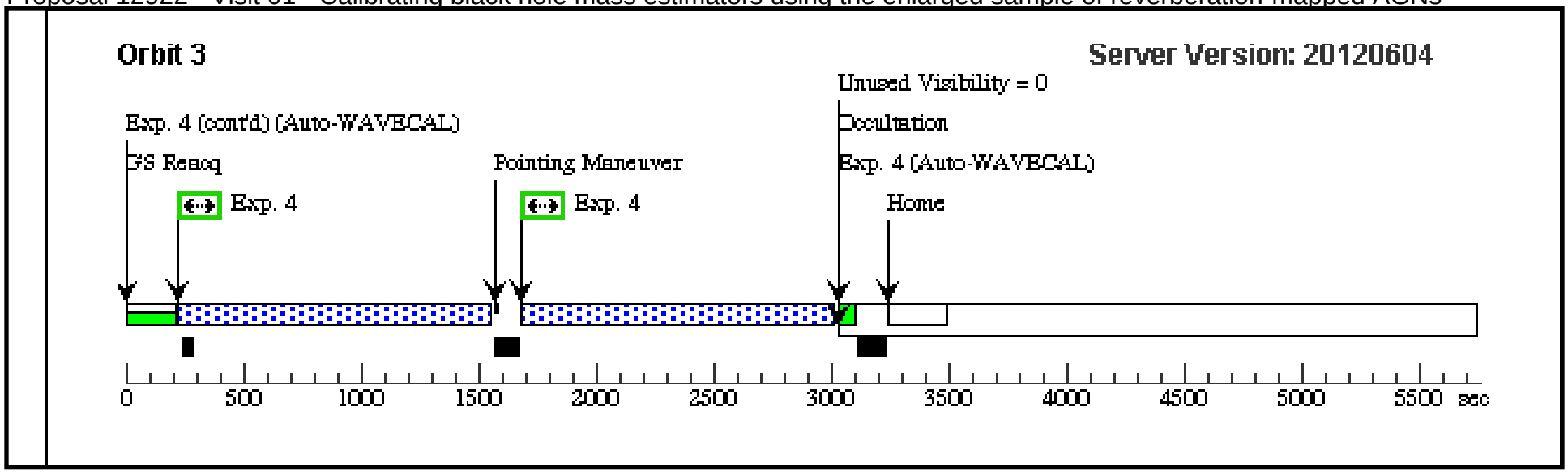
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) ARP-151	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs	
								[==>]	***[1]***
2	CCD (STIS.sp.41 4401)	(1) ARP-151	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO		Pattern 1, Exps 2-2 in Visit 01 (1)	165 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
3	FUV (STIS.sp.41 4937)	(1) ARP-151	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A		POS TARG 0,null	Pattern 1, Exps 3-3 in Visit 01 (1)	1268 Secs	
								[==>1266 Secs (Pattern 1)]	***[1]***
								[==>(Pattern 2)] *[==>1267 Secs (Pattern 3)]*	***[2]***
4	NUV (STIS.sp.41 4939)	(1) ARP-151	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 2, Exps 4-4 in Visit 01 (2)	1320 Secs	
								[==>(Pattern 1)] *[==>1319 Secs (Pattern 2)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20120604
Unused Visibility = 0
Occultation
Exp. 4 (cont'd) (Auto-WAVECAL)
FS Reacq
Pointing Maneuver
Exp. 4 (Auto-WAVECAL)
Exp. 4
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12922, Visit 02 Wed Jul 11 03:15:30 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=3 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(2)
(2)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(3), (4)

Fixed Targets

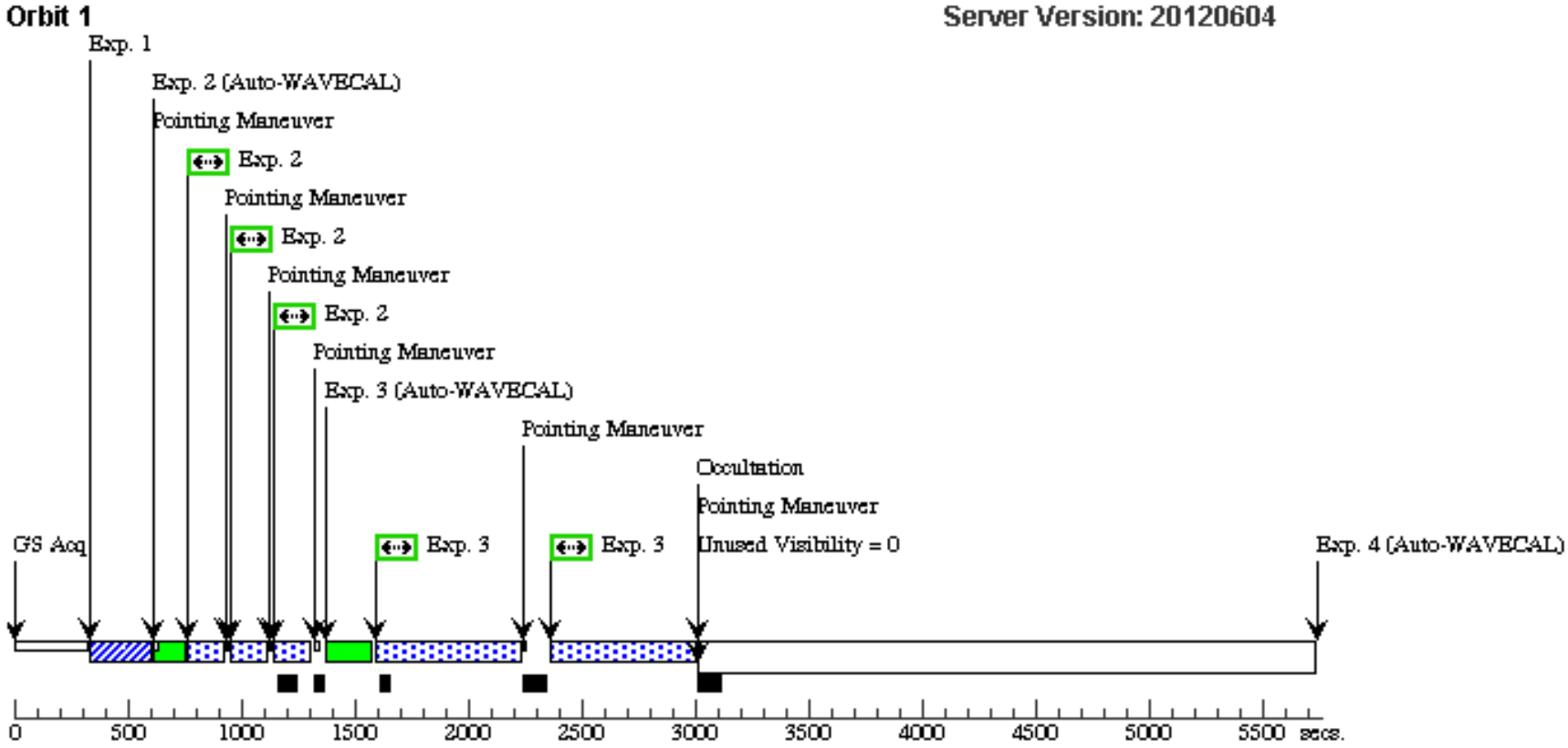
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	MRK-50	RA: 12 23 24.1414 (185.8505892d) Dec: +02 40 44.40 (2.67900d) Equinox: J2000		V=14.84	Reference Frame: ICRS

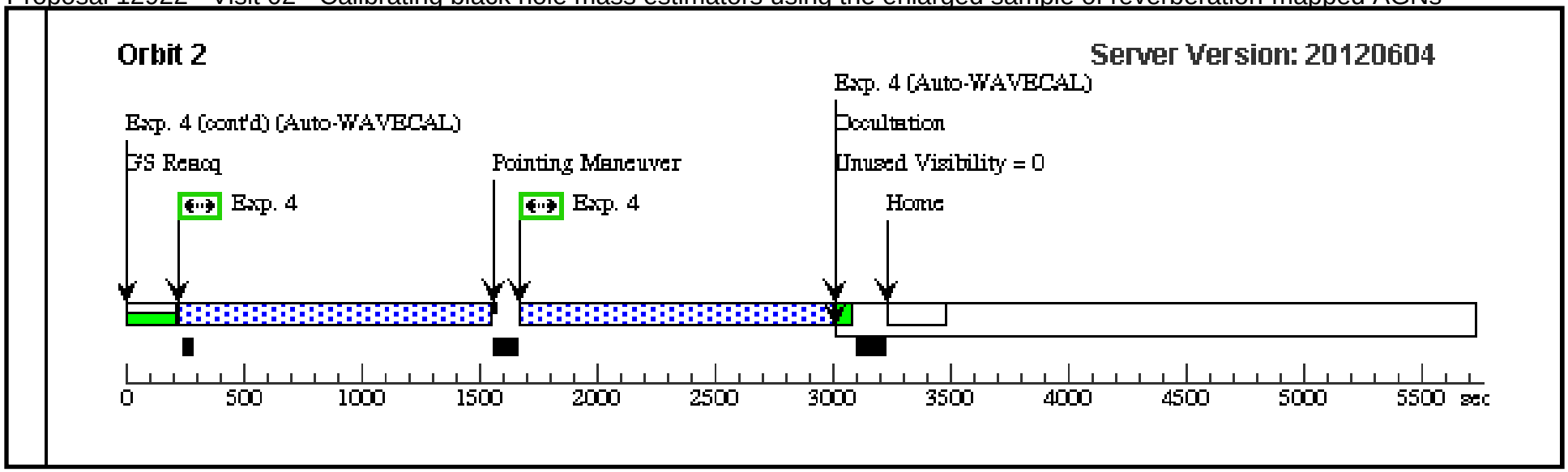
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) MRK-50	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs *[==>]*	***[1]***
2	CCD (STISTIS.sp .414967)	(2) MRK-50	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO		Pattern 1, Exps 2-2 in Visit 02 (1)	120 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
3	NUV (STIS.sp.41 4945)	(2) MRK-50	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 2, Exps 3-3 in Visit 02 (2)	628 Secs *[==>(Pattern 1)]* *[==>627.0 Secs (Pattern 2)]*	***[1]***
4	FUV (STIS.sp.41 4968)	(2) MRK-50	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A		POS TARG 0,null	Pattern 2, Exps 4-4 in Visit 02 (2)	1312 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20120604
Exp. 4 (Auto-WAVECAL)
Occultation
Unused Visibility = 0
Exp. 4 (cont'd) (Auto-WAVECAL)
FS Reacq
Pointing Maneuver
Exp. 4
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12922, Visit 03 Wed Jul 11 03:15:34 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=3 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(2)
(2)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(3), (4)

Fixed Targets

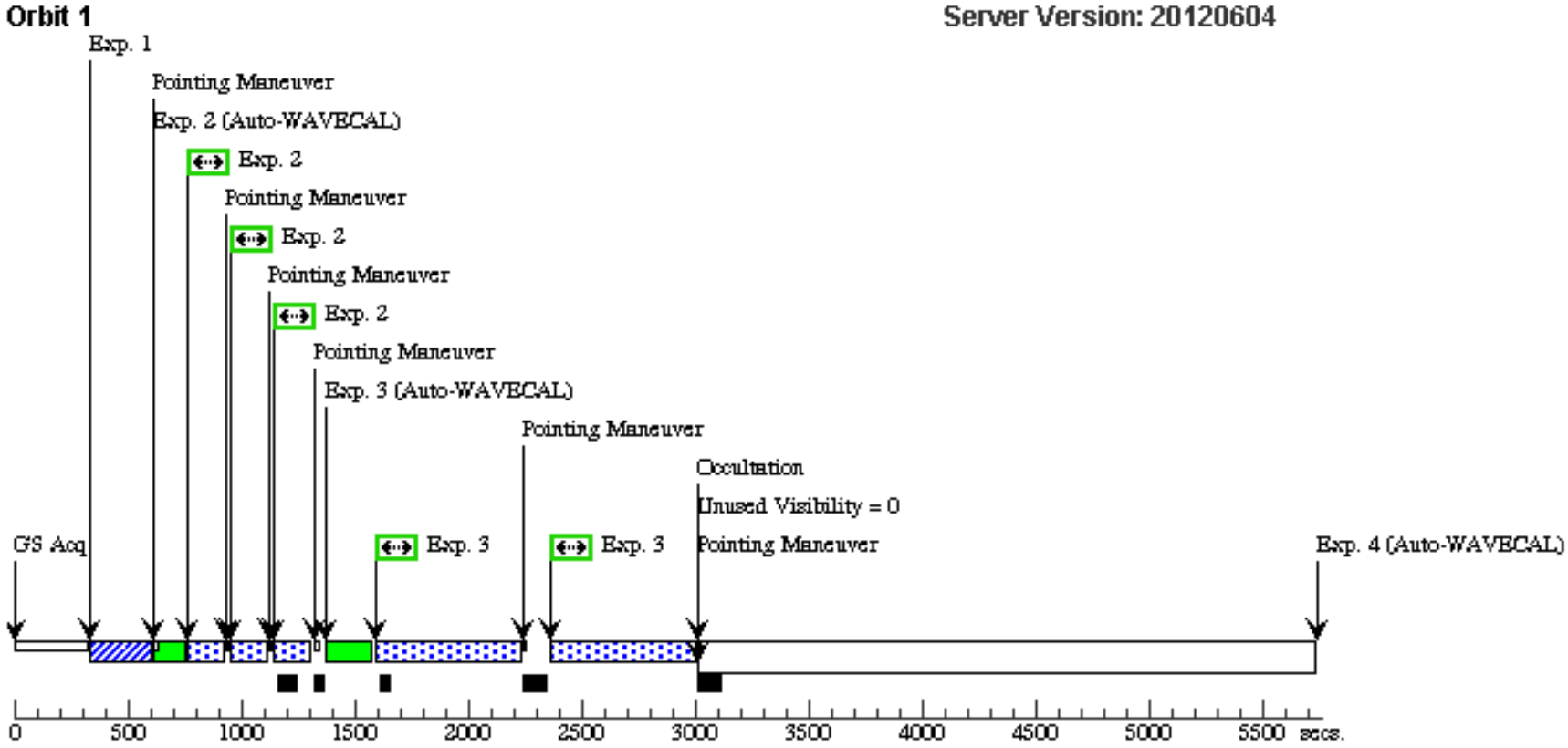
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	MRK-1310	RA: 12 01 14.3510 (180.3097958d) Dec: -03 40 40.97 (-3.67805d) Equinox: J2000		V=14.58	Reference Frame: ICRS

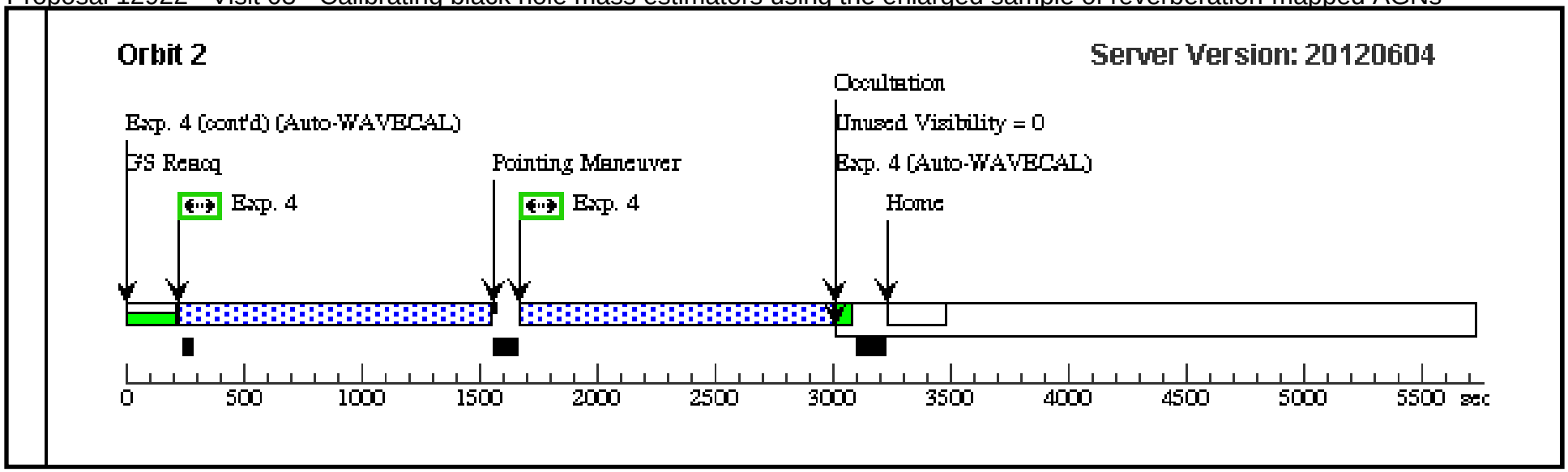
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(3) MRK-1310	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs *[==>]*	 ***[1]***
2	CCD (STIS.sp.41 4438)	(3) MRK-1310	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO		Pattern 1, Exps 2-2 in Visit 03 (1)	120 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	 ***[1]***
3	NUV (STIS.sp.41 4437)	(3) MRK-1310	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 2, Exps 3-3 in Visit 03 (2)	628 Secs *[==>(Pattern 1)]* *[==>627.0 Secs (Pattern 2)]*	 ***[1]***
4	FUV (STIS.sp.41 4969)	(3) MRK-1310	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A		POS TARG 0,null	Pattern 2, Exps 4-4 in Visit 03 (2)	1312 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	 ***[2]***

Orbit Structure




Orbit 2
Server Version: 20120604
Occultation
Exp. 4 (cont'd) (Auto-WAVECAL)
Unused Visibility = 0
FS Reacq
Pointing Maneuver
Exp. 4 (Auto-WAVECAL)
Exp. 4
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12922, Visit 04 Wed Jul 11 03:15:36 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=3 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(2)
(2)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(3), (4)

Fixed Targets

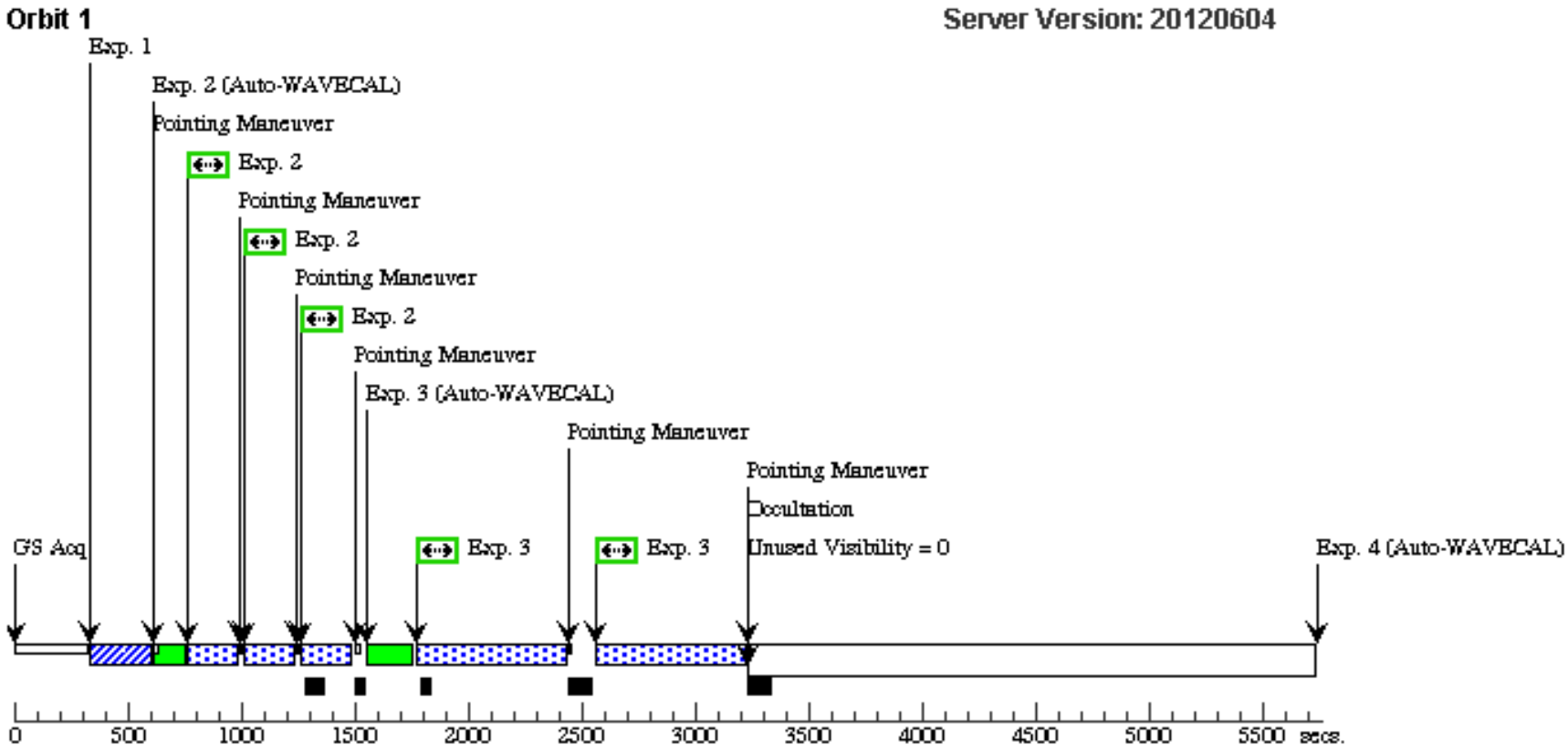
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(4)	NGC-6814	RA: 19 42 40.5760 (295.6690667d) Dec: -10 19 25.50 (-10.32375d) Equinox: J2000		V=13.8	Reference Frame: ICRS

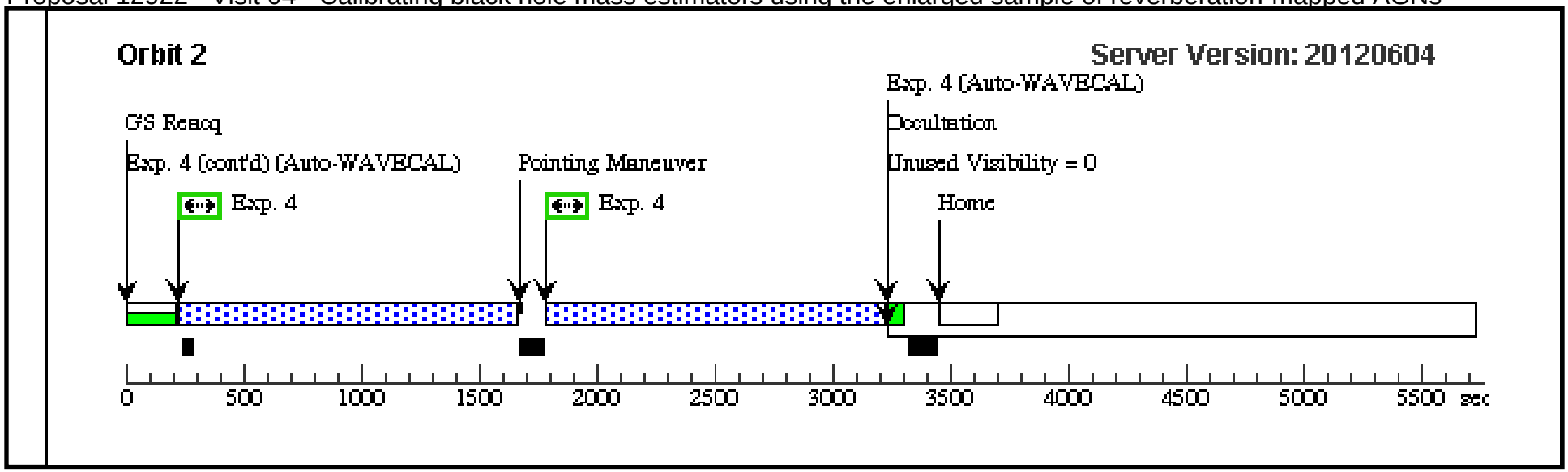
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(4) NGC-6814	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs *[==>]*	***[1]***
2	CCD (STIS.sp.41 4952)	(4) NGC-6814	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO		Pattern 1, Exps 2-2 i n Visit 04 (1)	180 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
3	NUV (STIS.sp.41 4950)	(4) NGC-6814	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 2, Exps 3-3 i n Visit 04 (2)	650 Secs *[==>(Pattern 1)]* *[==>649.0 Secs (Pattern 2)]*	***[1]***
4	FUV (STIS.sp.41 4949)	(4) NGC-6814	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A		POS TARG 0,null	Pattern 2, Exps 4-4 i n Visit 04 (2)	1424 Secs *[==>(Pattern 1)]* *[==>(Pattern 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20120604
GS Reacq
Exp. 4 (cont'd) (Auto-WAVECAL)
Exp. 4
Pointing Maneuver
Exp. 4
Exp. 4 (Auto-WAVECAL)
Occultation
Unused Visibility = 0
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12922, Visit 05 Wed Jul 11 03:15:38 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: SCHED 100%

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=3 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(2), (3)
(2)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(4)

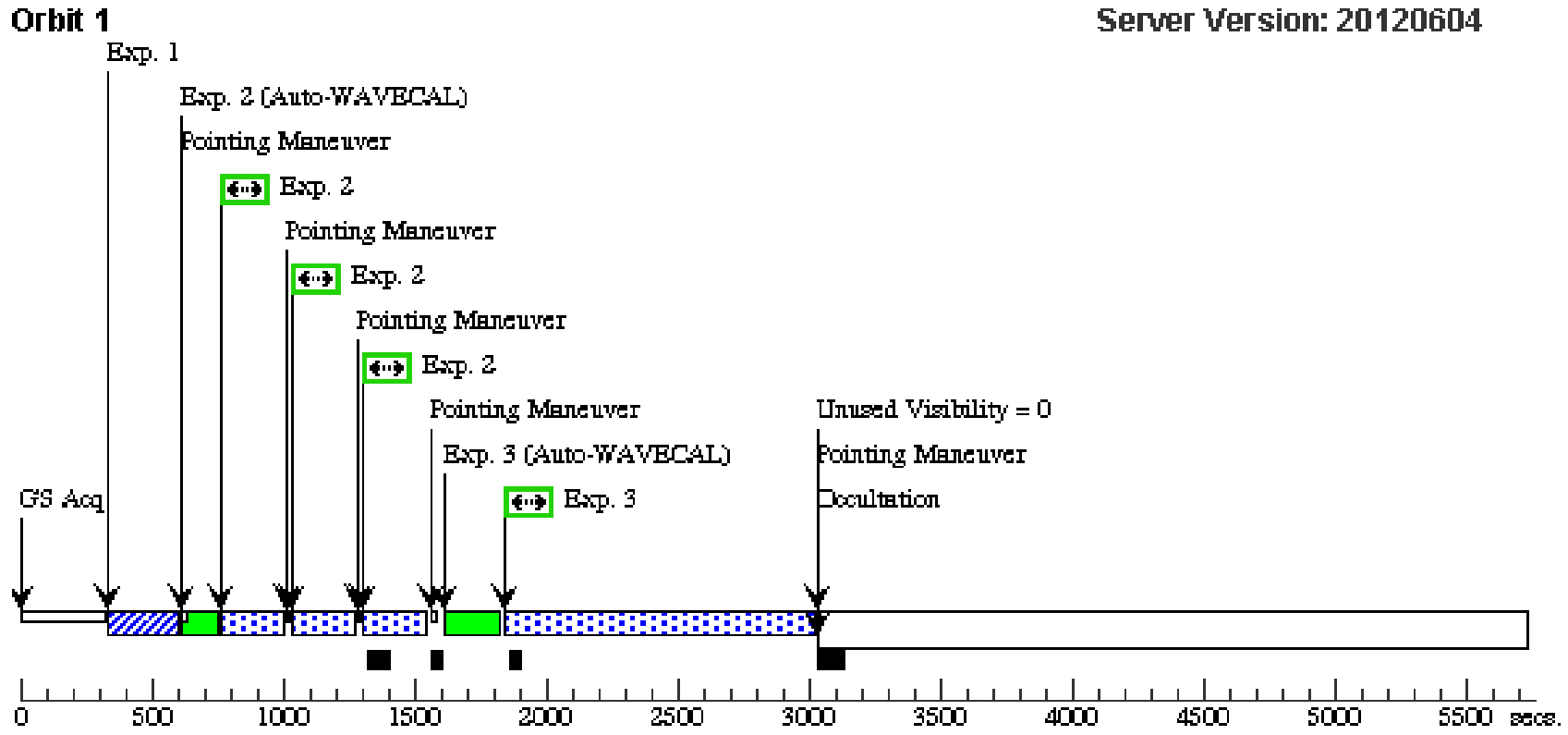
Fixed Targets

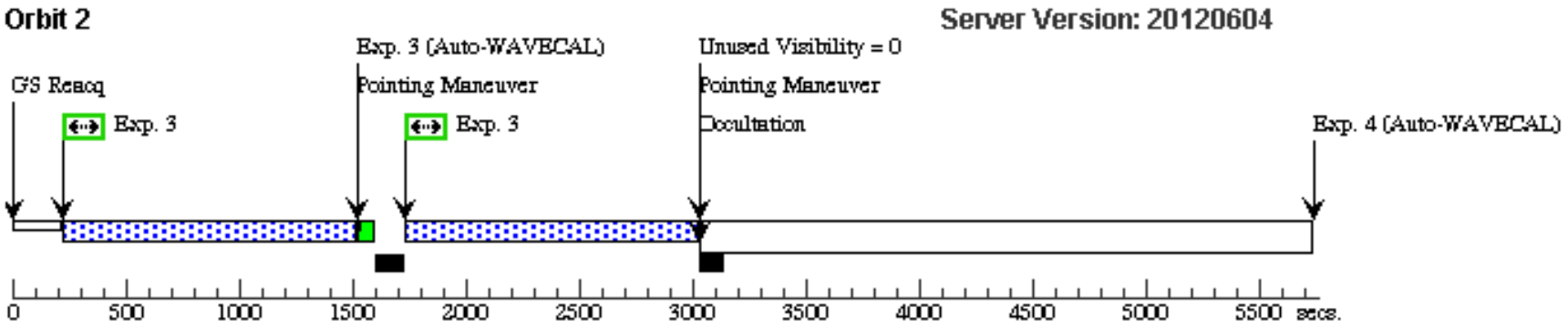
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(5)	SBS1116+583A	RA: 11 18 57.7000 (169.7404167d) Dec: +58 03 24.00 (58.05667d) Equinox: J2000		V=15.33	Reference Frame: ICRS

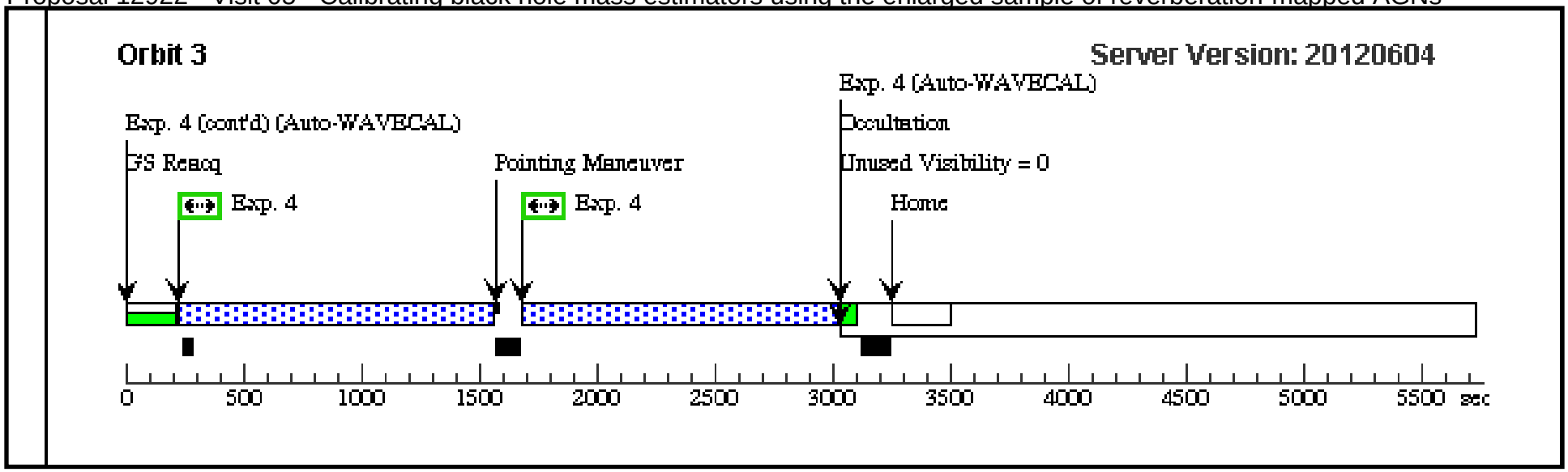
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(5) SBS1116+583A	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs	
								[==>]	***[1]***
2	CCD (STIS.sp.414970)	(5) SBS1116+583A	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO		Pattern 1, Exps 2-2 in Visit 05 (1)	200 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
3	FUV (STIS.sp.414956)	(5) SBS1116+583A	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A		POS TARG 0,null	Pattern 1, Exps 3-3 in Visit 05 (1)	1272 Secs	
								[==>1170.0 Secs (Pattern 1)]	***[1]***
								[==>(Pattern 2)] *[==>(Pattern 3)]*	***[2]***
4	NUV (STIS.sp.414954)	(5) SBS1116+583A	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 2, Exps 4-4 in Visit 05 (2)	1324 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20120604
Exp. 4 (Auto-WAVECAL)
Occultation
Unused Visibility = 0
Exp. 4 (cont'd) (Auto-WAVECAL)
GS Reacq
Pointing Maneuver
Exp. 4
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 12922, Visit 06 Wed Jul 11 03:15:41 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD, STIS/FUV-MAMA, STIS/NUV-MAMA

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=3 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(2), (3)
(2)	Pattern Type=STIS-ALONG-SLIT Purpose=DITHER Number Of Points=2 Point Spacing=0.15 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(4)

Fixed Targets

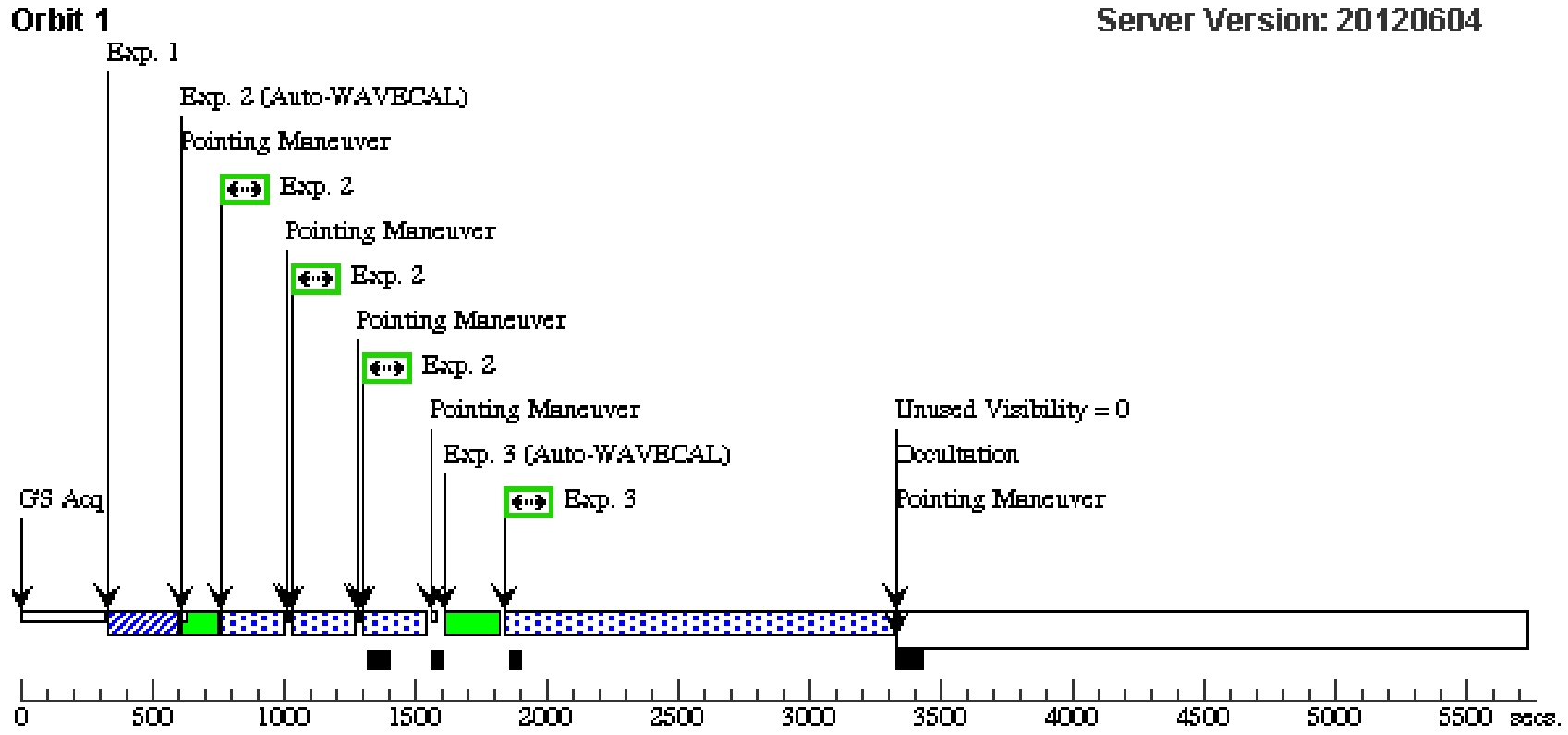
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(6)	ZW229-015	RA: 19 05 25.9280 (286.3580333d) Dec: +42 27 39.84 (42.46107d) Equinox: J2000		V=15.4	Reference Frame: ICRS

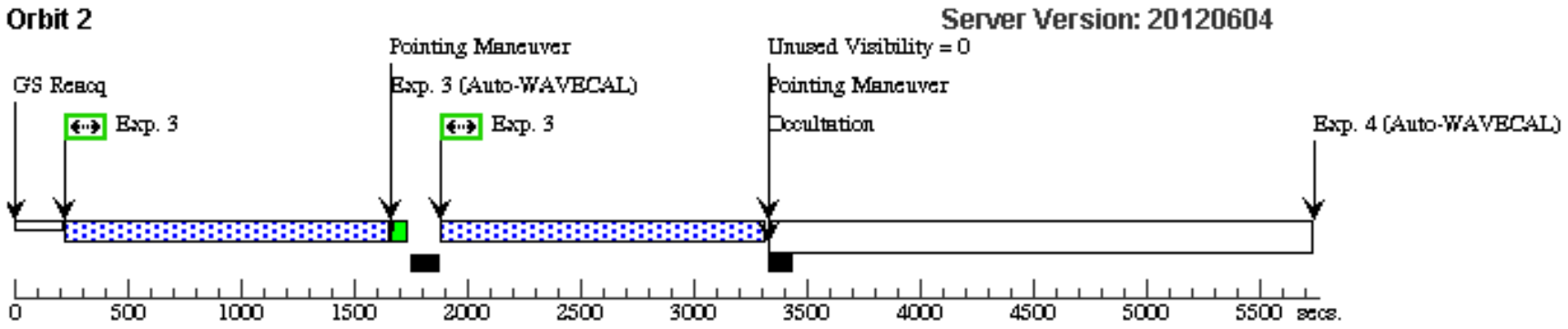
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

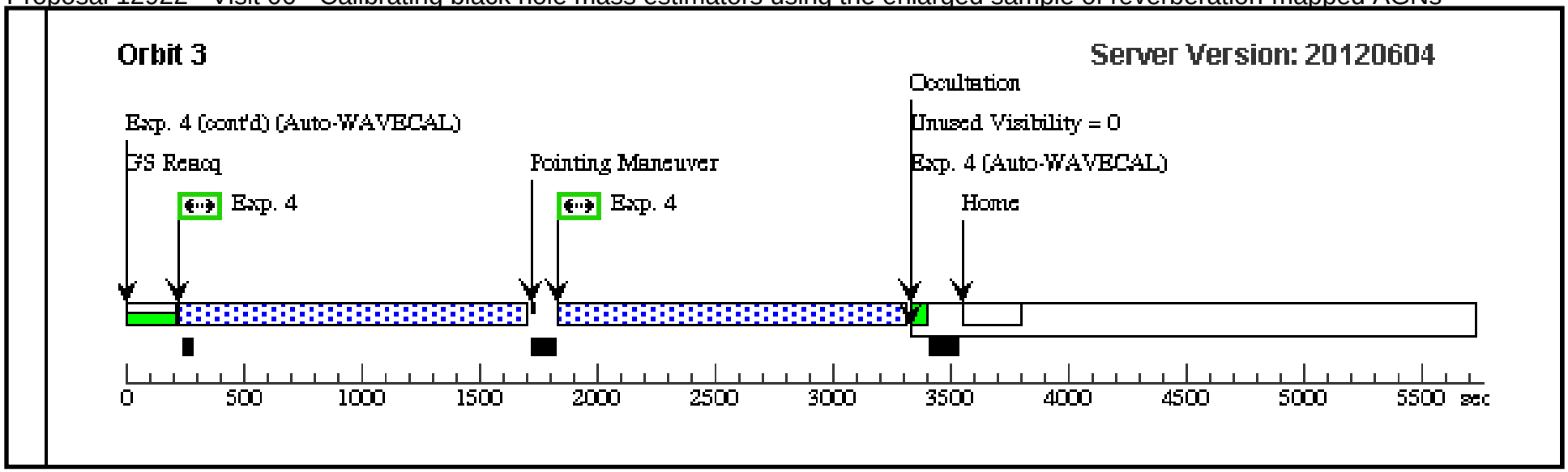
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(6) ZW229-015	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			10 Secs	
								[==>]	***[1]***
2	CCD (STIS.sp.414963)	(6) ZW229-015	STIS/CCD, ACCUM, 52X0.2E1	G430L 4300 A	CR-SPLIT=NO		Pattern 1, Exps 2-2 in Visit 06 (1)	200 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]* *[==>(Pattern 3)]*	***[1]***
3	FUV (STIS.sp.414962)	(6) ZW229-015	STIS/FUV-MAMA, ACCUM, 52X0.2D1	G140L 1425 A		POS TARG 0,null	Pattern 1, Exps 3-3 in Visit 06 (1)	1419 Secs	
								[==>1464.0 Secs (Pattern 1)]	***[1]***
								[==>(Pattern 2)] *[==>(Pattern 3)]*	***[2]***
4	NUV (STIS.sp.414959)	(6) ZW229-015	STIS/NUV-MAMA, ACCUM, 52X0.2	G230L 2376 A			Pattern 2, Exps 4-4 in Visit 06 (2)	1471 Secs	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[3]***

Orbit Structure






Orbit 3
Server Version: 20120604
Occultation
Exp. 4 (cont'd) (Auto-WAVECAL)
Unused Visibility = 0
GS Reacq
Pointing Maneuver
Exp. 4 (Auto-WAVECAL)
Exp. 4
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec