14194 - Precision Masses and Distances of Classical Cepheids

Cycle: 23, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

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) AX-CIR (3) AX-CIR-COMPANION WAVE	STIS/CCD STIS/FUV-MAMA	1	04-Sep-2015 21:03:07.0	yes
B1	(2) AW-PER (4) AW-PER-COMPANION WAVE	STIS/CCD STIS/FUV-MAMA	3	04-Sep-2015 21:03:12.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
B2	(2) AW-PER (4) AW-PER-COMPANION WAVE	STIS/CCD STIS/FUV-MAMA	3	04-Sep-2015 21:03:16.0	yes

7 Total Orbits Used

ABSTRACT

An important HST UV legacy is the measurement of the masses of Cepheids. Recently optical interferometry with the Very Large Telescope Interferometer (VLTI) and CHARA has resolved a number of Cepheid binary systems, providing combined spectroscopic and visual orbits. In order to fully exploit this data, we are requesting HST high resolution E140H spectra of 4 Cepheid systems (AX Cir, AW Per, Y Car, and V636 Sco) to measure the orbital velocity amplitude of the hot companion, and thereby determine the mass ratio for the Cepheid--companion system (using the ground-based orbit of the Cepheid). The anticipated velocity accuracy from the STIS spectra will result in masses with uncertainties of 5 to 11\%. This will provide a definitive test of evolutionary track physics (specifically main sequence core convective overshoot), and also a comparison of the mass-luminosity relation at two metallicities (the Milky Way and the Large Magellanic cloud).

OBSERVING DESCRIPTION

Auto-wavecals will be turned off and replaced with deep wavecals at the beginning and end of each orbit. All but the first wavecal hide in the occultations and or guide-star re-acquisitions.

ACQ and ACQ/PEAK exposures will center on the Cepheid. Offset targets are defined for the expected position of the blue companions based on inteferemetric measurements by CoI A Gallenne.

Other than the initial ACQ, the exposures for each orbit are put into a non-interruptable sequence to ensure that the wavecals stay close in time to each bracketed science exposure.

AX CIR:

1 visit of 1 orbit

(1) Acquire target with 0.6s F28X52OIII ACQ exposure

(2) 0.2 s ACQ/PEAK with G430L and 0.2X0.09 aperture
(3) 120 s WAVE
(4) 2014 s E140H 1271
(5) 250 s WAVE

AW PER:

Two identical visits of 3 orbits each
First orbit:
(1) Acquire target with 0.2s F28X52OIII ACQ exposure
(2) 0.2 s ACQ/PEAK with G430L and 0.2X0.09 aperture
(3) 120 s WAVE
(4) 1800 s E140H 1416
(5) 250 s WAVE
Each of two subsquent orbits:
(6) 250 s WAVE
(7) 3015 s E140H 1416
(8) 250 s WAVE

--------- Additional Comments ----------

Notes to schedulers:

The STIS FUV detector background rate increases with time after detector HV turn-on. Since AW Per is rather faint, please SCHEDULE VISITS B1 & B2 AS THE FIRST FUV MAMA VISIT IN EACH DAY'S SAA FREE BLOCK, and START EACH VISIT AS SOON AS POSSIBLE AFTER THAT DAY'S FUV HV RAMPUP. Please do NOT schedule B1 and B2 together in the same SAA free block

Visit

Proposal 14194, AX CIR (01), implementation Sat Sep 05 01:03:18 GMT 2015

Diagnostic Status: No Diagnostics

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

Special Requirements: BEFORE 01-OCT-2016:00:00:00

Comments: ACQ and peakup are done on the Cepheid and an offset is done to the expected location of the blue companion based on inteferometric observations.

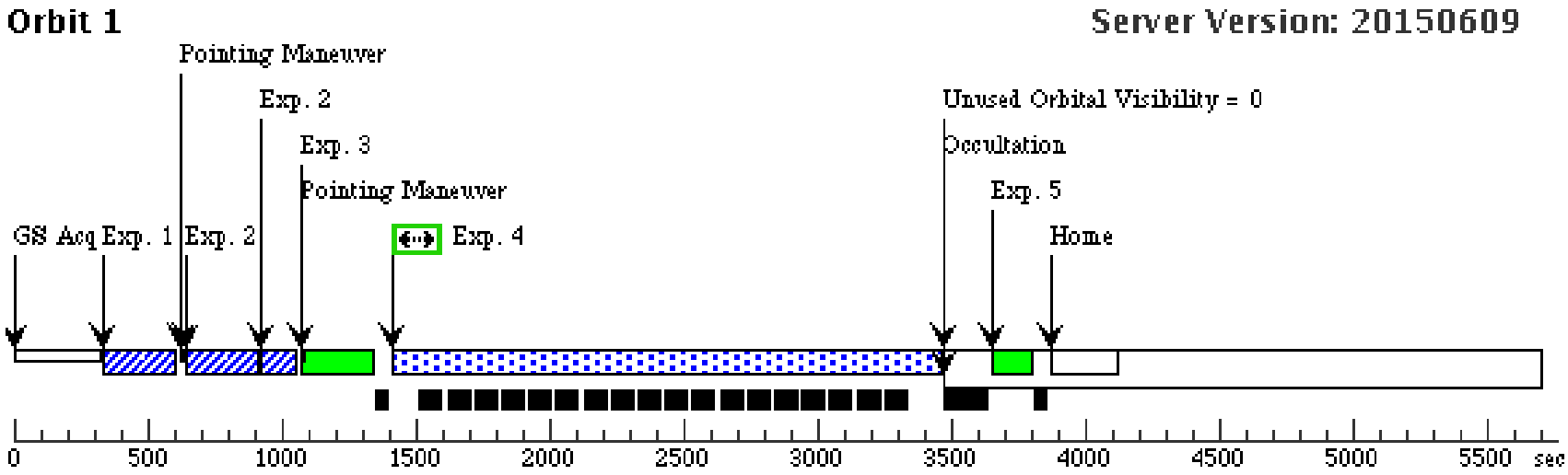
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	AX-CIR	RA: 14 52 35.2563 (223.1469012d) Dec: -63 48 35.39 (-63.80983d) Equinox: J2000	Proper Motion RA: -10.42 mas/yr Proper Motion Dec: -5.37 mas/yr Parallax: 0.00198" Epoch of Position: 2000	V=5.96 Spec=F8II+B6	Reference Frame: ICRS
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.					
(3)	AX-CIR-COMPANION	Offset from AX-CIR RA Offset: -8.886E-4 Secs Dec Offset: -0.0291585 Arcsec		V=9.21+/-0.3	Offset Position (AX-CIR-COMPANION)
Comments: Based on inteferemetric data plus what is known about the orbit, the companion to AX Cir has a predicted position for 2016-03-01 of 2016-03-01: rho = 29.746 mas, theta = -168.594 deg					

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (718611)	(1) AX-CIR	STIS/CCD, ACQ, F28X50OIII	MIRROR				0.6 Secs (0.6 Secs) *[==>]*	***[1]***
2	G430L ACQ /PEAK (718617)	(1) AX-CIR	STIS/CCD, ACQ/PEAK, 0.2X0.09	G430L 4300 A				0.2 Secs (0.2 Secs) *[==>]*	***[1]***
3	Wave 1	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1271 A			Sequence 3-5 Non-Int in AX CIR (01)	100 Secs (100 Secs) *[==>]*	***[1]***
4	E140H science (718619)	(3) AX-CIR-COMPANION	STIS/FUV-MAMA, TIME-TAG, 0.2X0.09	E140H 1271 A	BUFFER-TIME=102; WAVECAL=NO		Sequence 3-5 Non-Int in AX CIR (01)	2034 Secs (2034 Secs) *[==>]*	***[1]***
*Comments: buffer time = 2.0e6/13072 * 0.667 = 102 s*									
5	Wave 2	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1271 A			Sequence 3-5 Non-Int in AX CIR (01)	100 Secs (100 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 14194, AW Per (B1), implementation Sat Sep 05 01:03:18 GMT 2015

Diagnostic Status: No Diagnostics

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

Special Requirements: BETWEEN 01-AUG-2015 AND 30-NOV-2015; GROUP B1,B2 WITHIN 3D

Comments: ACQ and peakup are done on the Cepheid and an offset is done to the expected location of the blue companion based on inteferometric observations.

Note to schedulers: The STIS FUV detector background rate increases with time after detector HV turn-on. Since our target is rather faint (about 5X average background), please schedule each visit as the first FUV MAMA visit in that day's SAA free block of orbits, and start the visits as soon as possible after the HV is turned on for the day.

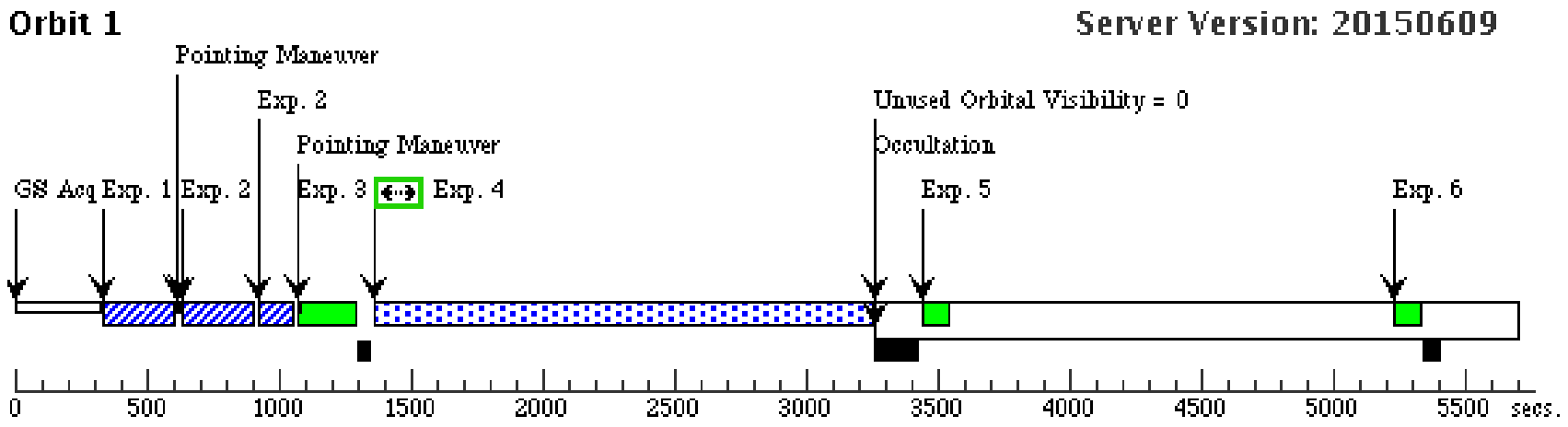
Fixed Targets

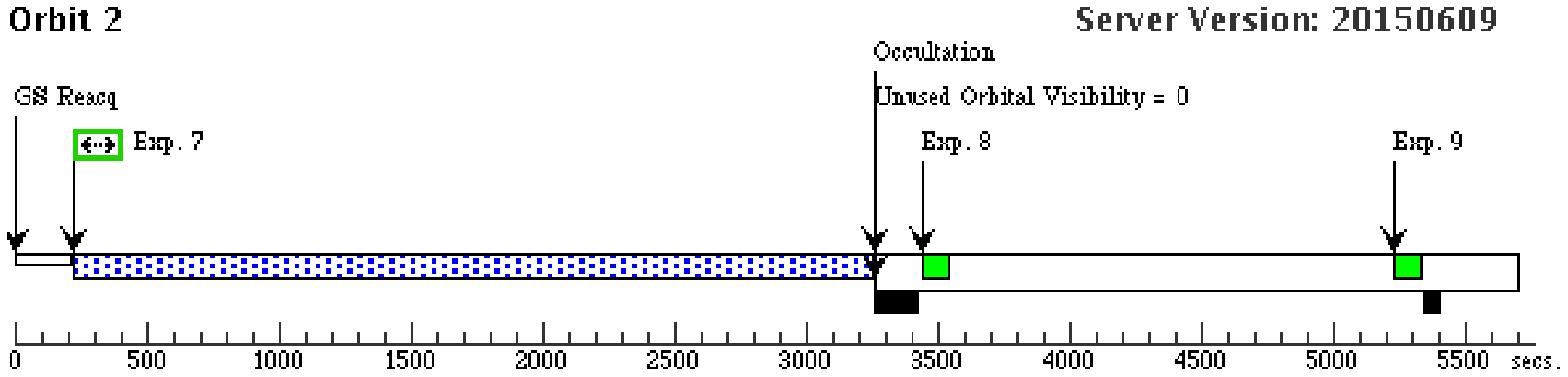
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	AW-PER	RA: 04 47 46.3177 (71.9429904d) Dec: +36 43 22.07 (36.72280d) Equinox: J2000	Proper Motion RA: 2.570 mas/yr Proper Motion Dec: -2.61 mas/yr Parallax: 0.00277" Epoch of Position: 2000	V=7.51	Reference Frame: ICRS
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.					
(4)	AW-PER-COMPANION	Offset from AW-PER RA Offset: 0.0027014 Secs Dec Offset: 0.00556 Arcsec		V=10+/-1	Offset Position (AW-PER-COMPANION)
Comments: Based on inteferemetric data plus what is known about the orbit, the companion to AW Per has a predicted position for 2015-10-01 of rho = 32.952 mas, theta = 80.286 deg (A. Gallenne)					

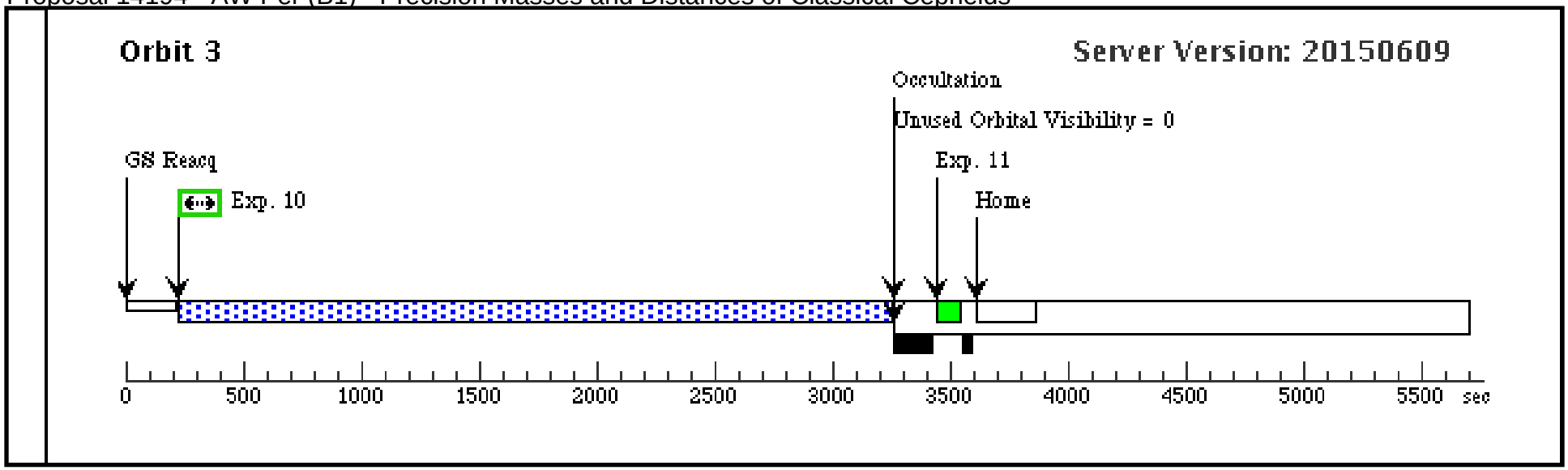
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (718621)	(2) AW-PER	STIS/CCD, ACQ, F28X50OIII	MIRROR				0.2 Secs (0.2 Secs) *[==>]*	***[1]***
2	G430L ACQ /PEAK (718622)	(2) AW-PER	STIS/CCD, ACQ/PEAK, 0.2X0.09	G430L 4300 A				0.2 Secs (0.2 Secs) *[==>]*	***[1]***
3	Wave 1	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 3-5 Non-Int in AW Per (B1)	50 Secs (50 Secs) *[==>]*	***[1]***
4	E140H science (718623)	(4) AW-PER-COMPANION	STIS/FUV-MAMA, TIME-TAG, 0.2X0.09	E140H 1416 A	BUFFER-TIME=9338; WAVECAL=NO		Sequence 3-5 Non-Int in AW Per (B1)	1875 Secs (1875 Secs) *[==>]*	***[1]***
5	Wave 2	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 3-5 Non-Int in AW Per (B1)	50 Secs (50 Secs) *[==>]*	***[1]***
6	Wave 1	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A		NEW ALIGNMENT	Sequence 6-8 Non-Int in AW Per (B1)	50 Secs (50 Secs) *[==>]*	***[1]***
7	E140H science (718623)	(4) AW-PER-COMPANION	STIS/FUV-MAMA, TIME-TAG, 0.2X0.09	E140H 1416 A	BUFFER-TIME=1508; WAVECAL=NO		Sequence 6-8 Non-Int in AW Per (B1)	3015 Secs (3015 Secs) *[==>]*	***[2]***
8	Wave 2	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 6-8 Non-Int in AW Per (B1)	50 Secs (50 Secs) *[==>]*	***[2]***
9	Wave 1	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A		NEW ALIGNMENT	Sequence 9-11 Non-Int in AW Per (B1)	50 Secs (50 Secs) *[==>]*	***[2]***
10	E140H science (718623)	(4) AW-PER-COMPANION	STIS/FUV-MAMA, TIME-TAG, 0.2X0.09	E140H 1416 A	BUFFER-TIME=1508; WAVECAL=NO		Sequence 9-11 Non-Int in AW Per (B1)	3015 Secs (3015 Secs) *[==>]*	***[3]***
11	Wave 2	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 9-11 Non-Int in AW Per (B1)	50 Secs (50 Secs) *[==>]*	***[3]***

Orbit Structure



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3000
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4000
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5000
5500
sec

Visit

Proposal 14194, AW Per (B2), implementation Sat Sep 05 01:03:19 GMT 2015

Diagnostic Status: No Diagnostics

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

Special Requirements: BETWEEN 01-AUG-2015 AND 30-NOV-2015

Comments: ACQ and peakup are done on the Cepheid and an offset is done to the expected location of the blue companion based on inteferometric observations.

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Comments: Based on inteferemetric data plus what is known about the orbit, the companion to AW Per has a predicted position for 2015-10-01 of rho = 32.952 mas, theta = 80.286 deg (A. Gallenne)					

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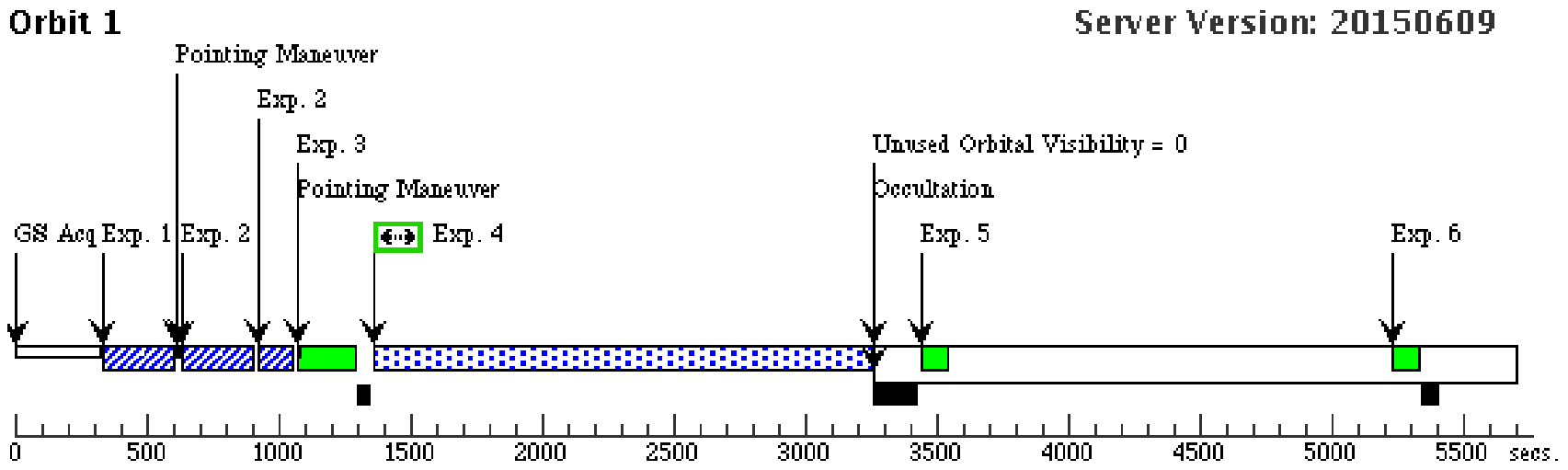
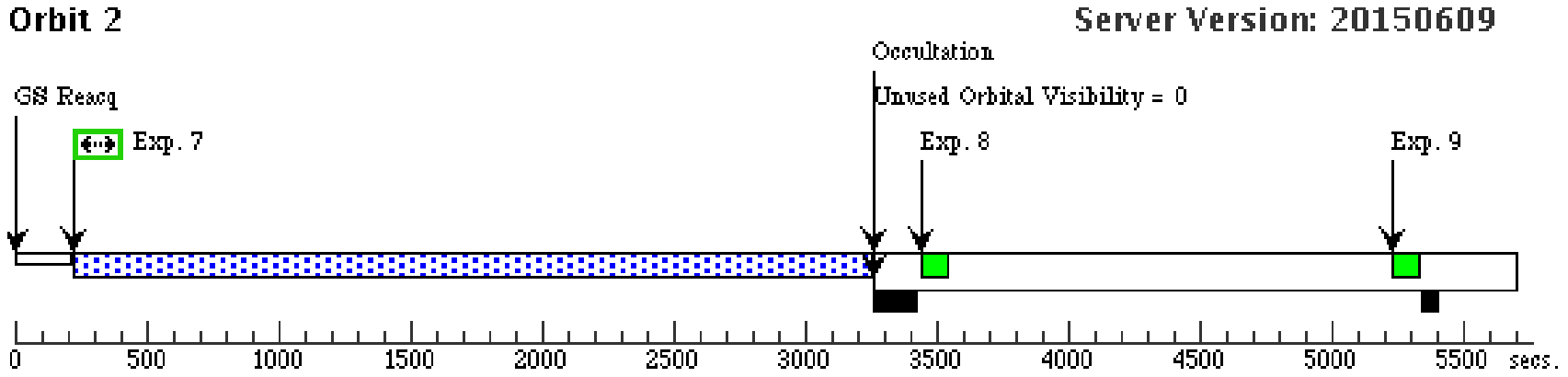
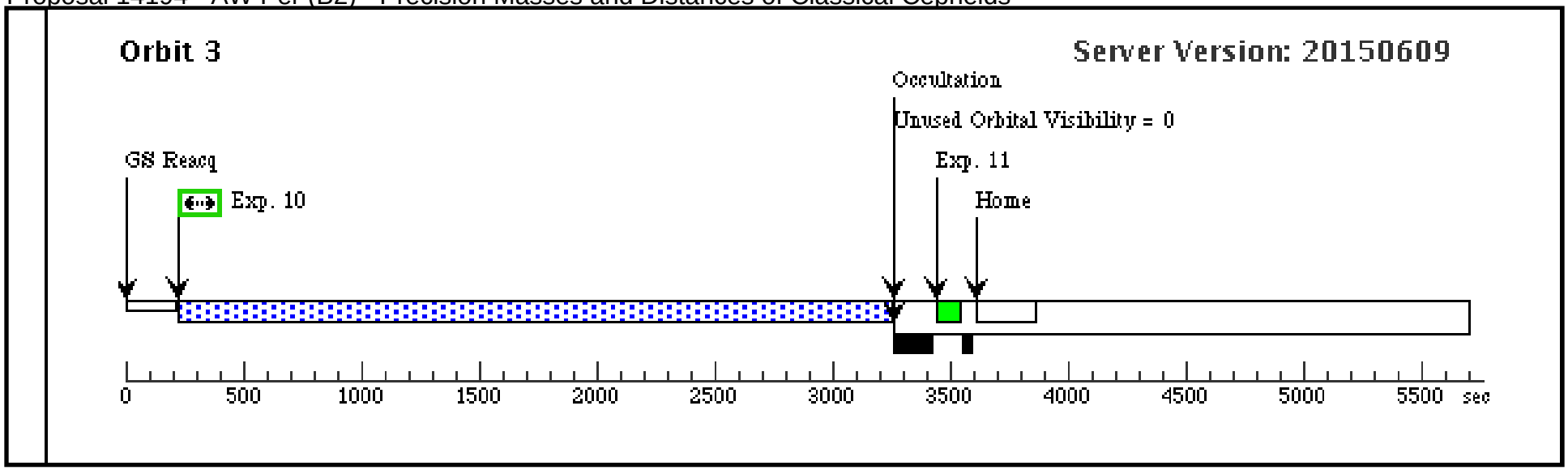
2	G430L ACQ /PEAK (718622)	(2) AW-PER	STIS/CCD, ACQ/PEAK, 0.2X0.09	G430L 4300 A				0.2 Secs (0.2 Secs) *[==>]*	***[1]***
3	Wave 1	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 3-5 Non-Int in AW Per (B2)	50 Secs (50 Secs) *[==>]*	***[1]***
4	E140H science (718623)	(4) AW-PER-COMPANION	STIS/FUV-MAMA, TIME-TAG, 0.2X0.09	E140H 1416 A	BUFFER-TIME=938; WAVECAL=NO		Sequence 3-5 Non-Int in AW Per (B2)	1875 Secs (1875 Secs) *[==>]*	***[1]***
5	Wave 2	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 3-5 Non-Int in AW Per (B2)	50 Secs (50 Secs) *[==>]*	***[1]***
6	Wave 1	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A		NEW ALIGNMENT	Sequence 6-8 Non-Int in AW Per (B2)	50 Secs (50 Secs) *[==>]*	***[1]***
7	E140H science (718623)	(4) AW-PER-COMPANION	STIS/FUV-MAMA, TIME-TAG, 0.2X0.09	E140H 1416 A	BUFFER-TIME=1508; WAVECAL=NO		Sequence 6-8 Non-Int in AW Per (B2)	3015 Secs (3015 Secs) *[==>]*	***[2]***
8	Wave 2	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 6-8 Non-Int in AW Per (B2)	50 Secs (50 Secs) *[==>]*	***[2]***
9	Wave 1	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A		NEW ALIGNMENT	Sequence 9-11 Non-Int in AW Per (B2)	50 Secs (50 Secs) *[==>]*	***[2]***
10	E140H science (718623)	(4) AW-PER-COMPANION	STIS/FUV-MAMA, TIME-TAG, 0.2X0.09	E140H 1416 A	BUFFER-TIME=1508; WAVECAL=NO		Sequence 9-11 Non-Int in AW Per (B2)	3015 Secs (3015 Secs) *[==>]*	***[3]***
11	Wave 2	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.09	E140H 1416 A			Sequence 9-11 Non-Int in AW Per (B2)	50 Secs (50 Secs) *[==>]*	***[3]***

Orbit Structure



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Exp. 10
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sec