12965 - Properties and dynamics of the upper atmosphere of the hot-Neptune GJ 436b

Cycle: 20, Proposal Category: GO

(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	(2) LHS-310 WAVE	STIS/CCD STIS/FUV-MAMA	4	12-Mar-2014 21:01:48.0	yes
02	(3) LHS-310-UPDATED WAVE	STIS/CCD STIS/FUV-MAMA	4	12-Mar-2014 21:02:12.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(3) LHS-310-UPDATED WAVE	STIS/CCD STIS/FUV-MAMA	4	12-Mar-2014 21:02:33.0	yes

12 Total Orbits Used

ABSTRACT

Atmospheric escape of highly-irradiated exoplanets can be detected -only by HST- as strong absorption in the stellar Lyman-alpha line of neutral hydrogen (121 nm) during planetary transits. So far, it has been observed only for hot-Jupiters. Nonetheless, lower-mass hot-Neptunes should be significantly impacted by this phenomenon, thought to be driven by the absorption of stellar X/EUV radiation in the upper layers of the atmosphere. Here, we propose to detect atmospheric escape from a hot-Neptune, GJ 436b. This planet transits a nearby, quiet M dwarf. We demonstrated with HST/STIS in a past Cycle that this star is a bright Lyman-alpha target. Hence, we will use this same instrument to measure the properties of the upper atmosphere of this hot-Neptune, constrain its escape rate, and search for temporal variations in its exosphere, thus bringing new insights on the physics of the atmospheric escape for a completely different range of masses. We also propose coordinated Chandra observations of GJ 436b's transits to measure the atmospheric escape efficiency factor and test the impact of stellar X-ray variability on the atmospheric properties of the planet.

OBSERVING DESCRIPTION

This program consists in 3 visits of 4 orbits. In each visit, we will observe the transit of an exoplanet in front of its star. Transits occur every 2.64 days (the orbital period of the planet) and last for about 1h. The timing requirements are set as phase constraints on the first ACQ exposure of the first orbit in a visit. The goal is to observe the star during two HST orbits before the transit, so that the transit can be completely covered by the third orbit. The fourth orbit occurs after the transit and serves to establish a (critical) posterior reference. The phase constraints given for the first orbit authorize a margin of 7-8 min.

ADDITIONAL COMMENTS

This is a joined HST-Chandra program. HST and Chandra should observe the same three transit events, meaning that HST and Chandra visits should be synchronized. Note, however, that the phase constraints given to Chandra are more relaxed (with start phase between 0.87 and 0.93) than for HST. Chandra will typically start to observe earlier (a couple of hours) than HST.

Visit

Proposal 12965, Visit 01, completed Thu Mar 13 01:02:45 GMT 2014

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; Period 2.6438979 D AND ZERO-PHASE HJD2454865.08321

Fixed Targets

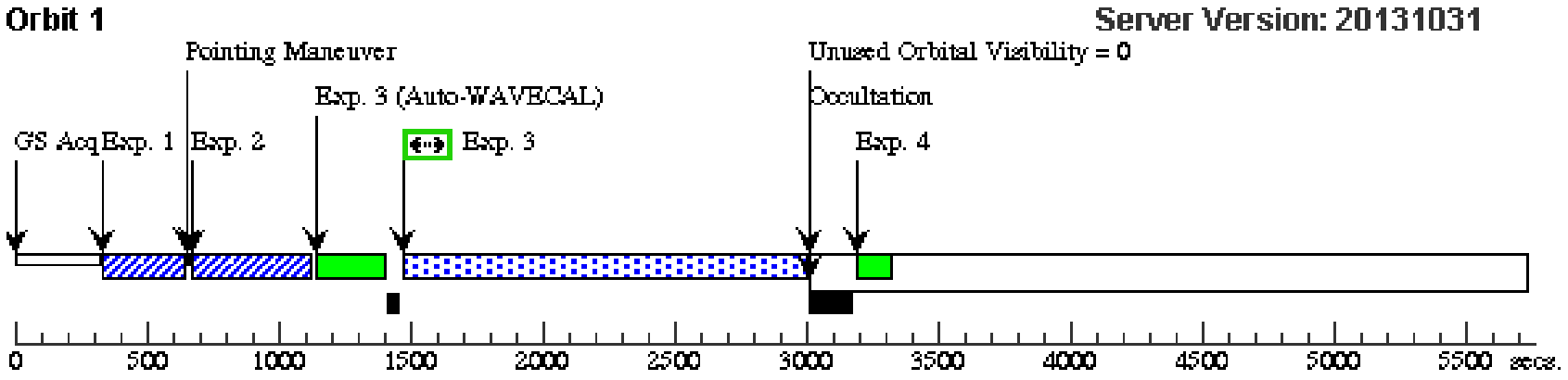
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	LHS-310	RA: 11 42 10.5470 (175.5439458d)	Proper Motion RA: 896.07 mas/yr	V=10.68	Reference Frame: ICRS
	Alt Name1: GJ436	Dec: +26 42 30.46 (26.70846d)	Proper Motion Dec: -813.54 mas/yr	Lyman-alpha: 5.5e-14 erg/s/cm^2	
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: 10 km/sec		

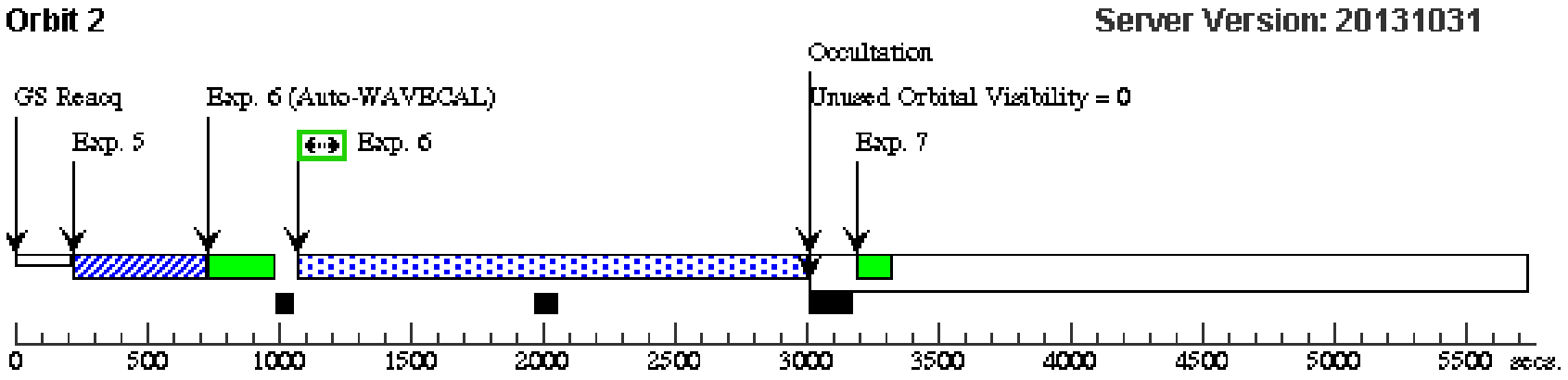
Comments: Coordinates and proper motions form the Simbad database.

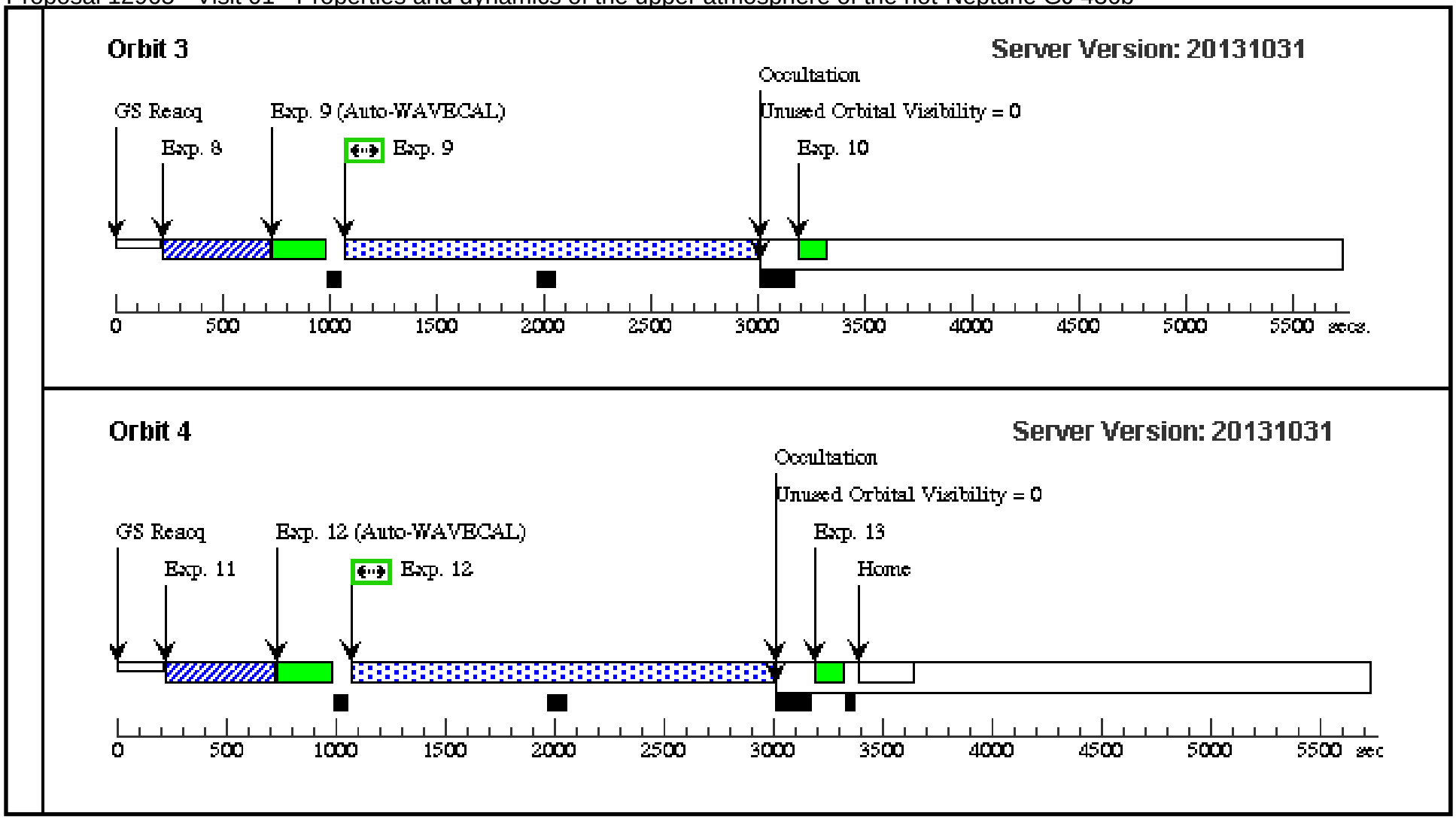
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ	(2) LHS-310	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.9410 TO 0.9430	Sequence 1-4 Non-Int in Visit 01	13 Secs (13 Secs)	
								[==>]	***[1]***
2	ACQ/PEAK	(2) LHS-310	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[1]***
3	SCIENCE 1 (STIS.sp.41 5432)	(2) LHS-310	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 1-4 Non-Int in Visit 01	1510 Secs (1510 Secs)	
								[==>]	***[1]***
4	GO-WAVE CAL 1	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Visit 01	*[==>]*	***[1]***
5	ACQ/PEAK 2	(2) LHS-310	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[2]***
6	SCIENCE 2 (STIS.sp.41 5426)	(2) LHS-310	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 5-7 Non-Int in Visit 01	1911 Secs (1911 Secs)	
								[==>]	***[2]***
7	GO-WAVE CAL 2	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-7 Non-Int in Visit 01	*[==>]*	***[2]***
8	ACQ/PEAK 3	(2) LHS-310	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[3]***
9	SCIENCE 3 (STIS.sp.41 5426)	(2) LHS-310	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 8-10 Non-Int in Visit 01	1911 Secs (1911 Secs)	
								[==>]	***[3]***
10	GO-WAVE CAL 3	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 8-10 Non-Int in Visit 01	*[==>]*	***[3]***
11	ACQ/PEAK 4	(2) LHS-310	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 01	7 Secs (7 Secs)	
								[==>]	***[4]***
12	SCIENCE 4 (STIS.sp.41 5426)	(2) LHS-310	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 11-13 Non-Int in Visit 01	1911 Secs (1911 Secs)	
								[==>]	***[4]***
13	GO-WAVE CAL 4	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 11-13 Non-Int in Visit 01	*[==>]*	***[4]***

Orbit Structure



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2500
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4500
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5500
secs.
Orbit 4
Server Version: 20131031
Occultation
Unused Orbital Visibility = 0
GS Reacq
Exp. 12 (Auto-WAVECAL)
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Exp. 11
Exp. 12
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4000
4500
5000
5500
sec

Visit

Proposal 12965, Visit 02, completed Thu Mar 13 01:02:49 GMT 2014

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; Period 2.6438979 D AND ZERO-PHASE HJD2454865.08321

Fixed Targets

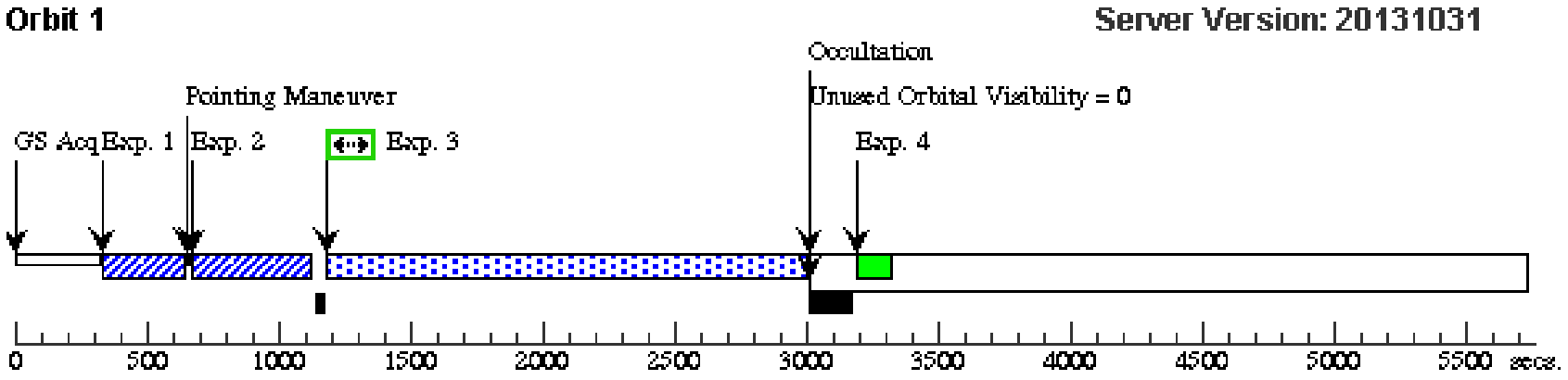
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	LHS-310-UPDATED	RA: 11 42 11.0940 (175.5462250d)	Proper Motion RA: 896.07 mas/yr	V=10.68	Reference Frame: ICRS
	Alt Name1: GJ436	Dec: +26 42 23.65 (26.70657d)	Proper Motion Dec: -813.54 mas/yr	Lyman-alpha: 5.5e-14 erg/s/cm^2	
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: 10 km/sec		

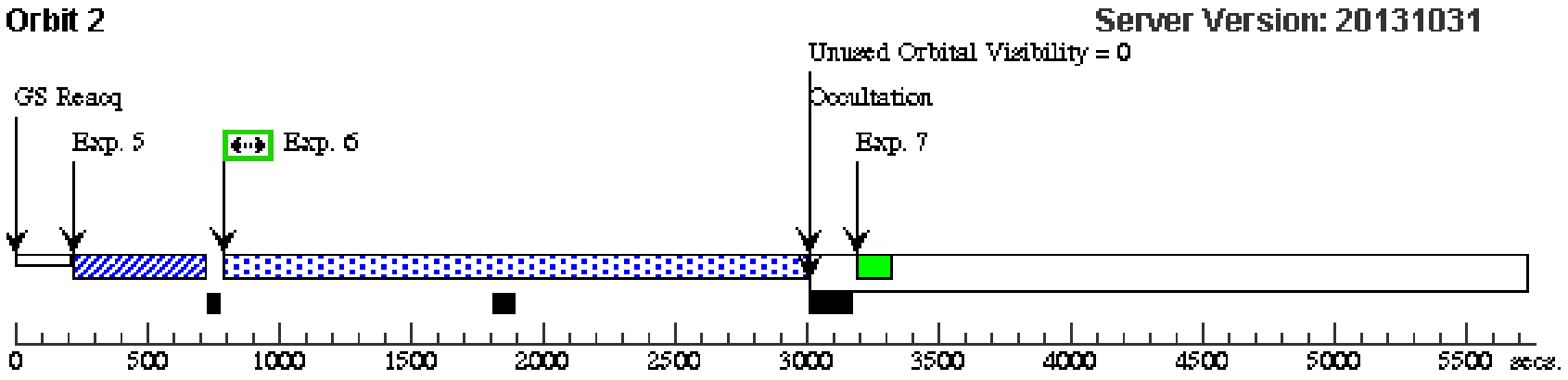
Comments: Coordinates and proper motions are taken from the Simbad database AFTER the request by STScI to correct the J2000 coordinates has been implemented.

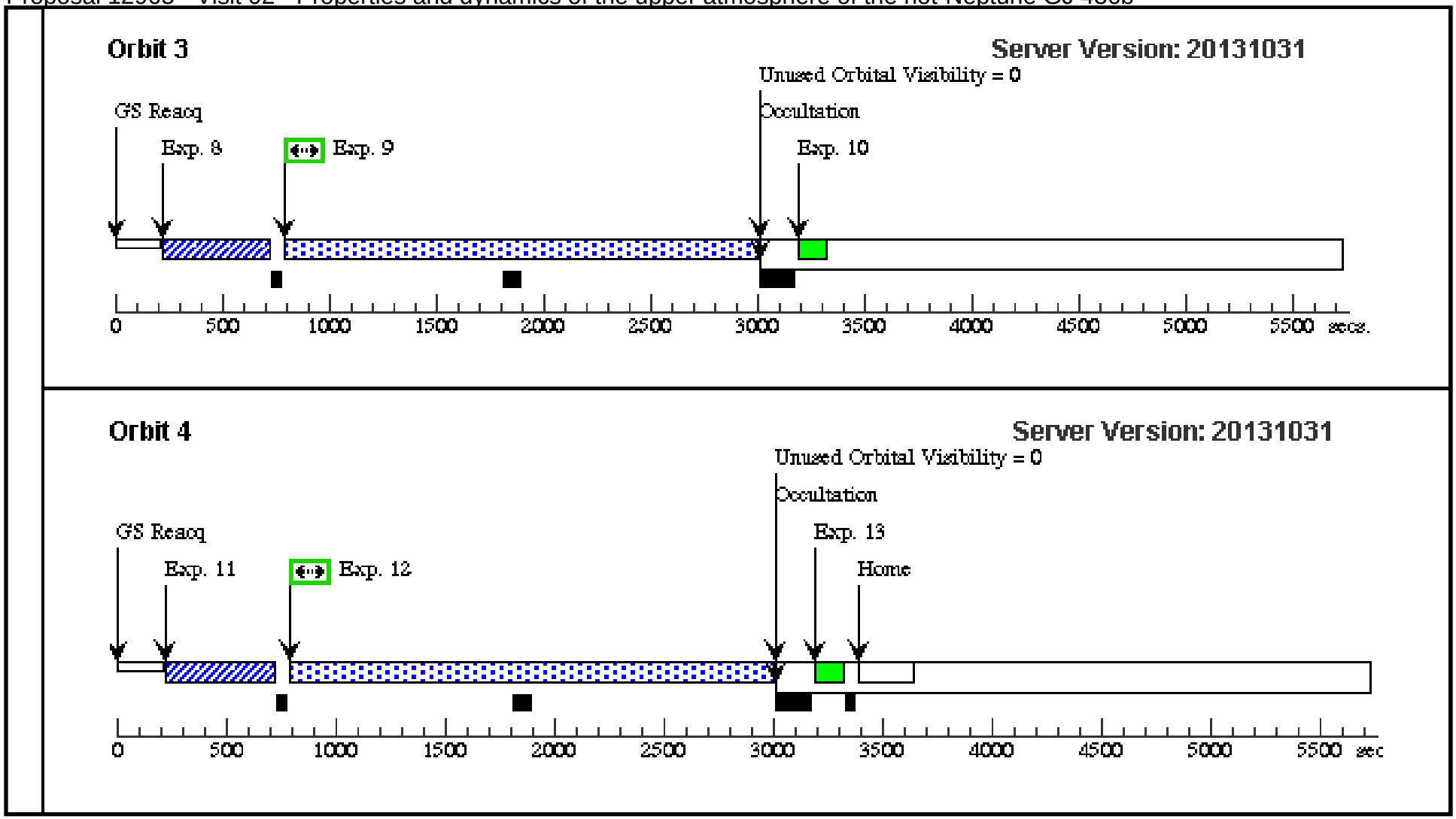
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ	(3) LHS-310-UPDATED	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.9410 TO 0.9430	Sequence 1-4 Non-Int in Visit 02	13 Secs (13 Secs)	
								[==>]	***[1]***
2	ACQ/PEAK	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[1]***
3	SCIENCE 1 (STIS.sp.41 5432)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 02	1670 Secs (1670 Secs)	
								[==>]	***[1]***
4	GO-WAVE CAL 1	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Visit 02	*[==>]*	***[1]***
5	ACQ/PEAK 2	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[2]***
6	SCIENCE 2 (STIS.sp.41 5426)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 5-7 Non-Int in Visit 02	2071 Secs (2071 Secs)	
								[==>]	***[2]***
7	GO-WAVE CAL 2	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-7 Non-Int in Visit 02	*[==>]*	***[2]***
8	ACQ/PEAK 3	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[3]***
9	SCIENCE 3 (STIS.sp.41 5426)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 8-10 Non-Int in Visit 02	2071 Secs (2071 Secs)	
								[==>]	***[3]***
10	GO-WAVE CAL 3	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 8-10 Non-Int in Visit 02	*[==>]*	***[3]***
11	ACQ/PEAK 4	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 02	7 Secs (7 Secs)	
								[==>]	***[4]***
12	SCIENCE 4 (STIS.sp.41 5426)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 11-13 Non-Int in Visit 02	2071 Secs (2071 Secs)	
								[==>]	***[4]***
13	GO-WAVE CAL 4	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 11-13 Non-Int in Visit 02	*[==>]*	***[4]***

Orbit Structure



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Exp. 10
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secs.
Orbit 4
Server Version: 20131031
Unused Orbital Visibility = 0
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GS Reacq
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Exp. 11
Exp. 12
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sec

Visit

Proposal 12965, Visit 03, implementation Thu Mar 13 01:02:51 GMT 2014

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%; Period 2.6438979 D AND ZERO-PHASE HJD2454865.08321

Fixed Targets

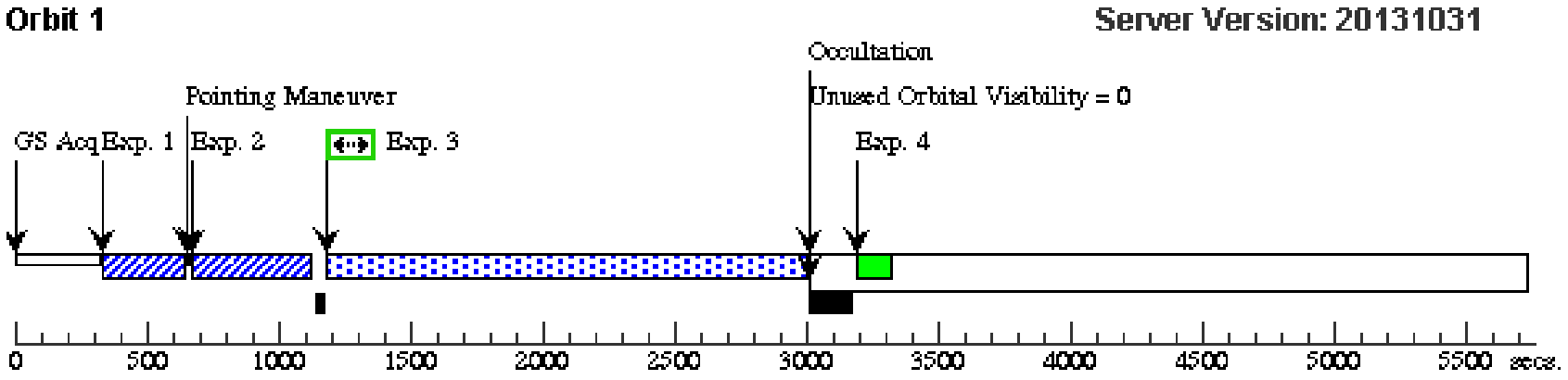
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	LHS-310-UPDATED	RA: 11 42 11.0940 (175.5462250d)	Proper Motion RA: 896.07 mas/yr	V=10.68	Reference Frame: ICRS
	Alt Name1: GJ436	Dec: +26 42 23.65 (26.70657d)	Proper Motion Dec: -813.54 mas/yr	Lyman-alpha: 5.5e-14 erg/s/cm^2	
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: 10 km/sec		

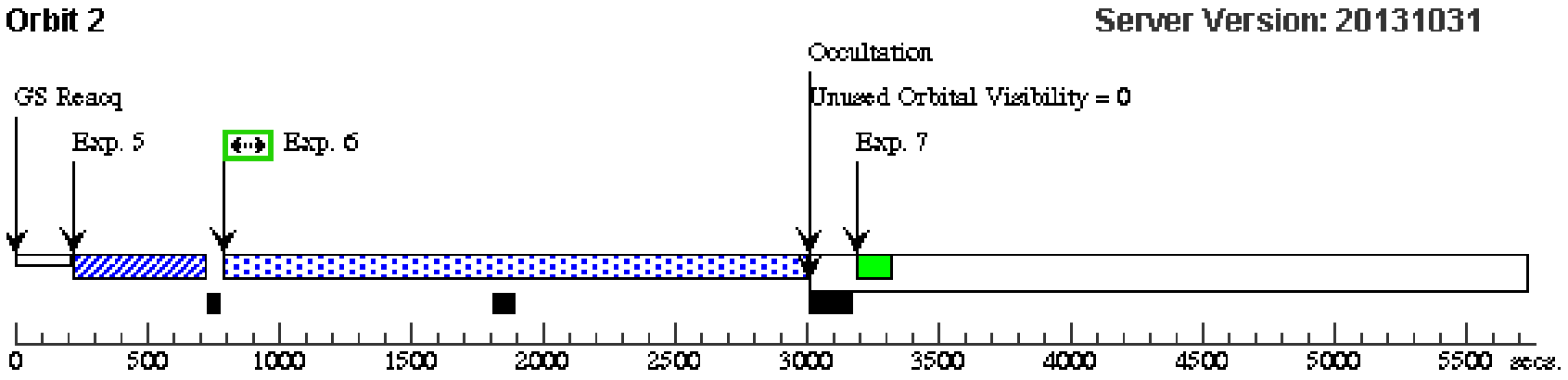
Comments: Coordinates and proper motions are taken from the Simbad database AFTER the request by STScI to correct the J2000 coordinates has been implemented.

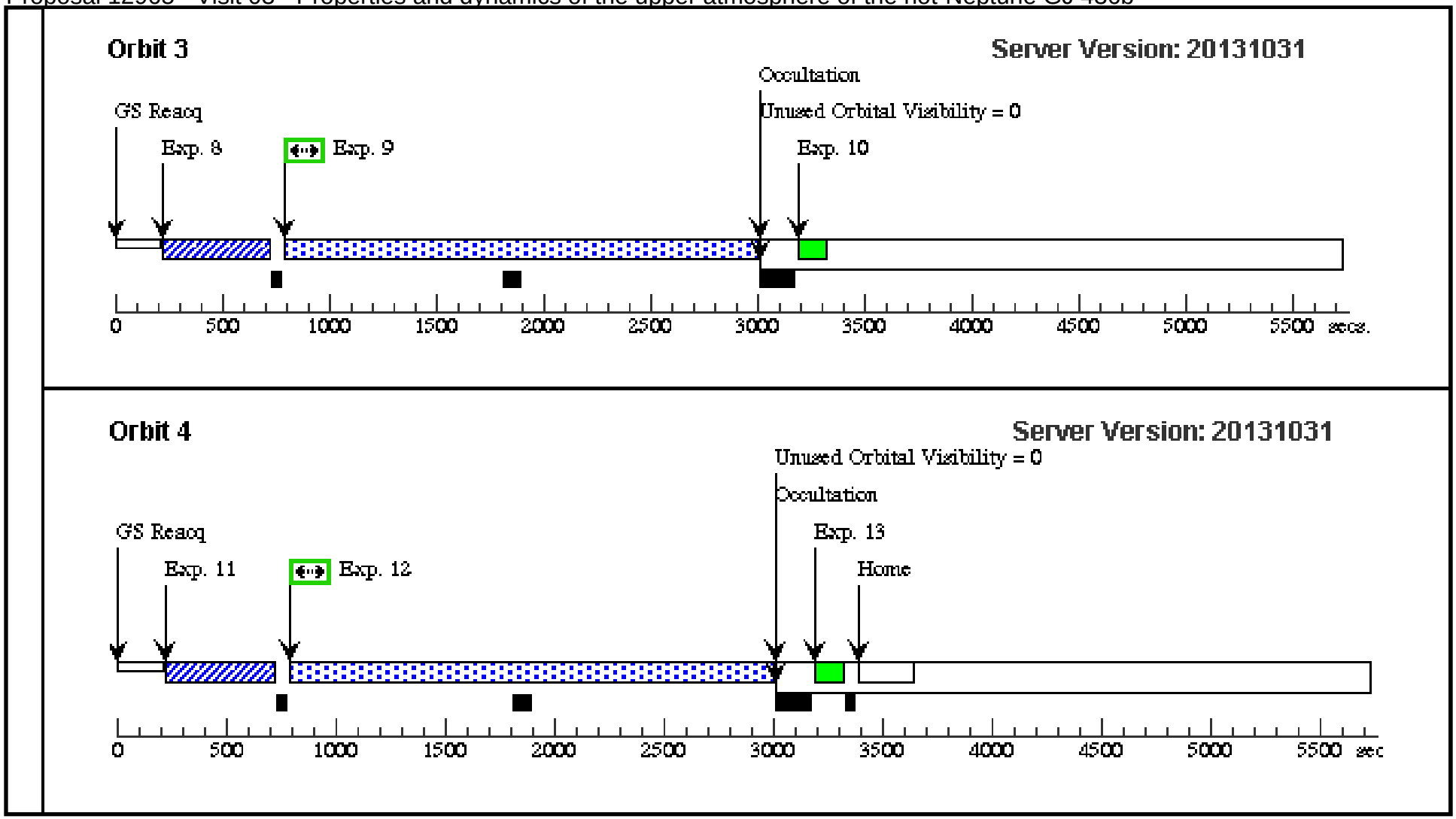
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ	(3) LHS-310-UPDATED	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.9395 TO 0.9445	Sequence 1-4 Non-Int in Visit 03	13 Secs (13 Secs)	
								[==>]	***[1]***
2	ACQ/PEAK	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 1-4 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[1]***
3	SCIENCE 1 (STIS.sp.41 5432)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 03	1670 Secs (1670 Secs)	
								[==>]	***[1]***
4	GO-WAVE CAL 1	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Visit 03	*[==>]*	***[1]***
5	ACQ/PEAK 2	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 5-7 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[2]***
6	SCIENCE 2 (STIS.sp.41 5426)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 5-7 Non-Int in Visit 03	2071 Secs (2071 Secs)	
								[==>]	***[2]***
7	GO-WAVE CAL 2	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-7 Non-Int in Visit 03	*[==>]*	***[2]***
8	ACQ/PEAK 3	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 8-10 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[3]***
9	SCIENCE 3 (STIS.sp.41 5426)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 8-10 Non-Int in Visit 03	2071 Secs (2071 Secs)	
								[==>]	***[3]***
10	GO-WAVE CAL 3	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 8-10 Non-Int in Visit 03	*[==>]*	***[3]***
11	ACQ/PEAK 4	(3) LHS-310-UPDATED	STIS/CCD, ACQ/PEAK, 52X0.05	G430L 4300 A			Sequence 11-13 Non-Int in Visit 03	7 Secs (7 Secs)	
								[==>]	***[4]***
12	SCIENCE 4 (STIS.sp.41 5426)	(3) LHS-310-UPDATED	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 11-13 Non-Int in Visit 03	2071 Secs (2071 Secs)	
								[==>]	***[4]***
13	GO-WAVE CAL 4	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 11-13 Non-Int in Visit 03	*[==>]*	***[4]***

Orbit Structure



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secs.
Orbit 4
Server Version: 20131031
Unused Orbital Visibility = 0
Occultation
GS Reacq
Exp. 11
Exp. 12
Exp. 13
Home
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