14128 - The dawn of rocky planet formation

Cycle: 23, Proposal Category: GO

(UV Initiative)

(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) SDSS0956+5912	STIS/CCD STIS/NUV-MAMA	2	07-Jul-2015 21:09:20.0	yes
02	(2) SDSS1038-0036	STIS/CCD STIS/NUV-MAMA	2	07-Jul-2015 21:09:23.0	yes
03	(3) SDSS1535+1247	STIS/CCD STIS/NUV-MAMA	4	07-Jul-2015 21:09:26.0	yes

8 Total Orbits Used

ABSTRACT

The vast majority of all known planet host stars will eventually evolve into white dwarfs. With the parameter space of the known planetary systems ever increasing, it is now clear that a significant fraction of these systems will survive this evolution (including the solar system from Mars outwards). Equally, many of the known white dwarfs were once planet hosts, and some of them very likely still host the remnants of planetary

systems. In fact, we already know the signposts of such evolved planetary systems: metal-pollution of the otherwise pristine H/He atmosphere of a white dwarf by accretion of planetary debris. The identification of the coolest and hence oldest metal-polluted white dwarfs opens the exciting potential to investigate the history of rocky planet formation in the Galaxy. Using the Sloan Digital Sky Survey, we are now discovering large numbers of such systems: white dwarfs that have accreted rocky bodies of at least the mass of Ceres, the largest asteroid known in the solar system, and that already finished their main-sequence life when the Earth was just being formed. Precise measurements of the system ages, and accurate chemical abundances of the planetary debris require improved model atmospheres and input physics to deal with the extremely dense atmospheres of these cool white dwarfs, which we have computed. Because the strongest absorption features lie in the near-ultraviolet, we request HST STIS observations of three systems spanning the relevant range of temperatures to test and calibrate our calculations. With those calibrations in hand, we will then be able to analyse the full sample using only the available optical data.

OBSERVING DESCRIPTION

The objective of these observations is to obtain NUV spectra of 3 cool metal-polluted white dwarfs covering different temperatures.
This wavelength range is previously unobserved for objects of this type, and so line strengths in this region are not well known. Because the degree of absorption in this range leads to radiative backwarming of the optical spectra of these stars, our atmospheric models are currently not well calibratated, and so accuracy of calculated temperatures is model limited.

The 3 objects cover a range of temperatures for these stars with the expected UV flux varying correspondingly. SDSS0956+5912 is the faintest object in the optical but has relatively bright UV flux as indicated by its GALEX NUV magnitude of 21.4. In contrast, SDSS1536+1247 is the brightest target in the optical (due to its proximity), but because it is much cooler, there is significant line blanketing in the UV and therefore has the lowest GALEX NUV magnitude of 22.4. Therefore, despite SDSS1536+1247 being the brightest object in the optical we require 4 orbits (rather than 2 for our other targets), to obtain the required signal-to-noise.

The observations are fairly straightforward. Each target has one visit which starts with an acquistion. The target is then observed over thr required number of orbits with STIS-NUV, using the G230-L grating and 52x2 slit.

Visit

Proposal 14128, SDSS0956+5912 (01) Wed Jul 08 01:09:28 GMT 2015

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS0956+5912	RA: 09 56 45.1680 (149.1882000d) Dec: +59 12 40.75 (59.21132d) Equinox: J2000	Proper Motion RA: -116.90 mas/yr Proper Motion Dec: -46.22 mas/yr Epoch of Position: 2000	V=18.4+/-0.05 GALEX_NUV = 21.4	Reference Frame: ICRS

Comments: Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	SDSS0956+5912 Acq (STIS.ta.715709)	(1) SDSS0956+5912	STIS/CCD, ACQ, 50CCD	MIRROR				4 Secs (4 Secs) *[==>]*	*[1]*

Comments: We use the 50CCD filter for the acquisition instead of the default F28X50LP as there is a nearby, somewhat fainter, red object - just to be on the safe side that STIS will acquire the brighter / bluer white dwarf target.

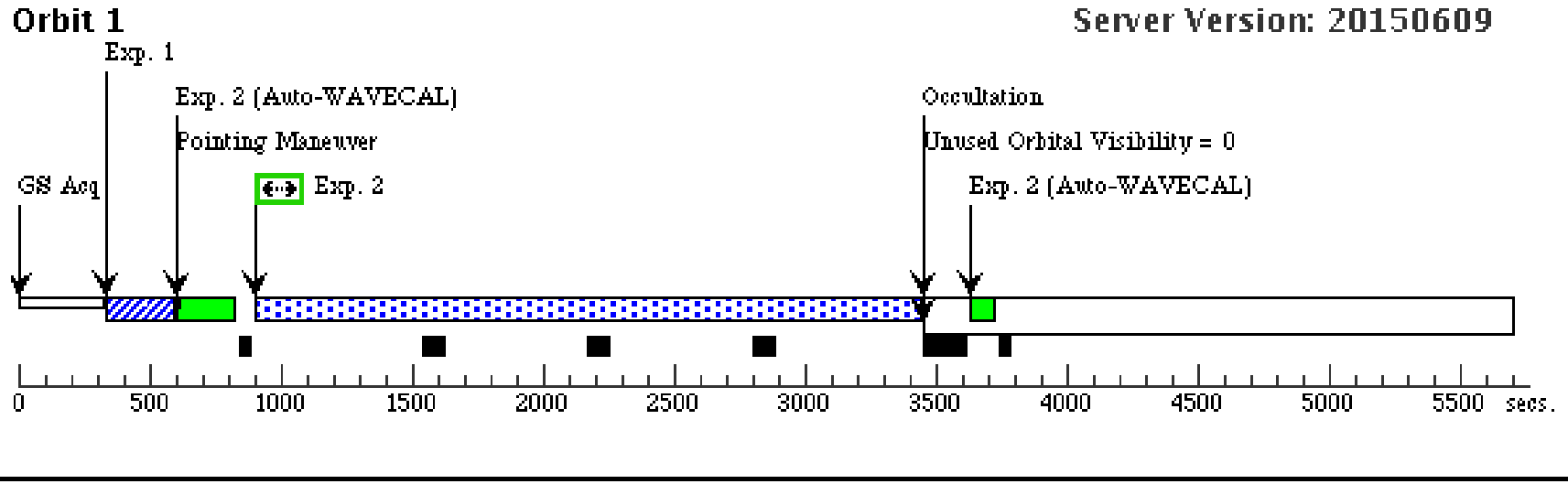
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
2	SDSS0956+5912 Science (STIS.sp.715712)	(1) SDSS0956+5912	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			2503 Secs (2503 Secs) *[==>]*	*[1]*

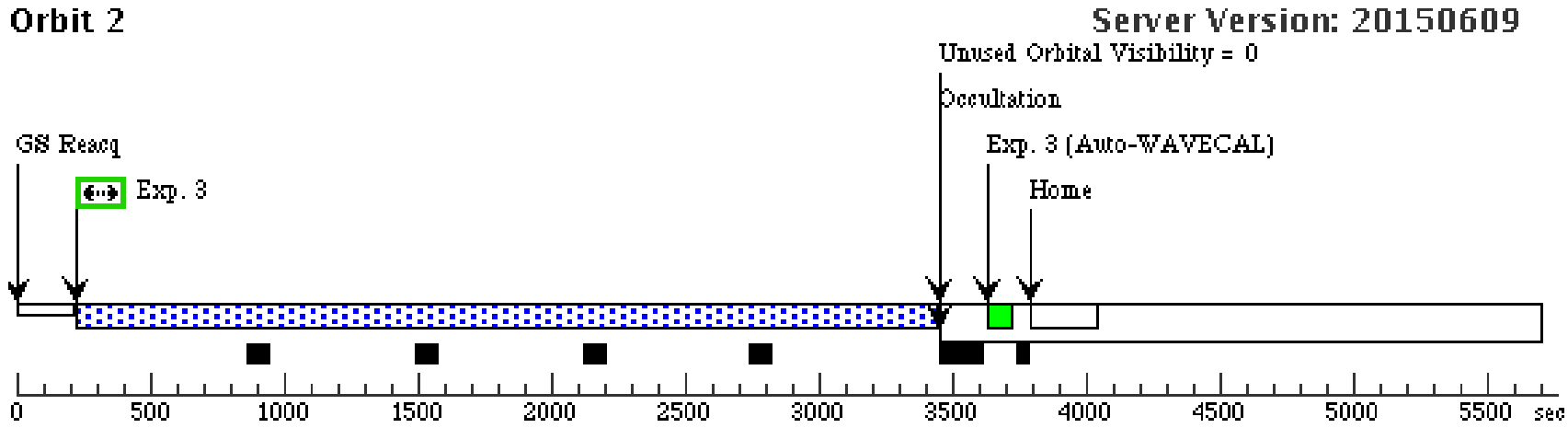
Comments: Estimated total count rate (source + target) ~1600, to be a bit more conservative (e.g. higher than expected background level), we assumed twice that rate to calculate the BUFFER-TIME.

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
3	SDSS0956+5912 Science (STIS.sp.715712)	(1) SDSS0956+5912	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			3181 Secs (3181 Secs) *[==>]*	*[2]*

Comments: Estimated total count rate (source + target) ~1600, to be a bit more conservative (e.g. higher than expected background level), we assumed twice that rate to calculate the BUFFER-TIME.

Orbit Structure





Visit

Proposal 14128, SDSS1038-0036 (02) Wed Jul 08 01:09:28 GMT 2015

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

Fixed Targets

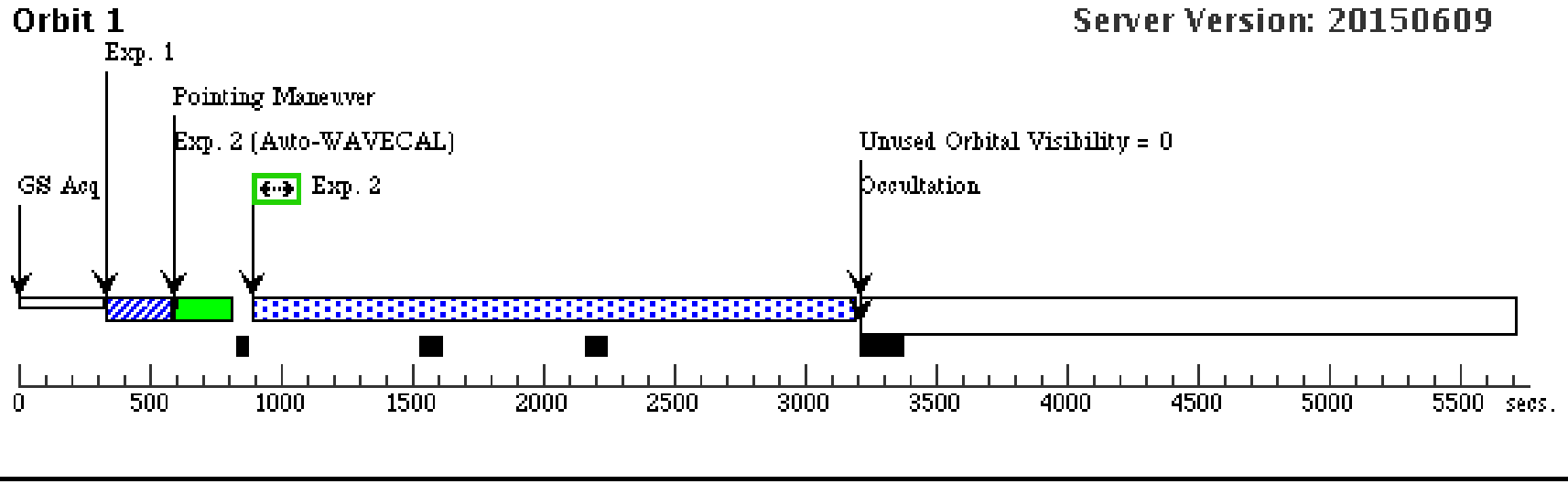
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	SDSS1038-0036	RA: 10 38 9.1850 (159.5382708d) Dec: -00 36 22.37 (-.60621d) Equinox: J2000	Proper Motion RA: -97.53 mas/yr Proper Motion Dec: 17.51 mas/yr Epoch of Position: 2000	V=17.0+/-0.05	Reference Frame: ICRS

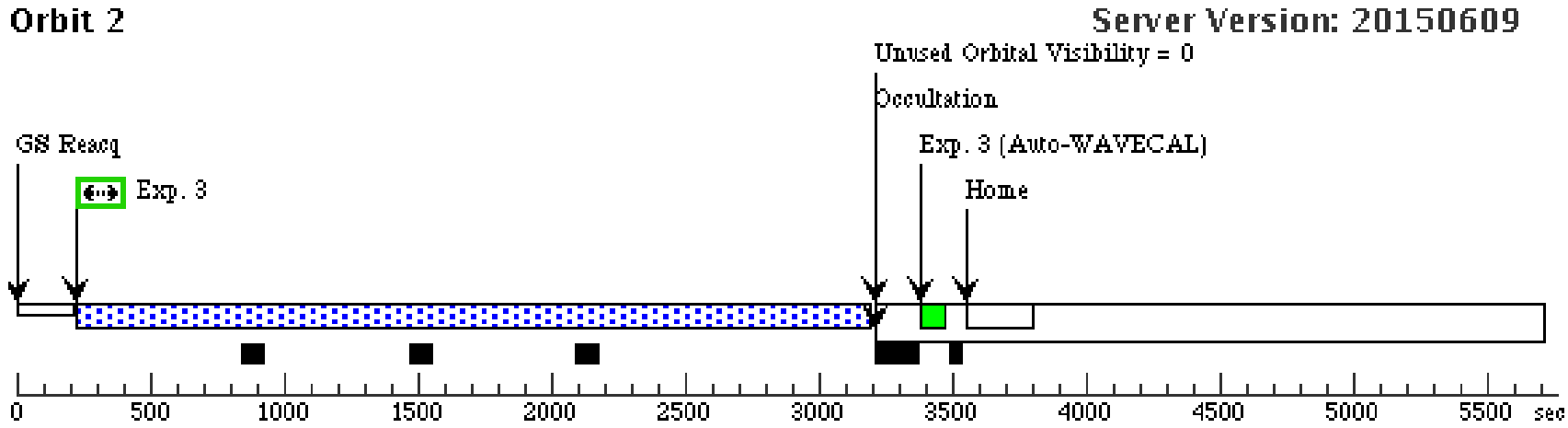
Comments: Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	SDSS1038-0036 Acq (STIS.ta.715786)	(2) SDSS1038-0036	STIS/CCD, ACQ, 50CCD	MIRROR				2 Secs (2 Secs) *[==>]*	***[1]***
2	SDSS1038-0036 Science (STIS.sp.715803)	(2) SDSS1038-0036	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			2265 Secs (2265 Secs) *[==>]*	***[1]***
	Comments: Estimated total count rate (source + target) ~1600, to be a bit more conservative (e.g. higher than expected background level), we assumed twice that rate to calculate the BUFFER-TIME.								
3	SDSS1038-0036 Science (STIS.sp.715803)	(2) SDSS1038-0036	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			2960 Secs (2960 Secs) *[==>]*	***[2]***
	Comments: Estimated total count rate (source + target) ~1600, to be a bit more conservative (e.g. higher than expected background level), we assumed twice that rate to calculate the BUFFER-TIME.								

Orbit Structure





Visit

Proposal 14128, SDSS1535+1247 (03) Wed Jul 08 01:09:29 GMT 2015

Diagnostic Status: No Diagnostics

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

Special Requirements: (none)

Fixed Targets

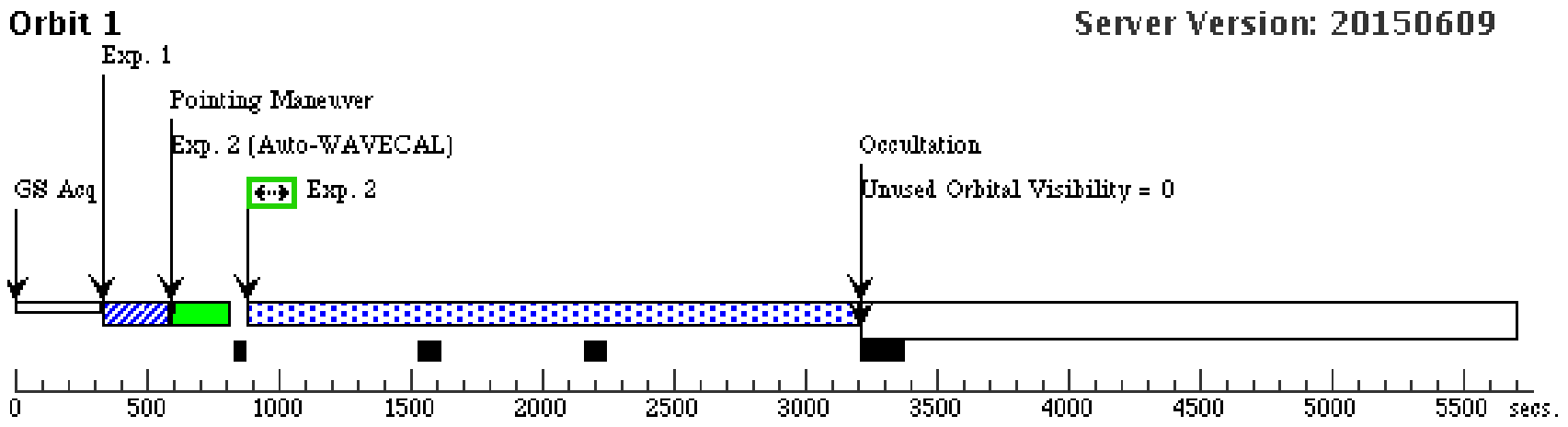
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(3)	SDSS1535+1247	RA: 15 35 5.8080 (233.7742000d) Dec: +12 47 45.13 (12.79587d) Equinox: J2000	Proper Motion RA: -166.0 mas/yr Proper Motion Dec: -186.6 mas/yr Epoch of Position: 2000	V=16.0+/-0.05 GALEX_NUV =22.4	Reference Frame: ICRS

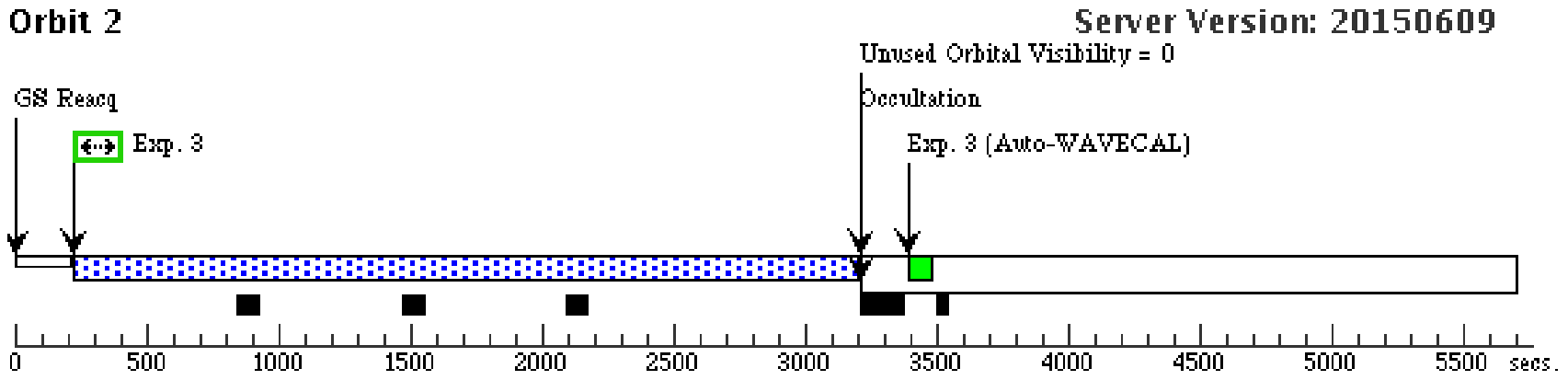
Comments: Extended=NO

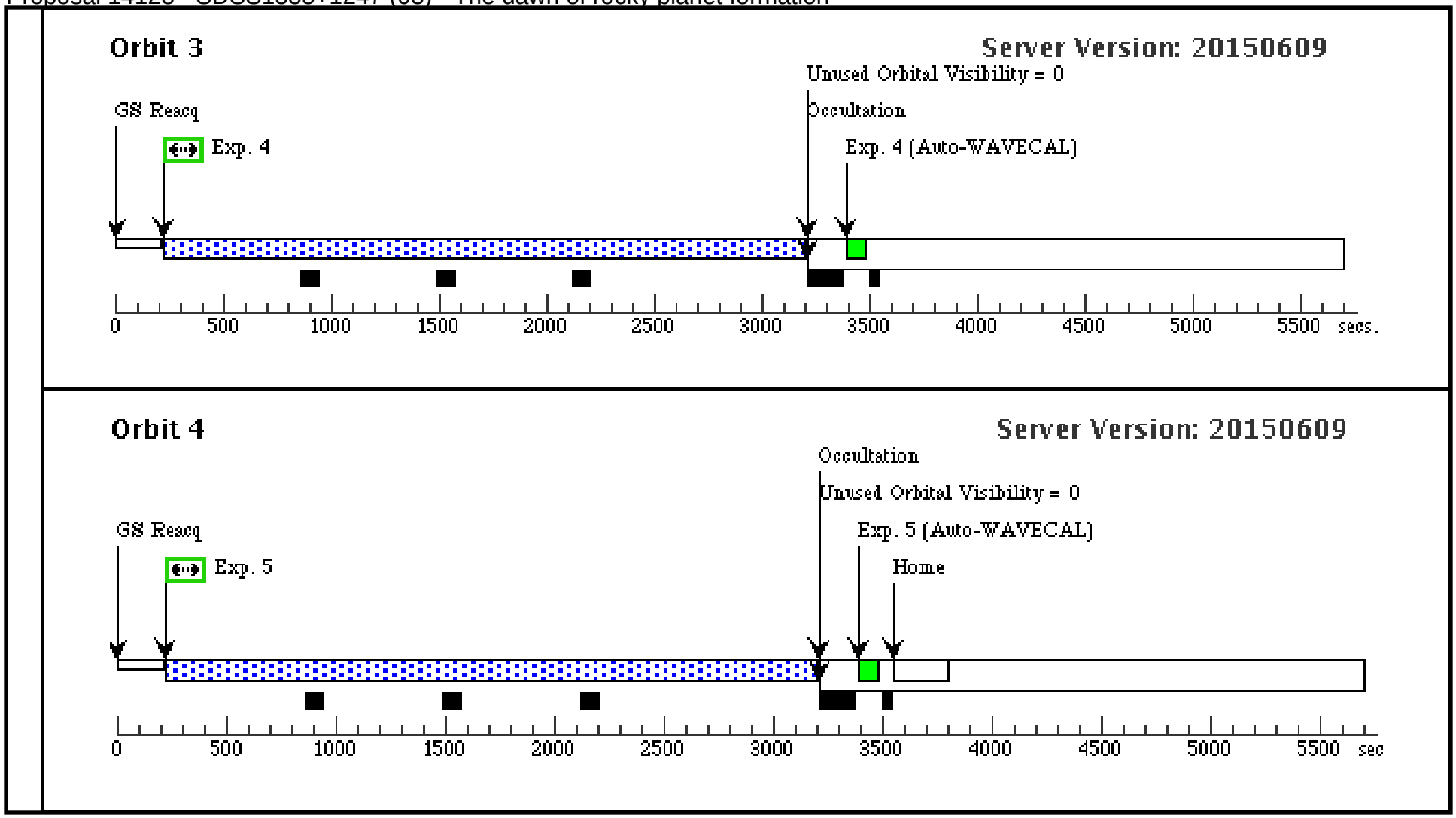
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	SDSS1535+1247 Acq (STIS.ta.715791)	(3) SDSS1535+1247	STIS/CCD, ACQ, 50CCD	MIRROR				1 Secs (1 Secs) *[==>]*	***[1]***
2	SDSS1535+1247 Science (STIS.sp.715792)	(3) SDSS1535+1247	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			2277 Secs (2277 Secs) *[==>]*	***[1]***
3	SDSS1535+1247 Science (STIS.sp.715792)	(3) SDSS1535+1247	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			2968 Secs (2968 Secs) *[==>]*	***[2]***
4	SDSS1535+1247 Science (STIS.sp.715792)	(3) SDSS1535+1247	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			2943 Secs (2943 Secs) *[==>]*	***[3]***
5	SDSS1535+1247 Science (STIS.sp.715792)	(3) SDSS1535+1247	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=625			2943 Secs (2943 Secs) *[==>]*	***[4]***

Orbit Structure



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