14130 - Down the Tubes: Vetting the Apparent Water-rich Parent Body being Accreted by the White Dwarf GD 16

Cycle: 23, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) WOLF88	COS/NUV	5	15-Dec-2015 21:03:14.0	yes

5 Total Orbits Used

ABSTRACT

How water is distributed in a planetary system critically affects the formation, evolution, and habitability of its constituent rocky bodies. White dwarf stars provide a unique method to probe the prevalence of water-rich rocky bodies outside of our Solar system and where they preferentially reside in a planetary system. However, as evidenced by the case of GD 362, some parent bodies that at first glance might appear to be water-rich can actually be quite water-scarce. At this time there are only a small number of plausibly water-rich rocky bodies that are being actively accreted by their host white dwarf star. Given such a sample size it is crucial to characterize each one in sufficient detail to remove interlopers like GD 362 that might otherwise affect future statistical analyses. In this proposal we seek to vet GD 16, a water-rich candidate yet to be observed with HST-COS that is the brightest remaining such target in the UV.

OBSERVING DESCRIPTION

Detecting or constraining the absorption lines which inform our science goals requires observations in the 1800-2040 Ang range. Medium spectral resolution ultraviolet spectroscopy with COS and the G185M grating and a central wavelength of 1921 Ang will satisfy the observational requirements. Two FP-POS positions will be used to mitigate bad pixels and address fixed pattern noise.

For the GALEX measured NUV flux of GD 16 (NUV AB magnitude of 16.22+/-0.02) it should be possible to obtain average S/N~20 in the 1800-2040 Ang wavelength range with a total on-source exposure time of ~12,500 seconds. Signal-to-noise ratio of ~20 for the 1800-2040 Ang wavelength range will enable detection or tight limits on the abundances of silicon, carbon, and aluminum (the main science goals). Such a signal-to-noise ratio will also enable the detection or constraint of other elements (e.g., S, Ni, Co, Mn, and others). These estimates are made using the COS ETC assuming standard background parameters and with a GD 16 spectral energy distribution matched to precise optical photometry obtained by us for this proposal (note that this precise photometry limits any reddening to E(B-V)<~0.01). Our requested time estimate for COS is increased assuming 20 minutes of instrument overhead (including all acquisition and exposure overheads as suggested in the COS manual) per visit and 6 minutes of observatory overhead per orbit (spacecraft acquisition). In sum, we request 5 orbits for COS observations of GD 16.

Observations will be done in the TIME-TAG mode using TAG-FLASH wavelength calibration.

GD 16 is an ICRS object (SDSS position with less than 0.4" positional uncertainty), has a measured GALEX NUV flux, and is safe for the COS detectors in our desired setups.

Visit

Proposal 14130, GD16 (01), implementation Wed Dec 16 02:03:16 GMT 2015

Diagnostic Status: Warning

Scientific Instruments: COS/NUV

Special Requirements: (none)

Diagnostics

(GD16 (01)) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

(GD16 (01)) Warning (Orbit Planner): INEFFICIENT ORDERING OF FP-POS POSITIONS

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Fixed Targets

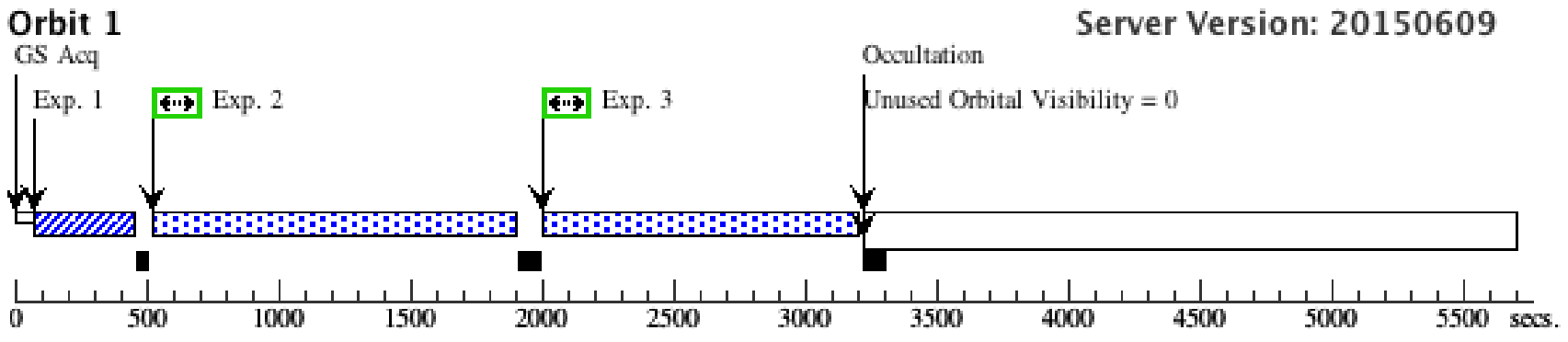
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WOLF88	RA: 01 48 56.9390 (27.2372458d)	Proper Motion RA: 224 mas/yr	V=15.56+/-0.02	Reference Frame: ICRS
	Alt Name1: GD16	Dec: +19 02 26.56 (19.04071d)	Proper Motion Dec: -115 mas/yr	GALEX NUV ABmag = 16.22+/-0.02	
		Equinox: J2000	Epoch of Position: 2009.0464		

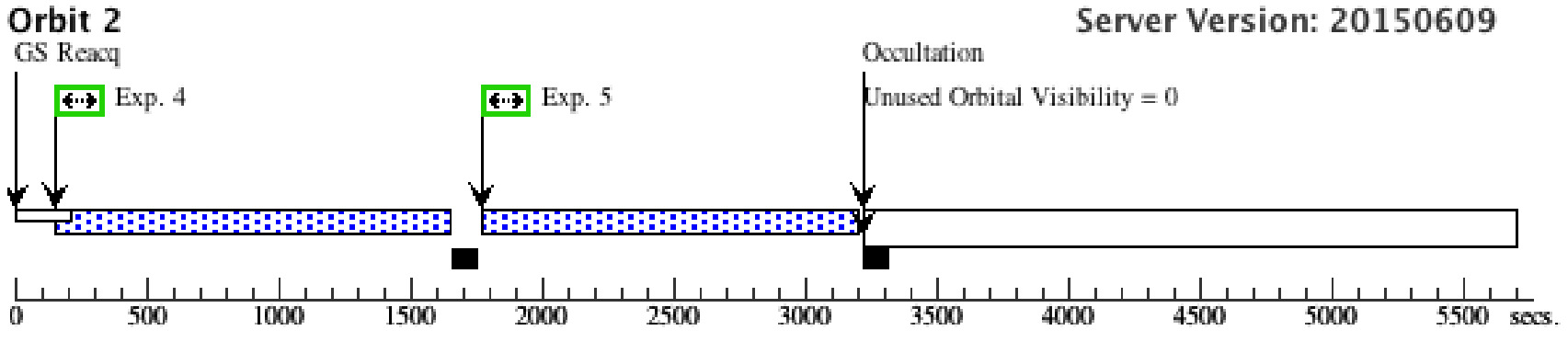
Comments: Extended=NO

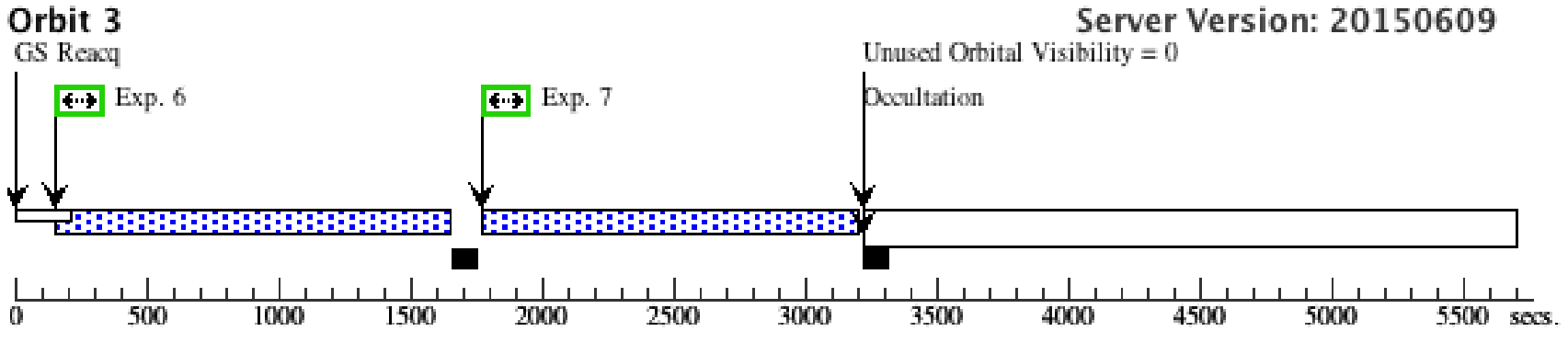
Exposures

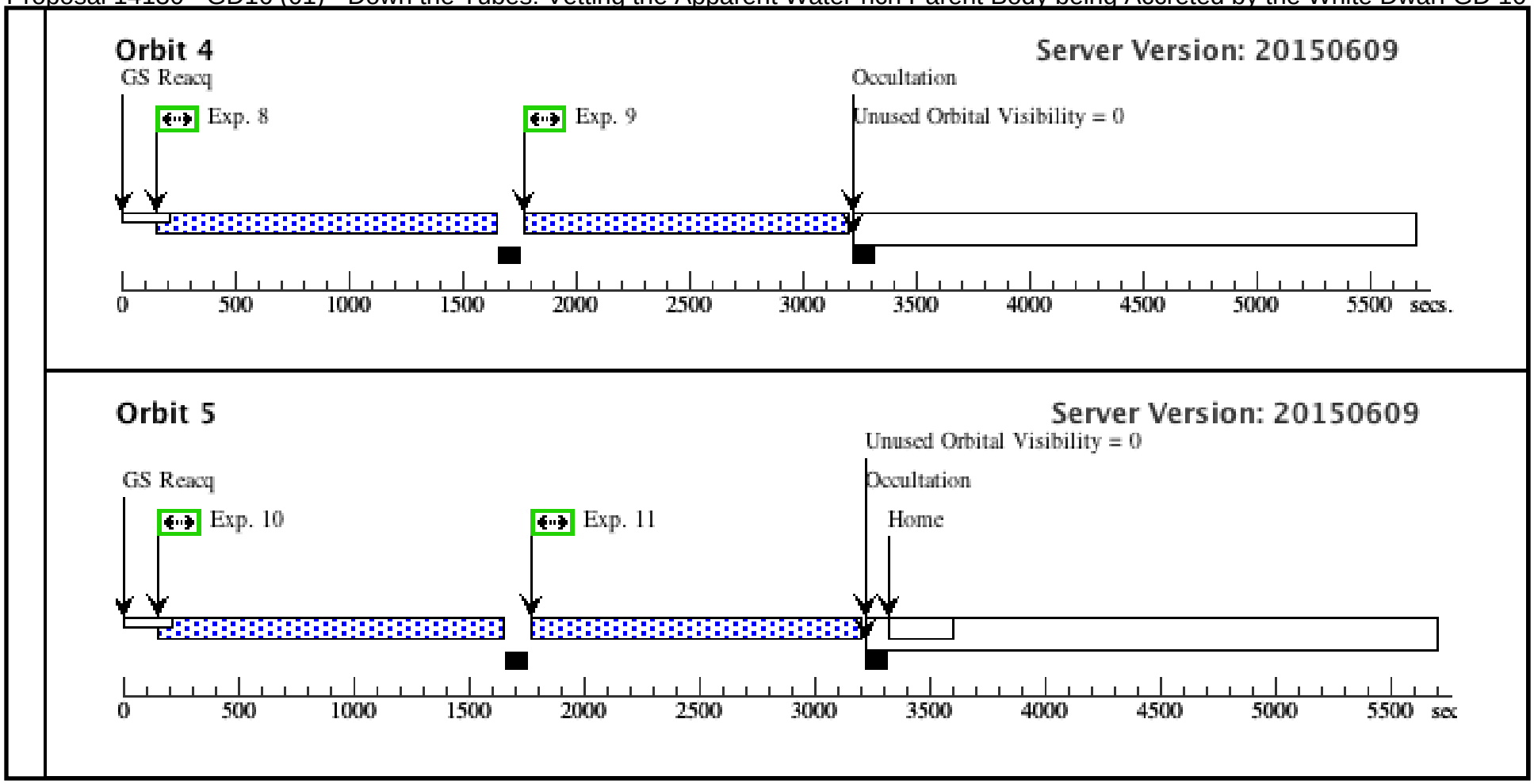
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(COS.ta.757 209)	(1) WOLF88	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				30 Secs (30 Secs)	
								[==>]	***[1]***
2	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=3; BUFFER-TIME=1602; FLASH=YES			1183 Secs (1183 Secs)	
								[==>]	***[1]***
3	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=4; BUFFER-TIME=1602; FLASH=YES			1182 Secs (1182 Secs)	
								[==>]	***[1]***
4	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=3; BUFFER-TIME=1602; FLASH=YES			1419 Secs (1419 Secs)	
								[==>]	***[2]***
5	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=4; BUFFER-TIME=1602; FLASH=YES			1418 Secs (1418 Secs)	
								[==>]	***[2]***
6	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=3; BUFFER-TIME=1602; FLASH=YES			1419 Secs (1419 Secs)	
								[==>]	***[3]***
7	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=4; BUFFER-TIME=1602; FLASH=YES			1418 Secs (1418 Secs)	
								[==>]	***[3]***
8	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=3; BUFFER-TIME=1602; FLASH=YES			1419 Secs (1419 Secs)	
								[==>]	***[4]***
9	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=4; BUFFER-TIME=1602; FLASH=YES			1418 Secs (1418 Secs)	
								[==>]	***[4]***
10	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=3; BUFFER-TIME=1602; FLASH=YES			1419 Secs (1419 Secs)	
								[==>]	***[5]***
11	(COS.sp.731 240)	(1) WOLF88	COS/NUV, TIME-TAG, PSA	G185M 1921 A	FP-POS=4; BUFFER-TIME=1602; FLASH=YES			1418 Secs (1418 Secs)	
								[==>]	***[5]***

Orbit Structure





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Exp. 9
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3000
3500
4000
4500
5000
5500
secs.
Orbit 5
Server Version: 20150609
Unused Orbital Visibility = 0
GS Reacq
Exp. 10
Exp. 11
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec