12168 - The temperature, mass and chemical composition of the bare ONe white dwarf SDSS1102+4054

Cycle: 18, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Boris T. Gaensicke (PI) (ESA Member)	**The University of Warwick**	**Boris.Gaensicke@warwick.ac.uk**
Dr. Detlev G. Koester (CoI) (ESA Member)	Universitat Kiel	koester@astrophysik.uni-kiel.de
Dr. John Thorstensen (CoI) (AdminUSPI)	Dartmouth College	john.thorstensen@dartmouth.edu
Mr. Jonathan Girven (CoI) (ESA Member)	The University of Warwick	J.M.Girven@warwick.ac.uk

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) SDSSJ110239.69+205439.4	COS/FUV COS/NUV	6	26-Jan-2011 21:01:58.0	yes

6 Total Orbits Used

ABSTRACT

SDSS1102+2054 is a cool white dwarf with a helium-dominated atmosphere that exhibits strong oxygen and carbon lines in its optical spectrum. The oxygen-to-carbon (O/C) abundance ratio implied by the line strengths is much larger than unity, which rules out out a carbon-oxygen core composition and provides strong evidence that SDSS1102+2054 is a naked oxygen-neon (ONe) core. Stellar evolution models predict that such extreme O/C abundance ratios are achieved only in the most massive stars that just avoid core-collapse, and we hence believe that SDSS1102+2054 descends from an intermediate mass star close to the 8-10Msun boundary between stars leaving behind either white dwarfs, or neutron stars. As such, this white dwarf has the potential to provide important constraints on our understanding of the evolution of intermediate mass stars, in particular

testing predictions of mass loss, the efficiency of convective core mixing, and the relevant nuclear reaction rates. We propose to obtain intermediate-resolution HST/COS spectroscopy of SDSS1102+2054 to overcome the limitations of the available ground-based data and accurately measure its effective temperature, mass, and Mg abundance, and stringently test the current models of stellar evolution.

OBSERVING DESCRIPTION

SDSS1102+2054 is the first cool white dwarf with a very oxygen (and carbon)-rich atmosphere. We need to obtain a low-res FUV/NUV spectrum to establish the spectral energy distribution, and from there determine the effective temperature of the star. This will be done by a combination of COS/G140L and COS/G230L observations. The G140L observations are spread over three orbits, and use two different FP-POS (1,4) settings to deal with fixed pattern noise. The NUV range is sampled in two orbits with three G230L observations, centred on 2635A, 2950A, 3360A. The target is sufficiently faint to be acquired with NUV imaging, MIRRORA + PSA.

Proposal 12168 - Visit 01 - The temperature, mass and chemical composition of the bare ONe white dwarf SDSS1102+4054

Visit

Proposal 12168, Visit 01, implementation Thu Jan 27 02:02:03 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ110239.69+205439.4	RA: 11 02 39.7300 (165.6655417d) Dec: +20 54 39.80 (20.91106d) Equinox: J2000	Proper Motion RA: -167.4 mas/yr Proper Motion Dec: -37.2 mas/yr Epoch of Position: 2000	V=17.24+/-0.01	Reference Frame: ICRS

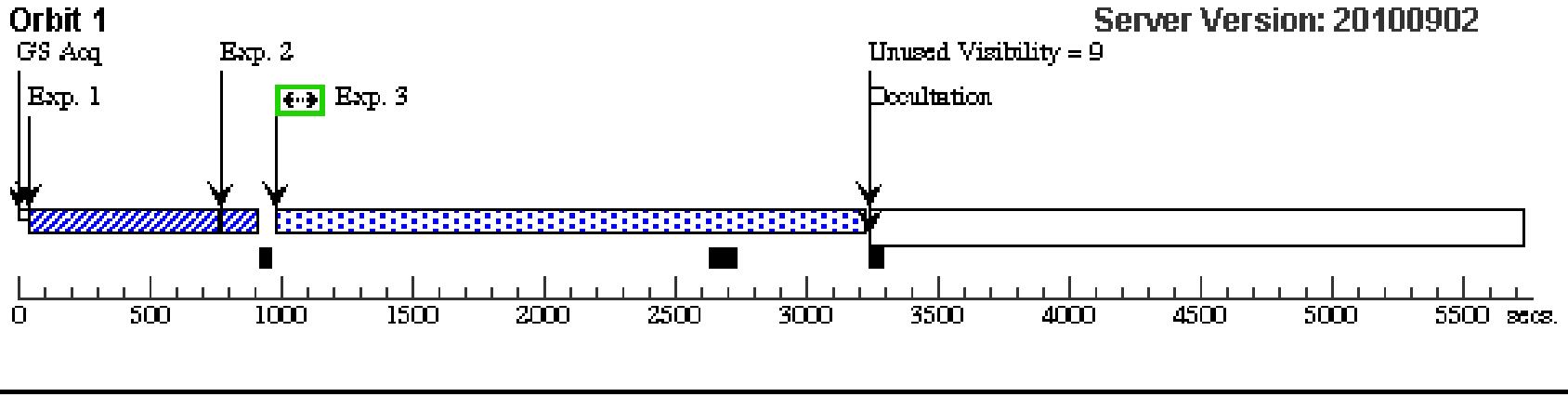
Comments: No GALEX data at the position, this is a cool white dwarf with a predicted flux of 1.5e-14/erg/cm2/s/AA across the NUV,and rapidly dropping at lambda < 2000A.

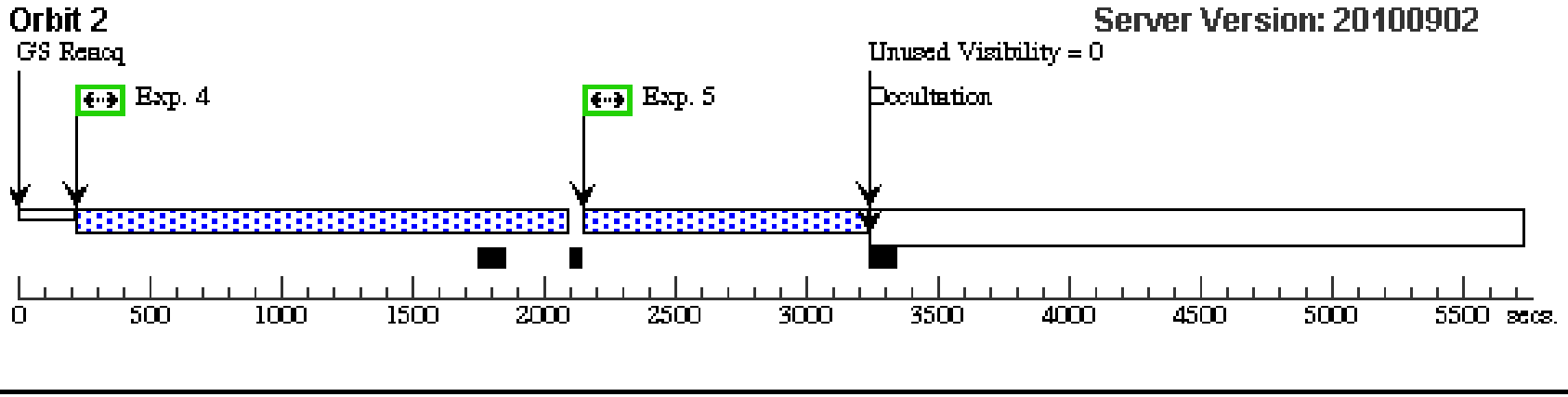
UPDATE - we have obtained a Swift UVOT UVW1 observation (Target ID=31907), which gvies a flux density [erg/s/cm^2/A] of 4.82 +/- 0.18 (stat) +/- 0.15 (sys) x 10^-16 at 2591A, i.e. about a factor ~3 lower than the predicted flux. I have updated the target acq exposure times from 7sec to 16sec.

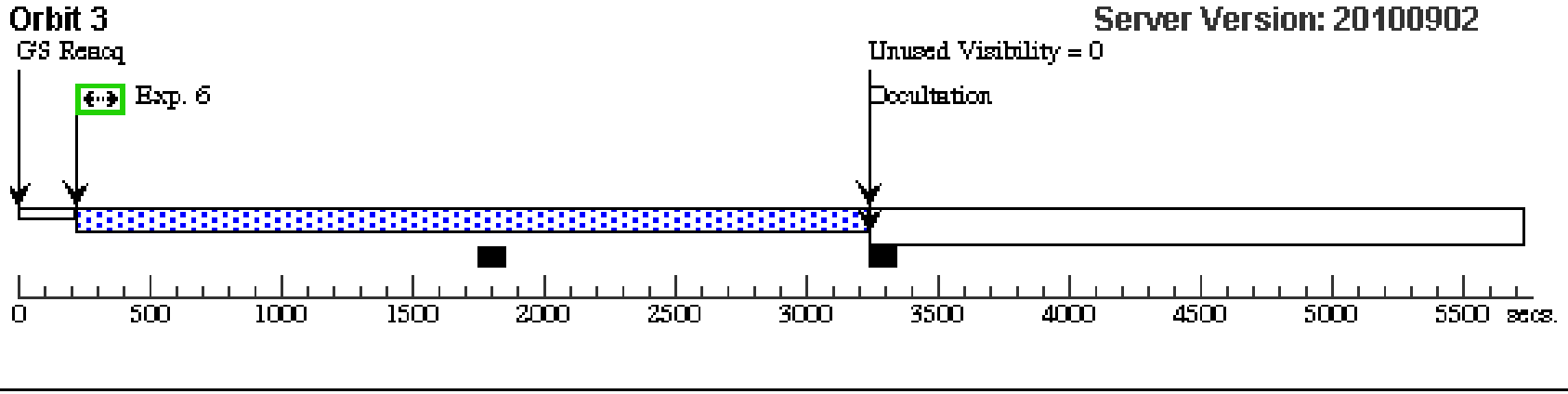
Exposures

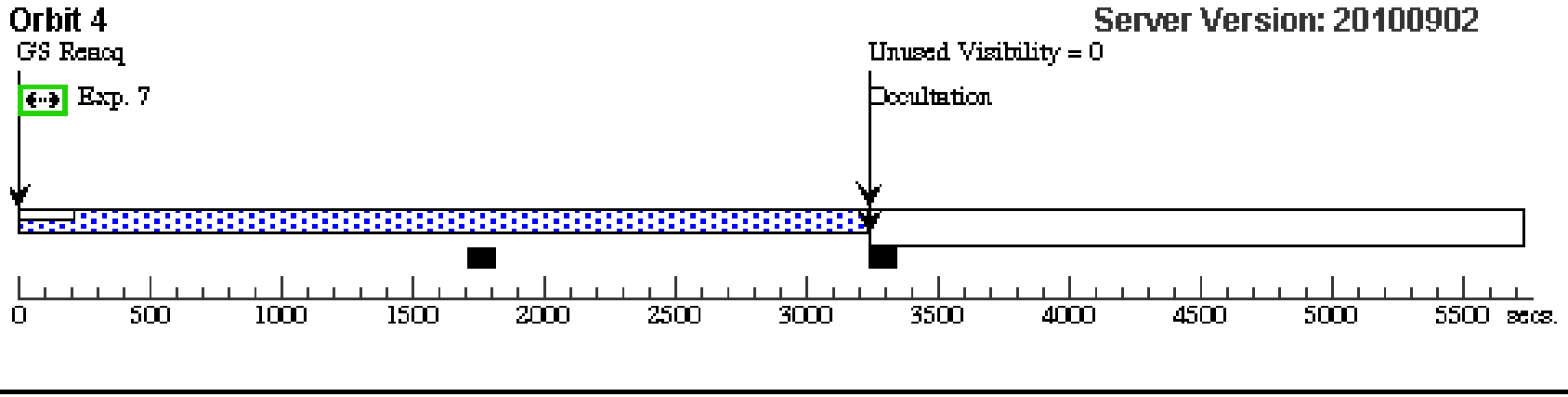
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SDSSJ110239.69 +205439.4	COS/NUV, ACQ/SEARCH, PSA	MIRRORA	SCAN-SIZE=3; STEP-SIZE=1.767; CENTER=FLUX-WT-FLR			16 Secs *[==>]*	***[1]***
Comments: COS.ta.004574									
2		(1) SDSSJ110239.69 +205439.4	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				16 Secs *[==>]*	***[1]***
Comments: COS.ta.004574									
3		(1) SDSSJ110239.69 +205439.4	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1500; FLASH=YES; FP-POS=1			2071 Secs *[==>]*	***[1]***
Comments: COS.A331104									
4		(1) SDSSJ110239.69 +205439.4	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1500; FLASH=YES; FP-POS=1			1815 Secs *[==>]*	***[2]***
Comments: COS.A331104									
5		(1) SDSSJ110239.69 +205439.4	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1029; FLASH=YES; FP-POS=4			1029 Secs *[==>]*	***[2]***
Comments: COS.A331104									
6		(1) SDSSJ110239.69 +205439.4	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1500; FLASH=YES; FP-POS=4			2963 Secs *[==>]*	***[3]***
Comments: COS.A331104									
7		(1) SDSSJ110239.69 +205439.4	COS/NUV, TIME-TAG, PSA	G230L 2635 A	BUFFER-TIME=1500; FLASH=YES			3000 Secs *[==>]*	***[4]***
Comments: COS.A331100									
8		(1) SDSSJ110239.69 +205439.4	COS/NUV, TIME-TAG, PSA	G230L 2950 A	BUFFER-TIME=1500; FLASH=YES			3000 Secs *[==>]*	***[5]***
Comments: COS.A331095									
9		(1) SDSSJ110239.69 +205439.4	COS/NUV, TIME-TAG, PSA	G230L 3360 A	BUFFER-TIME=1500; FLASH=YES			3000 Secs *[==>]*	***[6]***
Comments: COS.A331099									

Orbit Structure





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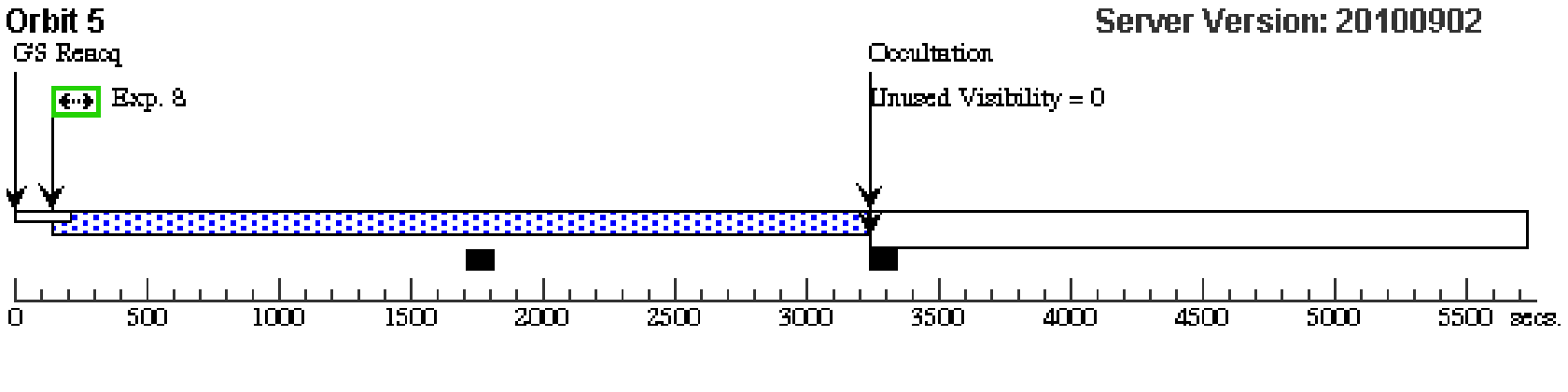
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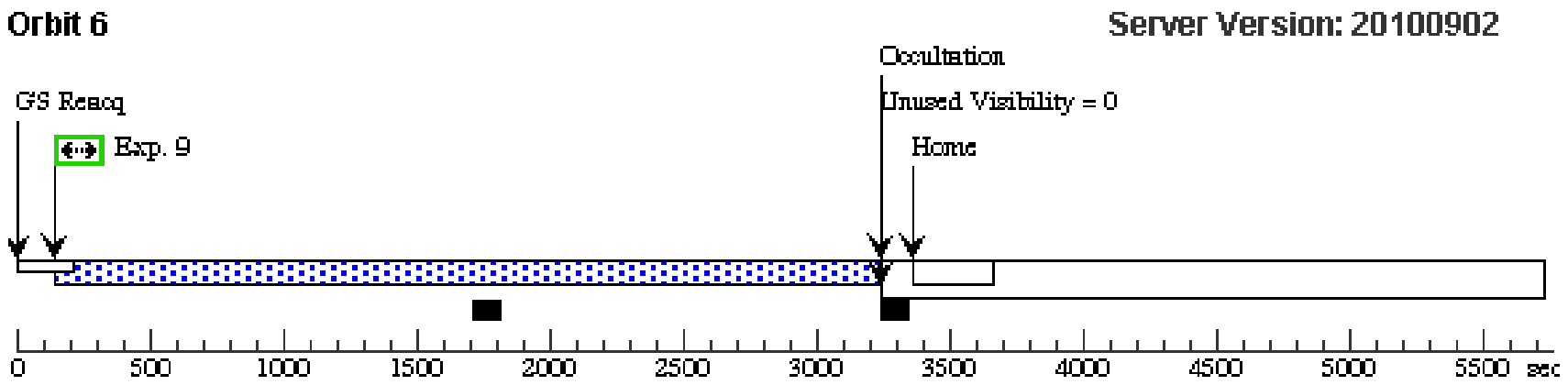
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