12207 - The past and future evolution of the unique double white dwarf binary SDSS1257+5428

Cycle: 18, Proposal Category: GO

(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) SDSSJ125733.64+542850.5	COS/FUV COS/NUV	3	09-Jul-2010 23:38:00.0	yes
02	(1) SDSSJ125733.64+542850.5	STIS/CCD STIS/NUV-MAMA	2	09-Jul-2010 23:38:08.0	yes

5 Total Orbits Used

ABSTRACT

The past 15 years has seen the unmasking of a vast population of close double white dwarfs (DWDs) with over 100 million in our Galaxy alone. So numerous are DWDs that they may themselves be the progenitors of significant populations such as accreting ultra-compact binary stars, isolated millisecond pulsars, hot subdwarfs and Type Ia supernovae. They are also expected to be the dominant sources for space-based gravitational wave astronomy. We have discovered a unique DWD, SDSS1257+5428, composed of two white dwarfs with masses of 0.2 and > 1 Msun, from the low and high-mass extremes of the white dwarf mass distribution. The high mass white dwarf is rapidly rotating, suggestive of accretion-induced spin-up, and yet in current models of the evoluton of such systems in which the low mass white dwarf should have emerged from a common envelope phase, there could not have been time for such spin-up to have occurred. Our current knowledge of the system, particular!
ly the fainter high mass white dwarf, is limited by the blending of the two spectra at optical wavelengths. We don't know for instance whether or not the total system mass exceeds the Chandrasekhar mass. We will acquire ultraviolet spectra of SDSS1257+5428 which will pin down the masses and temperatures of the compoanent white dwarfs to define the past and future evolution of this puzzling system.

OBSERVING DESCRIPTION

The aim of these observations is to record the FUV/NUV spectrum of the double-degenerate white dwarf SDSS1257+5428, and to use these data to determine accurate masses and temperatures for both components. This binary is composed of a cool, low-mass (~0.2Msun, ~8000K) plus a more massive, somewhat hotter (~0.8Msun, ~12000K) component (see arXiv:0910.2709, arXiv:1002.4677, arXiv:1003.2169). COS/G140L observations will occupy three orbits and cover the quasimolecular H2+ (1400A) and H2 (1600A) absorption lines, which are very temperature/pressure sensitive. Two orbits of STIS/G230L observations will delineate the spectral energy distribution across the NUV range.

Visit

Proposal 12207, Visit 01, implementation Sat Jul 10 03:38:14 GMT 2010

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/NUV, COS/FUV

Special Requirements: (none)

Fixed Targets

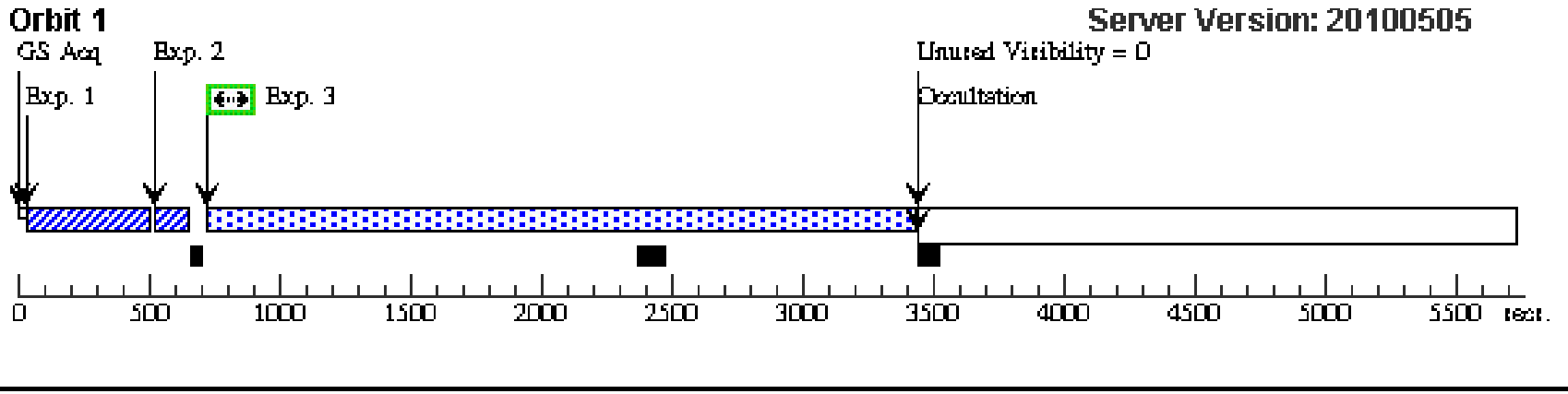
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ125733.64+542850.5	RA: 12 57 33.6900 (194.3903750d) Dec: +54 28 50.50 (54.48069d) Equinox: J2000		V=16.84+/-0.04 Swift: UVW2(2030A) 1.3e-15erg/cm2/s/A UVW1(2634A) 1.0e-15erg/cm2/s/A	Reference Frame: ICRS

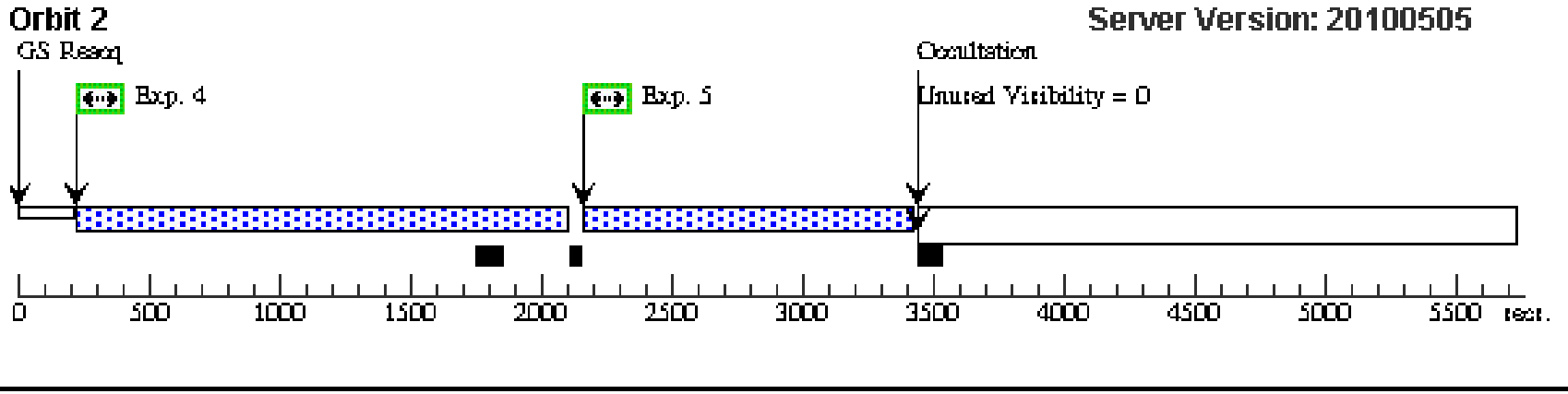
Comments: No GALEX data, but the UV fluxes are well-established from Swift/UVOT observations (Swift target 31472, observations 001 - 007).

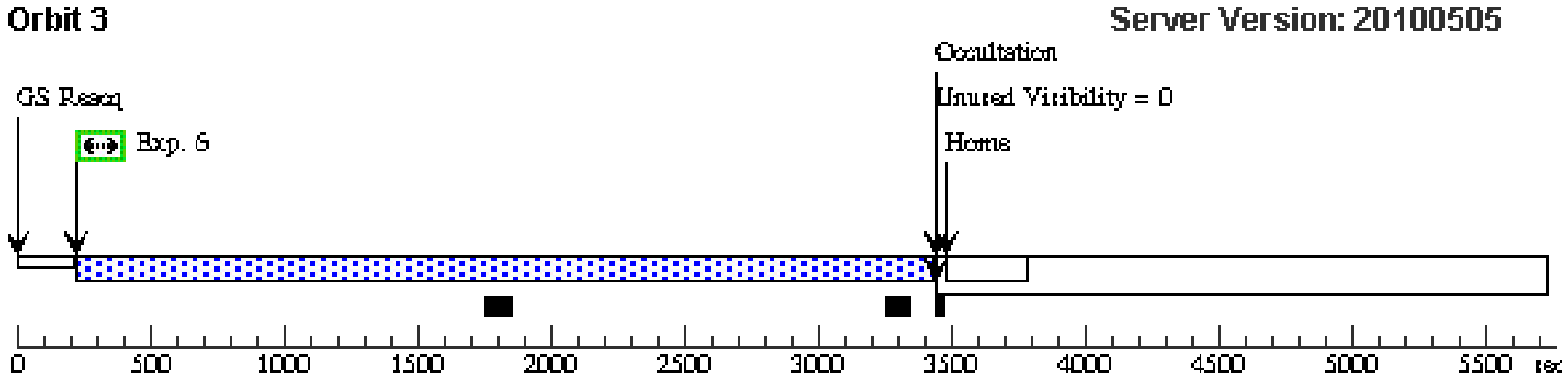
Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SDSSJ125733.64+542850.5	COS/NUV, ACQ/SEARCH, PSA	MIRRORA	SCAN-SIZE=2; STEP-SIZE=1.767			7 Secs *[==>]*	*[1]*
2		(1) SDSSJ125733.64+542850.5	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				7 Secs *[==>]*	*[1]*
3		(1) SDSSJ125733.64+542850.5	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1500; FLASH=YES; FP-POS=1			2537 Secs *[==>]*	*[1]*
4		(1) SDSSJ125733.64+542850.5	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1500; FLASH=YES; FP-POS=1			1830 Secs *[==>]*	*[2]*
5		(1) SDSSJ125733.64+542850.5	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1500; FLASH=YES; FP-POS=4			1210 Secs *[==>]*	*[2]*
6		(1) SDSSJ125733.64+542850.5	COS/FUV, TIME-TAG, PSA	G140L 1280 A	BUFFER-TIME=1500; FLASH=YES; FP-POS=4			3159 Secs *[==>]*	*[3]*

Orbit Structure







Visit

Proposal 12207, Visit 02, implementation Sat Jul 10 03:38:15 GMT 2010

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)	SDSSJ125733.64+542850.5	RA: 12 57 33.6900 (194.3903750d) Dec: +54 28 50.50 (54.48069d) Equinox: J2000		V=16.84+/-0.04 Swift: UVW2(2030A) 1.3e-15erg/cm2/s/A UVW1(2634A) 1.0e-15erg/cm2/s/A	Reference Frame: ICRS

Comments: No GALEX data, but the UV fluxes are well-established from Swift/UVOT observations (Swift target 31472, observations 001 - 007).

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) SDSSJ125733.64+542850.5	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT			5 Secs *[==>]*	***[1]***
2		(1) SDSSJ125733.64+542850.5	STIS/NUV-MAMA, TIME-TAG, 52X0.5	G230L 2376 A	BUFFER-TIME=250			1500 Secs *[==>2505.0 Secs]*	***[1]***
3		(1) SDSSJ125733.64+542850.5	STIS/NUV-MAMA, TIME-TAG, 52X0.5	G230L 2376 A	BUFFER-TIME=250			1500 Secs *[==>3172.0 Secs]*	***[2]***

Orbit Structure