14600 - SDSS 1240+6710: a partially burnt supernova remnant

Cycle: 24, 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?*
02	(1) SDSSJ124043.00+671034.6	COS/FUV COS/NUV	4	26-Dec-2016 21:01:15.0	yes

4 Total Orbits Used

ABSTRACT

We have recently (Kepler et al. 2016, Science 352, 6281, April 1 issue) identified SDSSJ124043.01+671034.68 as a white dwarf with most peculiar characterstics. Instead of the usual hydrogen or helium, its atmosphere is composed almost purely of oxygen, the only other trace elements detected are neon, magnesium, and silicon; and it has a large transverse velocity of ~340km/s. The relatively low mass, 0.6Msun, and the non-detection of carbon strongly argue against SDSSJ1240+6710 being a canonical oxygen-neon core formed from the evolution of a single progenitor star with a mass of ~6.5-10Msun. The detection of silicon suggests that the progenitor of this white dwarf may have initiated oxygen-burning, and we argue that SDSSJ1240+6710 is the partially burnt remnant of an unusual thermonuclear supernova, of which a variety have been discovered by the ongoing large transient surveys. We propose to obtain COS ultraviolet spectroscopy of SDSSJ1240+6710 to measure (1) the abundances of phosphorus and

sulfur, two other products of oxygen-burning, (2) significantly improve the upper limits on hydrogen (from Ly alpha) and carbon (1330/1335A resonance lines), (3) probe for traces of other nuclear burning, including nitrogen, iron, and nickel, and (4) accurately measure its effective temperature and mass. SDSSJ1240+6710 provides so far the unique opportunity to test the predictions of the rapidly growing number of theoretical stellar explosion models producing gravitationally bound remnants.

OBSERVING DESCRIPTION

The purpose of this program is to obtain a S/N~20 spectrum of the white dwarf SDSS1240+6710 to improve on the photospheric abundances of O, Si, and Mg, and to search for absorption lines of S, P, and C. The target is located in the continiuous viewing zone (requested in Phase I), which allows to efficiently pack the required exposure time into four orbits. The star has GALEX FUV and NUV fluxes, and we carried out the ETC simulations with a model spectrum computed based on the abundances measured from optical spectroscopy. The star will be acquired with NUV imaging, after which G140L spectroscopy will be obtained using all four FP-POS settings.

Visit

Proposal 14600, SDSS1240+6710 COS G140L (02), implementation Tue Dec 27 02:01:16 GMT 2016

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: CVZ

Comments: 2016-12-22: Updated target acquisition to use MIRRORB to avoid BOP violation.

Fixed Targets

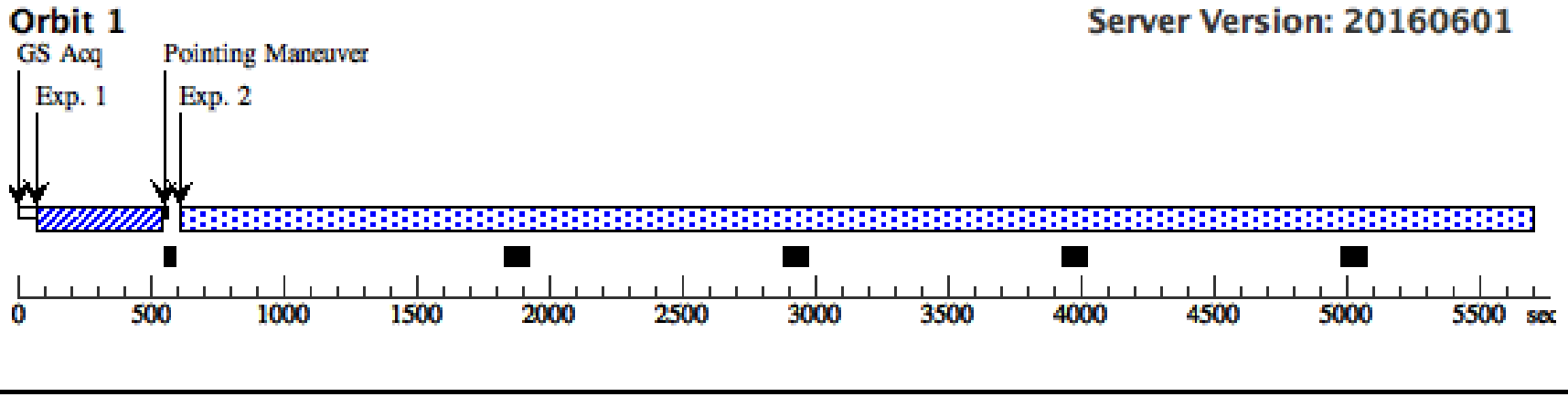
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSSJ124043.00+671034.6	RA: 12 40 43.4424 (190.1810100d) Dec: +67 10 35.94 (67.17665d) Equinox: J2000	Proper Motion RA: -183.1 mas/yr Proper Motion Dec: -93.3 mas/yr Epoch of Position: 2000	V=18.2+/-0.1 GALEX FUV=17.92 GALEX NUV=17.5	Reference Frame: ICRS

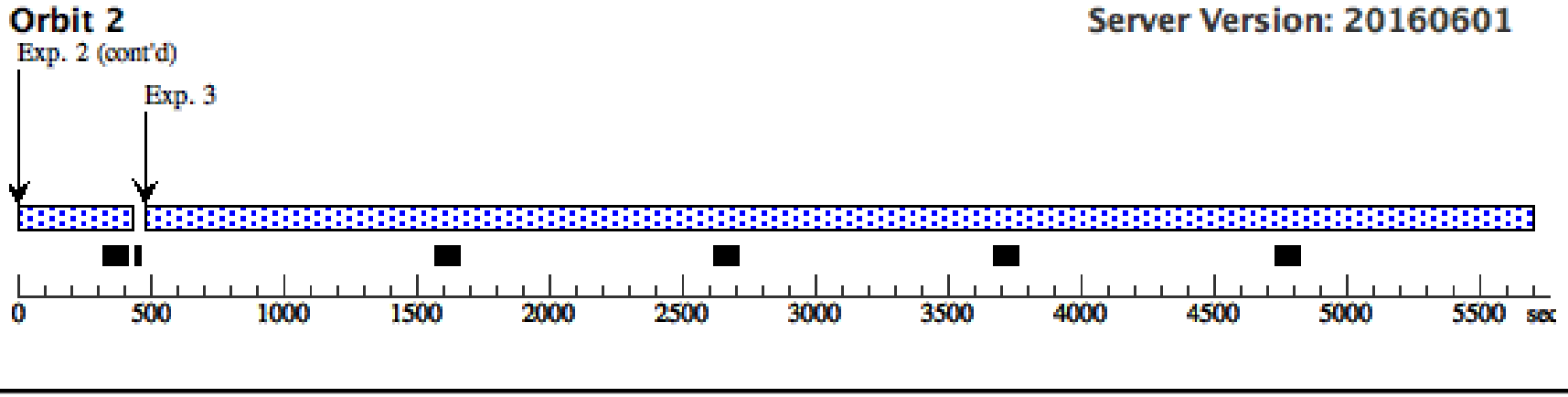
Comments: 2016/09/29: updated the proper motions from Gould et al. 2004ApJS..152..103G
Extended=NO

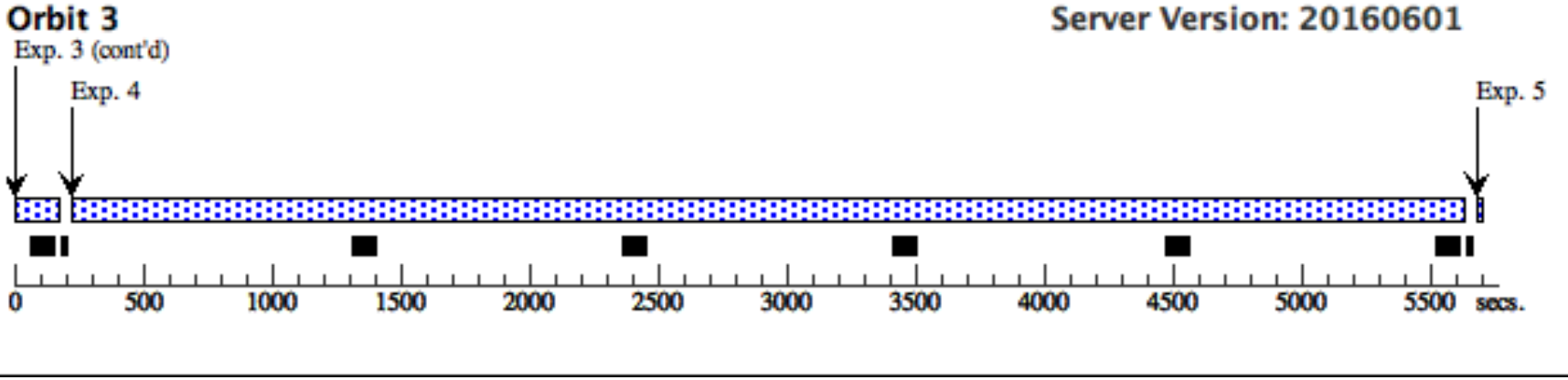
Exposures

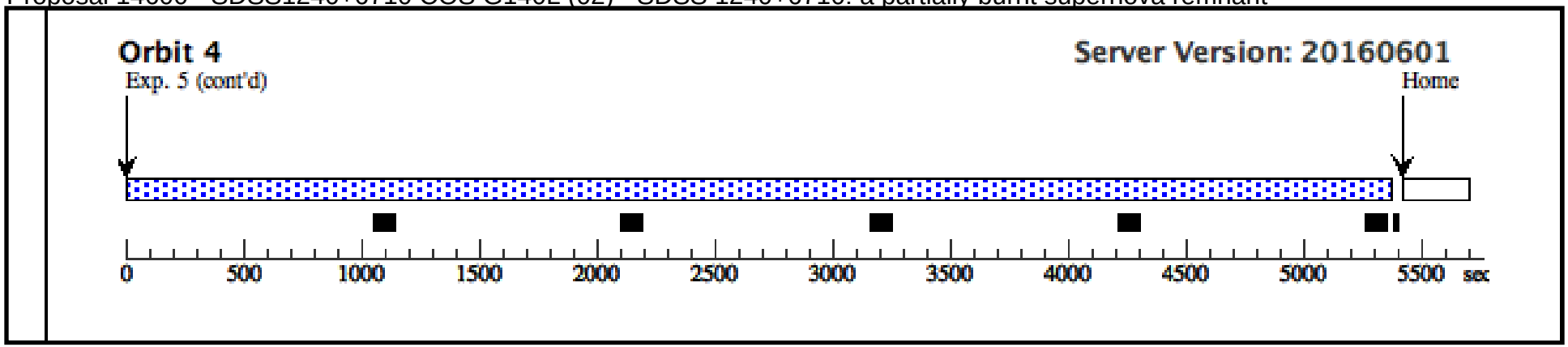
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	SDSS1240+6710 COS Acq (COS.ta.849183)	(1) SDSSJ124043.00+671034.6	COS/NUV, ACQ/IMAGE, PSA	MIRRORB				75 Secs (75 Secs) *[==>]*	***[1]***
	Comments: Updated to use MIRRORB								
2	SDSS1240+6710 COS G140L (COS.sp.820293)	(1) SDSSJ124043.00+671034.6	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=1; BUFFER-TIME=1052			5357 Secs (5357 Secs) *[==>]*	***[1]***
3	SDSS1240+6710 COS G140L (COS.sp.820293)	(1) SDSSJ124043.00+671034.6	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=2; BUFFER-TIME=1052			5356 Secs (5356 Secs) *[==>]*	***[2]***
4	SDSS1240+6710 COS G140L (COS.sp.820293)	(1) SDSSJ124043.00+671034.6	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=3; BUFFER-TIME=1052			5356 Secs (5356 Secs) *[==>]*	***[3]***
5	SDSS1240+6710 COS G140L (COS.sp.820293)	(1) SDSSJ124043.00+671034.6	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=4; BUFFER-TIME=1052			5356 Secs (5356 Secs) *[==>]*	***[3]***

Orbit Structure








Orbit 4
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