13421 - CSS 41177: an eclipsing double white dwarf binary

Cycle: 21, 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) SDSS-J100559.10+224932.2	COS/FUV	2	11-Jul-2013 19:50:47.0	yes

2 Total Orbits Used

ABSTRACT

The overwhelming majority of stellar remnants are white dwarfs. Despite their abundance and importance to, amongst others, Galactic age determinations and our understanding of type Ia supernovae fewer than a dozen white dwarfs have model-independent measurements of fundamental parameters like mass and radius. A major limitation on the observational side is that such parameters are extremely difficult to determine in a model-independant way for single white dwarfs. Close white dwarf binaries can provide these important tests.

The largest class of white dwarf binaries in the Galaxy are the detached double white dwarfs, which are becoming increasingly popular as the

progenitor systems of Type Ia supernovae. In recent years four eclipsing double white dwarfs have been found, creating the opportunity for precision mass and radius measurements of two white dwarfs at once. Our target, CSS 41177, contains two extremely low-gravity white dwarfs with very different temperatures, presenting us with a unique chance to test the existing mass-radius relation at its extremes.

Here we propose a 2 orbit HST/COS FUV observation of CSS 41177, to accurately determine the temperature and surface gravity of the hot white dwarf. Through the flux ratio from the light curve this will at the same time constrain those of the cool white dwarf. Therefore it will allow us to add two more white dwarfs with accurate parameters to the short list of white dwarfs for which precise masses and radii are known.

Note: The proposed observations are part of the doctoral thesis of Ms. Madelon C.P. Bours.

OBSERVING DESCRIPTION

The aim of the observation is to obtain a far-ultraviolet spectrum of a double-degenerate DA white dwarf. The sequence is straight-forward: target acquisition in dispersed light, followed by G140L spectroscopy using all four FP-POS positions.

ADDITIONAL COMMENTS

As this is part of Ms Bours PhD work, it would be very helpful if the observations could be scheduled early in Cycle 21.

Visit

Proposal 13421, CSS41177 (01), implementation Thu Jul 11 23:50:56 GMT 2013

Diagnostic Status: No Diagnostics

Scientific Instruments: COS/FUV

Special Requirements: Period 0.1160154352 D AND ZERO-PHASE HJD2455936.84389534

Comments: This double white dwarf is eclipsing. Even though the eclipse lasts only ~minutes, we implement a phase constraint for this visit to avoid that the target acq. is done during the eclipse. FYI, a similar procedure has been successfully used in a number of visits in program 12870.

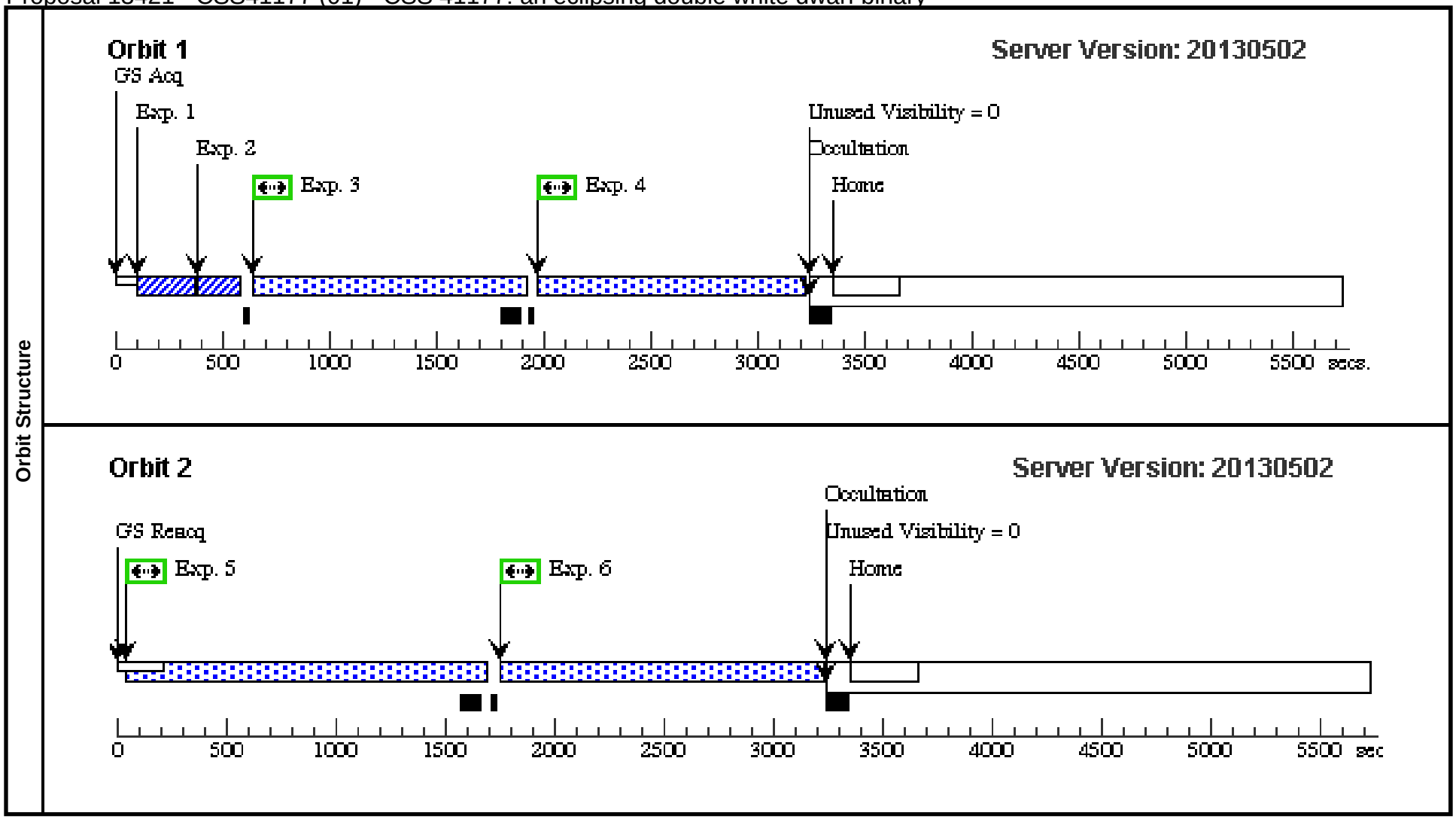
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	SDSS-J100559.10+224932.2	RA: 10 05 59.1200 (151.4963333d) Dec: +22 49 32.48 (22.82569d) Equinox: J2000	Proper Motion RA: -19.6 mas/yr Proper Motion Dec: -13.3 mas/yr Epoch of Position: 2000	V=17.3+/-0.1	Reference Frame: ICRS

Comments: The target was observed with GALEX, at m(fuv)=16.72 +/- 0.04 (AB) and m(nuv)=16.98 +/- 0.03 (AB).

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/PEAKXD (COS.sa.516705)	(1) SDSS-J100559.10+224932.2	COS/FUV, ACQ/PEAKXD, PSA	G140L 1105 A		PHASE 0.2 TO 0.8		11 Secs (11 Secs) *[==>]*	*[1]*
2	ACQ/PEAKD (COS.sa.516705)	(1) SDSS-J100559.10+224932.2	COS/FUV, ACQ/PEAKD, PSA	G140L 1105 A	STEP-SIZE=0.9; NUM-POS=5; CENTER=DEF			11 Secs (11 Secs) *[==>]*	*[1]*
3	CSS41177 FP-POS=1 (COS.sp.516706)	(1) SDSS-J100559.10+224932.2	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=1062; FLASH=YES; FP-POS=1			1162 Secs (1162 Secs) *[==>]*	*[1]*
4	CSS41177 FP-POS=2 (COS.sp.516706)	(1) SDSS-J100559.10+224932.2	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=1200; FLASH=YES; FP-POS=2			1200 Secs (1200 Secs) *[==>]*	*[1]*
5	CSS41177 FP-POS=3 (COS.sp.516706)	(1) SDSS-J100559.10+224932.2	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=1320; FLASH=YES; FP-POS=3	NEW OBSET		1428 Secs (1426 Secs) *[==>1426.0 Secs]*	*[2]*
6	CSS41177 FP-POS=4 (COS.sp.516706)	(1) SDSS-J100559.10+224932.2	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=1425; FLASH=YES; FP-POS=4			1425 Secs (1425 Secs) *[==>]*	*[2]*


Orbit Structure
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Server Version: 20130502
GS Acq
Exp. 1
Exp. 2
Exp. 3
Exp. 4
Unused Visibility = 0
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
secs.
Orbit 2
Server Version: 20130502
Occultation
GS Reacq
Unused Visibility = 0
Exp. 5
Exp. 6
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec