12594 - The White Dwarf Mass-Radius Relation Based on Dynamical Masses: STIS Observations of Close Double Degenerates

Cycle: 19, 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) G107-70 CCDFLAT	STIS/CCD	1	03-Oct-2011 21:10:24.0	yes
02	(2) WD1818+126 CCDFLAT	STIS/CCD	2	03-Oct-2011 21:10:36.0	yes

3 Total Orbits Used

ABSTRACT

This is a proposal to add six new white dwarfs (WDs) to the mass-radius relation for WDs, thus providing a stringent new test of our understanding of WD physics. For the past several years, we have had underway programs of HST/FGS astrometry of three close visual binaries in which both components are WDs. The astrometry is yielding precise, model-independent dynamical masses for these six WDs. To complete the investigation, we need to obtain flux-calibrated spectra of the individual WDs in these binaries, which, combined with the accurate parallaxes from the FGS data, yield the radii.

All three binaries are too close together for individual spectra to be obtained from the ground, but they can be obtained easily with STIS. By using an optimal telescope roll angle, we can obtain both spectra simultaneously in a single STIS exposure. Two of the binaries are bright enough to obtain the spectra in one orbit. Our faintest target requires 2 orbits to obtain the necessry S/N on the V=17.4 secondary. In order to observe the closest of the binaries at maximum separation (0.132"), its observation should be done a few months after the beginning of Cycle 20.

OBSERVING DESCRIPTION

We propose to use HST/STIS to obtain low resolution broad-band spectroscopy & photometry of the six WD stars in our three DD binary systems. From the FGS observations of these binaries we know precisely the component position angle and separation at a given time. With this knowledge, for each binary we propose to align the binary position angle with the 52"x2" STIS long slit (to within 1 degree) by specification of a date-dependent HST ORIENT, and place the object near the center of the aperture, using the STIS target acquisition capability. A peak-up will not be needed for the 2" wide slit. The stars will be observed using the G430L and the G750L low resolution elements, with a CR-SPLIT = 2, and a 2-point dither along the slit in the spatial direction, of 0.650", to accomodate the widest binary in this proposal (G107-70, sep = ~450 mas at the proposed observing time. In accordance with guidance from the STIS INS HDBK, we obtain CCD flats with the G750L to calibrate away the red fringing.

Visit

Proposal 12594, Visit 01, implementation Tue Oct 04 01:10:43 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 127D TO 128 D; BETWEEN 15-JAN-2012 AND 05-FEB-2012

Comments: Optimal orientation (133 deg) for aligning binary position angle with spatial direction of 52x2 slit has no guide stars. The selection of 127 deg (has guide stars) will be acceptable.

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2), (3)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.6350	Center Pattern=false		
	Line Spacing=			

Fixed Targets

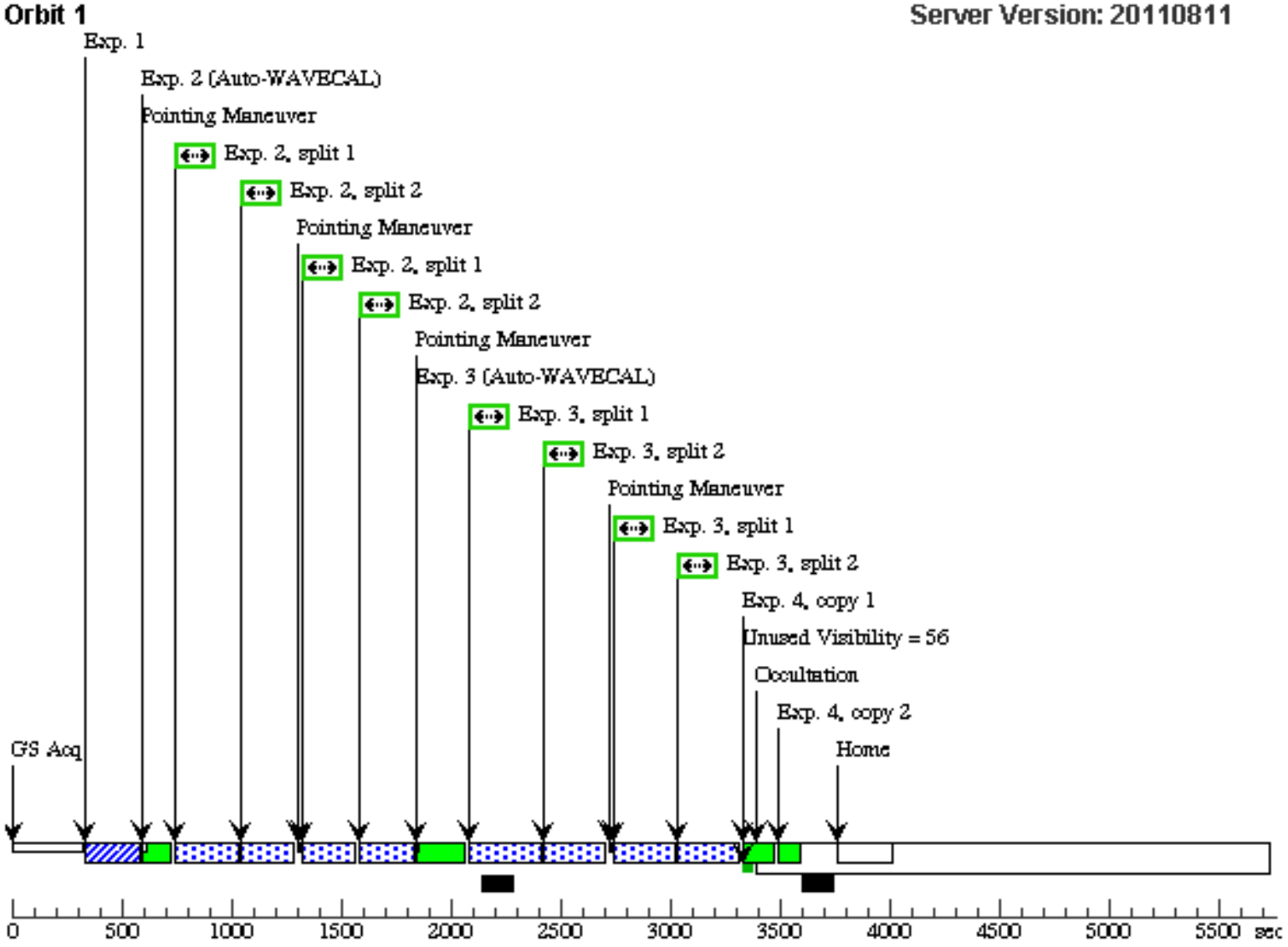
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	G107-70	RA: 07 30 47.2846 (112.6970192d)	Proper Motion RA: -0.022 sec of time/yr	V=15.0+/-0.1	Reference Frame: ICRS
		Dec: +48 10 27.40 (48.17428d)	Proper Motion Dec: -1.271 arcsec/yr		
		Equinox: J2000	Epoch of Position: 2000		

Comments: Target coordinates are updated from observed "miss distance" in the FGS observations (dRA= +1", dDec = +0.8"). This is a binary system with sep = 0.430", PA = 269.9 deg, and dmag = 0.3 at epoch Feb 2012.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(1) G107-70	STIS/CCD, ACQ, 50CCD	MIRROR	ACQTYPE=POINT	GS ACQ SCENARIO BASE1B3		2.0 Secs	
								[==>]	***[1]***
Comments: binary star system, sep = 0.6", dmag = 0.3, PA =									
2		(1) G107-70	STIS/CCD, ACCUM, 52X2E1	G430L 4300 A	CR-SPLIT=2		Pattern 1, Exps 2-2 in Visit 01 (1)	420.0 Secs	
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
3		(1) G107-70	STIS/CCD, ACCUM, 52X2E2	G750L 7751 A	CR-SPLIT=2		Pattern 1, Exps 3-3 in Visit 01 (1)	500 Secs	
								[==>(Pattern 1, Split 1)]	***[1]***
								[==>(Pattern 1, Split 2)]	
								[==>(Pattern 2, Split 1)]	
								[==>(Pattern 2, Split 2)]	
4		CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A				*[==>(Copy 1)]*	***[1]***
								[==>(Copy 2)]	

Orbit Structure



Visit

Proposal 12594, Visit 02, implementation Tue Oct 04 01:10:45 GMT 2011

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: ORIENT 53.0D TO 55.0 D; BETWEEN 01-NOV-2011 AND 01-DEC-2011

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=STIS-ALONG-SLIT	Coordinate Frame=POS-TARG		(2), (3)
	Purpose=DITHER	Pattern Orientation=90.0		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=0.6350	Center Pattern=false		
	Line Spacing=			

Fixed Targets

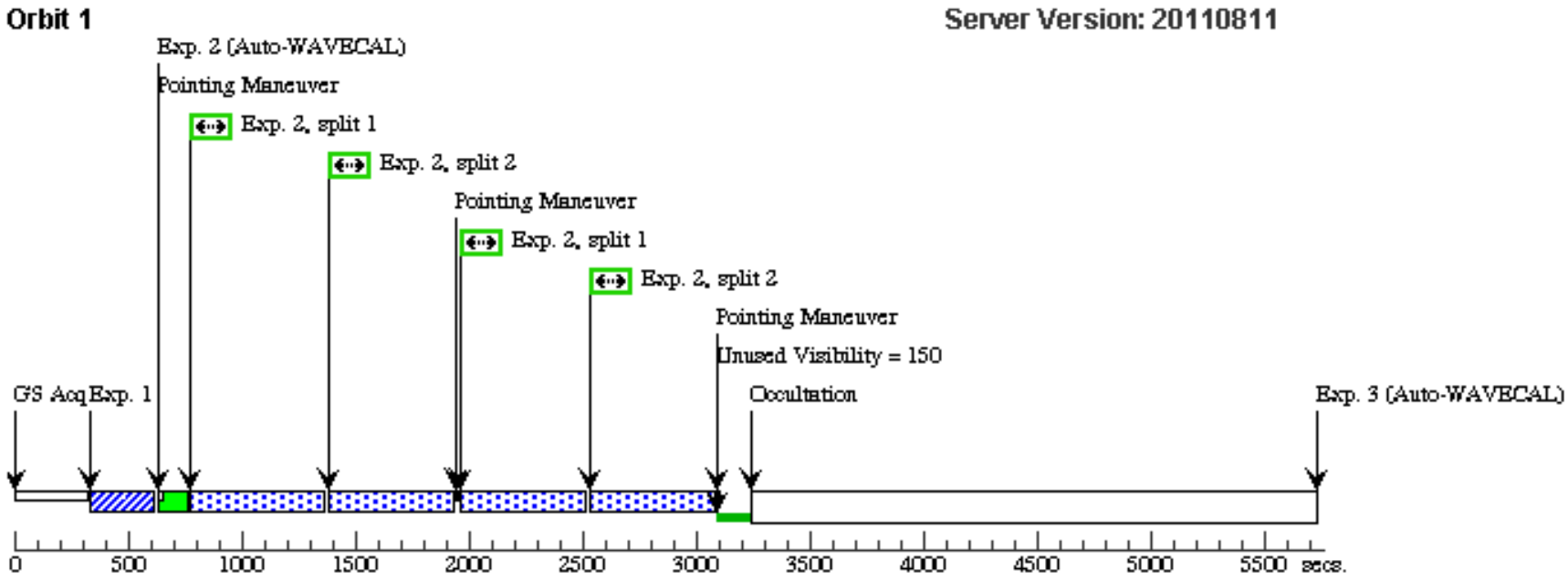
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	WD1818+126	RA: 18 20 30.8800 (275.1286667d)	Proper Motion RA: 0.007 sec of time/yr	V=16.06+/-0.05	Reference Frame: ICRS
		Dec: +12 39 17.70 (12.65492d)	Proper Motion Dec: 0.271 arcsec/yr		
		Equinox: J2000	Epoch of Position: 2000		

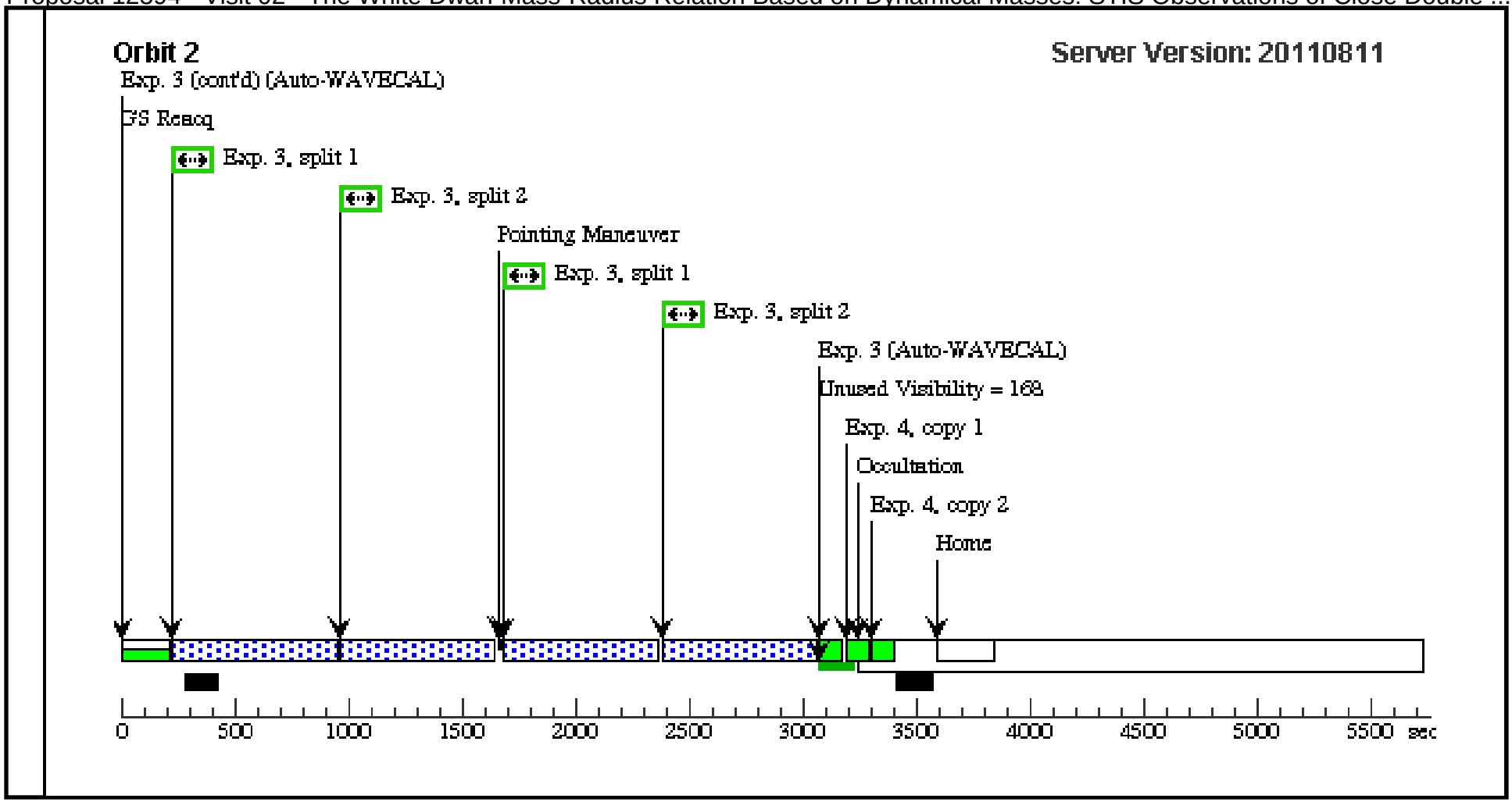
Comments: binary system with sep = 173", PA = 189.5 deg, dmag = 0.9, at epoch Nov, 2011.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1		(2) WD1818+126	STIS/CCD, ACQ, 50CCD	MIRROR	ACQTYPE=POINT			10.0 Secs	
								[==>]	***[1]***
Comments: binary star system, sep = 175 mas, PA = 189 deg, dmag = 0.9									
2		(2) WD1818+126	STIS/CCD, ACCUM, 52X2E1	G430L 4300 A	CR-SPLIT=2		Pattern 1, Exps 2-2 in Visit 02 (1)	1030 Secs	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]*	***[1]***
3		(2) WD1818+126	STIS/CCD, ACCUM, 52X2E2	G750L 7751 A	CR-SPLIT=2		Pattern 1, Exps 3-3 in Visit 02 (1)	1300 Secs	
								[==>(Pattern 1, Split 1)] *[==>(Pattern 1, Split 2)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]*	***[2]***
4		CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A				*[==>(Copy 1)]* *[==>(Copy 2)]*	***[2]***

Orbit Structure




Orbit 2
Server Version: 20110811
Exp. 3 (cont'd) (Auto-WAVECAL)
FGS Reacq
Exp. 3, split 1
Exp. 3, split 2
Pointing Maneuver
Exp. 3, split 1
Exp. 3, split 2
Exp. 3 (Auto-WAVECAL)
Unused Visibility = 168
Exp. 4, copy 1
Occultation
Exp. 4, copy 2
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec