



# 13059 - The White Dwarf Mass-Radius Relation Based on Dynamical Masses: STIS Observations of Close Double Degenerates

Cycle: 20, Proposal Category: GO  
(Availability Mode: SUPPORTED)

## INVESTIGATORS

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## VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(3) WD1639+153 CCDFLAT	STIS/CCD	1	11-Jul-2012 02:08:28.0	yes

1 Total Orbits Used

## ABSTRACT

This is the second part of 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. The first part (12594) observed white dwarf binaries G107-70 and WD 1818+126. This proposal observes WD1639+153 as it achieve its maximum projected component separation (0.13") between August 2013 and Feb 2014.

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 necessary S/N on the V=17.4 secondary. In order to observe the closest of the binaries at maximum separation (WD 1639+153 at 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 accommodate 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.

Proposal 13059 - Visit 01 - The White Dwarf Mass-Radius Relation Based on Dynamical Masses: STIS Observations of Close Double ...

Wed Jul 11 06:08:36 GMT 2012

Visit	<b>Proposal 13059, Visit 01, implementation</b> <b>Diagnostic Status: No Diagnostics</b> Scientific Instruments: STIS/CCD Special Requirements: ORIENT 308D TO 312 D; ORIENT 128.0D TO 132.0 D; BETWEEN 01-AUG-2013 AND 02-FEB-2014 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 Purpose=DITHER Number Of Points=2 Point Spacing=0.6350 Line Spacing=	Coordinate Frame=POS-TARG Pattern Orientation=90.0 Angle Between Sides= Center Pattern=false		(2), (3)						
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous					
	(3)	WD1639+153	RA: 16 41 36.7000 (250.4029167d) Dec: +15 12 36.38 (15.21011d) Equinox: J2000	Proper Motion RA: 0.005 sec of time/yr Proper Motion Dec: -0.736 arcsec/yr Epoch of Position: 2000	V=15.7+/-0.1	Reference Frame: ICRS					
Comments: This target will be observed by the "Cycle 20 continuation proposal" associated with this proposal. We wish to wait for the projected separation of the binary components to approach apastron (0.132"), which occurs in early Cycle 20. We retain the target in this proposal for bookkeeping purpose.											
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit	
	1		(3) WD1639+153	STIS/CCD, ACQ, 50CCD	MIRROR	ACQTYPE=POINT	GS ACQ SCENARI O BASE1B3		2.0 Secs		
	Comments: binary star system, sep = 0.6", dmag = 0.3, PA =										
	2		(3) WD1639+153	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)] [==>(Pattern 1, Split 2)] [==>(Pattern 2, Split 1)] [==>(Pattern 2, Split 2)]	[1]
3		(3) WD1639+153	STIS/CCD, ACCUM, 52X2E2	G750L 7751 A	CR-SPLIT=2			Pattern 1, Exps 3-3 in Visit 01 (1)	400 Secs		
									[==>(Pattern 1, Split 1)] [==>(Pattern 1, Split 2)] [==>(Pattern 2, Split 1)] [==>(Pattern 2, Split 2)]	[1]	
4		CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A					[==>(Copy 1)] [==>(Copy 2)]	[1]	

