Gravitational Waves from J0651

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SPY survey

HE 1414-0848
0.71 + 0.52 Msol WDs
at 0.6 day period
(Napiwotzki et al. 2002)
SPY survey

S. Geier, priv. comm.
The ELM Survey

ELM WDs in the SDSS

ELM WDs in the Hypervelocity Star Survey
ELM WDs in the SDSS

Teff, log g, and Mass
The Shortest Period Detached Binary WD
The Shortest Period Detached Binary WD

First detection of ellipsoidal variations in a WD.  
$i = 67 \ deg, \ 0.17 + 0.43 \ M_{\odot} \ WD$.  
Merger time $= 37 \ \text{Myr}$  
Is the period shrinking?
**J0651+2844:**  $T_{\text{eff}} = 16,500$ K,  $M = 0.25$ M$_\odot$,  $d = 1$ kpc

Discovered in March 2011

Brown et al. (2011)
J0651+2844:

**J0651 - Oct11 + Apr12 MMT spectroscopy**

Heliocentric Julian Date - 2455800 [days]

**P = 0.2125463486 hr**

**K = 599 km/s**
J0651
J0651

\[ P = 765.20654 \pm 0.00012 \text{ s} \]

Gemini GMOS and GTC g-band data
i = 85.3 deg
0.25 + 0.49 Msol WDs at 0.17 Rsol separation.
R1 = 0.0365 Rsol
R2 = 0.0138 Rsol
Mass transfer in 0.9 Myr.
Is the period shrinking? Expected $P_{\text{dot}} = 0.25$ ms/yr
Laboratories for General Relativity

Hulse Taylor pulsar

\( P = 7.8 \text{ hr} \)
\( \dot{P} = 2.42 \times 10^{-12} \text{ s/s} \)

Weisberg et al 2010
J0651

Gravitational Wave Detection
Conclusions

- We measured Pdot for the 12-min binary WD J0651 using Gemini, GTC, and the McDonald 2.1m.

- GMOS can do high speed photometry of 20-22 mag targets in 20-30 s.

- 40% of the time (out of 5 epochs), there was a moving object in our images.