APR13-2013-000362

Abstract for an Invited Paper
for the APR13 Meeting of
the American Physical Society

Towards Synchronism Through Dynamic Tides in J0651: the "Antiresonance" Locking[1]

FRANCESCA VALSECCHI, CIERA and Northwestern University

In recent years, the Extremely Low Mass White Dwarf (ELM WD) survey has quintupled the number of known close, detached double WD binaries (DWD). The tightest such DWD, SDSS J065133.33+284423.3 (J0651), harbors a He WD eclipsing a C/O WD every $\simeq$ 12 min. The orbital decay of this source was recently measured to be consistent with general relativistic (GR) radiation. Here we investigate the role of dynamic tides in a J0651-Like binary and we uncover the potentially new phenomenon of "antiresonance" locking. In the most probable scenario of an asynchronous binary at birth, we find that dynamic tides play a key role in explaining the measured GR-driven orbital decay, as they lock the system at stable antiresonances with the star's eigenfrequencies. We show how such locking is naturally achieved and how, while locked at an antiresonance, GR drives the evolution of the orbital separation, while dynamic tides act to synchronize the spin of the He WD with the companion's orbital motion, but only on the GR timescale. Given the relevant orbital and spin evolution timescales, the system is clearly on its way to synchronism, if not already synchronized.

[1]Simulations were performed on the computing cluster Fugu available to the Theoretical Astrophysics group at Northwestern and partially funded by NSF grant PHY–0619274 to VK. This work was supported by NASA Award NNX09AJ56G to V.K.