Contribution ID: **8** Type: **not specified**

Role of r-modes in evolution of recycled neutron stars

Thursday 1 October 2015 14:15 (40 minutes)

Observations of hot rapidly rotating neutron stars in low-mass X-ray binaries (LMXBs) provide important constraints on the r-mode instability in neutron stars (see, e.g., Ref. [1]). Here we discuss additional constraints imposed on this instability, which follow from observations of recycled neutron stars. Recent Ref. [2] was devoted to the same subject and concluded that ''ungapped interacting quark matter is consistent with both the observed radio and x-ray data". However, this model leads to very high neutrino luminosity, thus high temperatures observed for neutron stars in LMXBs can hardly be explained (deep crustal heating is clearly not enough). We argue that *all* the models in which r-mode instability is suppressed by the bulk viscosity should face the same problem. Therefore we concentrate on our recent model [1] where r-mode instability is suppressed because of the resonant interaction of oscillation modes at some internal temperatures ("resonant temperatures"). Here we demonstrate that this model agrees with observations of millisecond pulsars and provide observational evidences that the coupling parameter for resonant mode interaction at low temperatures should be rather large, in agreement with theoretical expectations [1]. Furthermore, as shown in Ref. [3], in addition to millisecond pulsars, members of the new class of neutron stars – hot widows/HOFNARs – can be born in LMXBs. Recent observations confirm stability of the surface temperature of the quiescent neutron stars without power-law components [4]. This could indicate that some of those stars can, in fact, belong to hot widows/HOFNARs.

This study was partially supported by RFBR (grants 14-02-00868-a and 14-02-31616-mol-a), and by RF president programme (grants MK-506.2014.2 and NSh-294.2014.2).

References

[1] M.E. Gusakov, A.I. Chugunov, and E.M. Kantor, Phys. Rev. Lett. 112, 151101 (2014); Phys. Rev. D 90, 063001 (2014)

[2] M.G. Alford and K. Schwenzer, Phys. Rev. Lett. 113, 251102 (2014)

[3] A.I. Chugunov, E.M. Gusakov, and M.E. Kantor, MNRAS 445, 385–391 (2014)

[4] A. Bahramian et al., MNRAS 452, 3475–3488 (2015)

Author: CHUGUNOV, Andrey (Ioffe Institute)

Co-authors: Dr KANTOR, Elena (Ioffe Institute); Dr GUSAKOV, Mikhail (Ioffe Institute)

Presenter: CHUGUNOV, Andrey (Ioffe Institute)