

PHAROS Conference 2020: The multi-messenger physics and astrophysics of neutron stars



Contribution ID: 43

Type: **Oral Presentation**

Tidal deformations of hybrid stars with sharp phase transitions and elastic crusts

Monday 30 March 2020 15:15 (15 minutes)

With the advent of gravitational wave (GW) astronomy, neutron star (NS) properties, such as its equation of state, could be better constrained. This is possible thanks to measurements of their tidal deformations, which modify gravitational waveforms of the early inspiral phase of binary NSs. Our main goal here is to show that, differently from usually believed, tidal deformations of hybrid stars with sharp phase transitions and elastic hadronic crusts may differ significantly from their perfect-fluid counterparts in several cases. The analysis is carried out in the usual context of nonradial perturbations with frequencies much smaller than the stellar modes and crusts presenting elastic aspects just when they are perturbed. We show that ordinary continuity conditions for perturbations actually lead to some unconstrained crustal degrees of freedom, which could greatly influence tidal deformations for some physically reasonable range of parameters. Besides, for large enough energy jumps, tidal deformations could also be significantly affected. Therefore, tidal deformations are actually very sensitive to crust-core and perfect fluid-elastic phase properties and GW observations could also be used to constrain aspects of phase transitions, elasticity and even perturbations of hybrid stars.

Author: Dr PEREIRA, Jonas (Nicolaus Copernicus Center)

Co-authors: Prof. BEJGER, Michal (Nicolaus Copernicus Astronomical Center); Prof. ANDERSSON, Nils (University of Southampton); Mr GITTINS, Fabian (University of Southampton)

Presenter: Dr PEREIRA, Jonas (Nicolaus Copernicus Center)

Session Classification: Parallel 2A

Track Classification: Dense matter in neutron stars