Contribution ID: **330** Type: **Oral**

Analysing the sensitivity of nuclear equation of state parameters with stellar observables using f-modes oscillations in Neutron Stars

Gravitational wave(GW) astronomy has been maturing rapidly since the first detection of gravitational waves. Already, the current GW detectors have the sensitivity to detect gravitational waves emitted from neutron stars. Next-generation detectors will improve on this, resulting in a golden age of GW astronomy for Neutron Stars(NS). The observed mass of NS is limited to around two times that of the Sun. Recently, NICER provided a mass and radius measurement of an isolated neutron star through soft X-ray timing, while LIGO/Virgo measured the tidal deformability of neutron stars through gravitational waves. The goal is to use these observations to explore the interior composition of NS. To date, there is no consensus about the core constituents. Hundreds of equation of state (EoS) models for the NS core exist in the literature that can successfully connect to the global properties. One approach is constructing a spectral fit of these large collections of realistic neutron-star EoSs using few parameters. These representations can be used to extract EoS information from data obtained by X-ray and gravitational-wave observations of neutron stars. In particular, we perform a fully general relativistic study of the f-mode oscillations of NS, choosing a large set of EoS consistent with the latest astrophysical observations from NICER and LIGO. The fundamental f-modes are within the sensitivity range of the current generation of GW detectors and are correlated with the tidal deformability during the inspiral phase of binary neutron star mergers. They also carry information about the interior composition and viscous forces that bring the perturbed star back to equilibrium. The empirical relations among quasinormal oscillation mode frequencies and the compactness and tidal deformability of the NS can help us constrain the allowed EoS for the NS core. We systematically look at the correlations of mode frequencies and estimate the correlations for our spectral set of EoS. We also find out the EoS parameters that are sensitive to stellar observables, like the radius and f-mode frequencies.

Email

debanjan.gr@gmail.com

Affiliation

Birla Institute of Technology & Science Pilani, Hyderabad Campus, Secunderabad, Telangana, India

Author: Mr GUHA ROY, Debanjan (Birla Institute of Technology & Science Pilani, Hyderabad Campus, Secunderabad, Telangana, India)

Co-authors: MALIK, TUHIN; BHATTACHARYA, Swastik (BITS Pilani Hyderabad); BANIK, SARMISTHA (Birla Institute of Technology and Sciences)

Presenter: Mr GUHA ROY, Debanjan (Birla Institute of Technology & Science Pilani, Hyderabad Campus, Secunderabad, Telangana, India)

Session Classification: Gravitational Waves

Track Classification: Gravitational Waves