Contribution ID: **5** Type: **contributed talk**

Neutron skins and neutron stars in the multi-messenger era

Thursday, 24 May 2018 10:15 (15 minutes)

The historical first detection of a binary neutron star merger by the LIGO-Virgo collaboration [B. P. Abbott et al. Phys. Rev. Lett. 119, 161101 (2017)] is providing fundamental new insights into the astrophysical site for the r-process and on the nature of dense matter. A set of realistic models of the equation of state (EOS) that yield an accurate description of the properties of finite nuclei, support neutron stars of two solar masses, and provide a Lorentz covariant extrapolation to dense matter are used to confront its predictions against tidal polarizabilities extracted from the gravitational-wave data. Given the sensitivity of the gravitational-wave signal to the underlying EOS, limits on the tidal polarizability inferred from the observation translate into constraints on

the neutron-star radius. Based on these constraints, models that predict a stiff symmetry energy, and thus large stellar radii, can be ruled out. Indeed, we deduce an upper limit on the radius of a 1.4 M⊠ neutron star of R1.4 < 13.76 km. Given the sensitivity of the neutron-skin thickness of 208Pb to the symmetry energy, albeit at a lower density, we infer a corresponding upper limit of about R208 <= 0.25 fm. However, if the upcoming PREX-II experiment measures a significantly thicker skin, this may be evidence of a softening of the symmetry energy at high densities—likely indicative of a phase transition in the interior of neutron stars.

Primary author: HOROWITZ, Charles (Indiana University)

Co-authors: Dr FATTOYEV, Farrukh (Indiana University); PIEKAREWICZ, Jorge (Florida State University)

Presenter: Dr FATTOYEV, Farrukh (Indiana University)

Session Classification: Session M4