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Equation of state of superdense matter from future high-precision neutron star radius measurements

To more precisely constrain the Equation of State (EOS) of supradense neutron-rich nuclear matter, future high-precision X-ray and gravitational wave observatories are proposed to measure the radii of neutron stars (NSs) with an accuracy better than about 0.1 km. However, it remains unclear what particular aspects (other than the stiffness generally spoken of in the literature) of the EOS and to what precision they will be better constrained. In this talk, within a Bayesian framework using a meta-model EOS for NSs, we discuss what aspects of nuclear EOS can (and what can not) be better constrained by future high-precision NS radius measurements. In particular, we infer the posterior probability distribution functions (PDFs) of incompressibility K_0 and skewness J_0 of symmetric nuclear matter (SNM) as well as the slope L, curvature $K_{\rm sym}$, and skewness $J_{\rm sym}$ characterizing the density dependence of nuclear symmetry energy $E_{\rm sym}(\rho)$, respectively, from mean values of NS radii consistent with existing observations and an expected accuracy ΔR ranging from about 1.0 km to 0.1 km. Effects of high-precision NS radius measurements on determining properties of first-order hadron-quark phase transition will also be discussed.

Author: Prof. LI, Bao-An (East Texas A&M University)

Presenter: Prof. LI, Bao-An (East Texas A&M University)