Probing the Equation of State of Neutron-rich Matter

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Abstract

The nuclear symmetry energy is central to the understanding of matter found in neutron stars and in explosive stellar environments. This includes the correlation between neutron star radii and their masses, as well as the dynamics in neutron star mergers and core collapse supernovae in which many of the heavy elements are formed. Astrophysical observations have already provided some constraints on the symmetry energy at supra-saturation densities. Measurements of masses, isobaric analog states, skins, giant resonances, pygmy resonances and dipole polarizabilities of nuclei, for example, have already provided laboratory constraints on the symmetry energy below saturation density. Constraints on the EoS at more extreme densities have been probed in nuclear reactions. In my talk, I will review progress that is being made in constraining the symmetry energy and discuss prospects where future constraints at high density may be expected.