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Probing the EoS of Neutron-rich Matter

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The relationships between energy, pressure, temperature, density and isospin asymmetry $\delta=(\rho_n-\rho_p)/\rho$ within finite nuclear systems, neutron stars or core-collapse supernovae are fundamental properties of nuclear matter. It is an important objective of many laboratory experiments and astrophysical observations to describe these relationships by a nuclear Equation of State (EoS), which can be separated into a symmetric-matter contribution that would be appropriate for equal neutron and proton densities, and a symmetry-energy term, proportional to the square of the asymmetry. Nuclear systems can be momentarily produced in the laboratory at a range of densities and isospin asymmetries. Studies of such systems can provide constraints on the EoS that are relevant to the properties of nuclear matter and to dense astrophysical objects. In this talk, I will discuss some the various laboratory observables that can provide constraints on the EoS [1]. I will discuss some of the measurements that have been performed and the constraints that have been derived from them. I will also discuss some new results and the opportunities for future constraints that may be expected with planned and future experiments.

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[1] M.B. Tsang, et al., Phys. Rev. C 86, 015803 (2012).