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**Determination of experimental equation of state at low density**[1]
W.G. LYNCH, M.B. TSANG, Michigan State Univ — The density dependence of the nuclear symmetry energy governs many aspects of very neutron rich systems such as neutron stars and heavy nuclei. Many observables and experiments have been designed to probe the symmetry energy in regions below the saturation density. However, analyses of most of these measurements focused on model dependent extrapolations to the symmetry energy ($S_0$ or $J$) and its first derivative ($L$) at saturation density, $\rho_0$. We show that each observable probes densities below $\rho_0$ and illustrate an alternative approach focused on obtaining the symmetry energy at the density most accurately probed by the experiment using published constraints of ($S_0$) and ($L$). We obtain new constraints on the density dependence of symmetry energy from $0.2\rho_0$ to $0.8\rho_0$. Specifically, the new constraints at $\rho < 0.5\rho_0$ provide important benchmarks for calculations of neutron-rich matter in low-density astrophysical environments.

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