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Constraining the nonanalytic terms in the isospin-asymmetry expansion of nuclear equation of state PENGSHENG WEN, JEREMY HOLT, Texas AM University — The nuclear symmetry energy, defined as the difference of the energy per particle between the pure neutron matter and the symmetric nuclear matter at a fixed density, is crucial for understanding the properties of neutron-rich nuclei and neutron stars. The expansion of the nuclear symmetry energy in even powers of the isospin asymmetry has recently been shown to breakdown in beyond-mean-field-theory calculations of the nuclear equation of state. In this talk we will describe a new finite difference method to extract the fourth- and sixth-order regular and logarithmic contributions to the nuclear symmetry energy with microscopic chiral two- and three-body forces. We find that in general the expansion coefficients of the nonanalytic logarithm terms are larger in magnitude than those of the corresponding regular terms (even-power) for the energy from the second-order perturbation calculation. But overall, the normal terms give larger contributions to the ground state energy. The high-order terms are important to describe the proton fraction in the beta-equilibrium nuclear matter. Different chiral potentials produce different values of those coefficients, which results in uncertainties of the tendency of the proton fraction at the high-density region.

Pengsheng Wen
Texas A
M University

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