Abstract Submitted
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Auxiliary-field quantum Monte Carlo simulations of neutron matter in chiral effective field theory[1] JEREMY HOLT, AUREL BULGAC, SERGEJ MOROZ, Univ of Washington, KENNETH ROCHE, Univ of Washington and Pacific Northwest National Laboratory, GABRIEL WLAZLOWSKI, Warsaw University of Technology and Univ of Washington — We report on recent variational calculations of the neutron matter equation of state using chiral nuclear interactions. The ground-state wavefunction of neutron matter, containing nonperturbative many-body correlations and nucleon pairing, is obtained from auxiliary-field quantum Monte Carlo simulations of up to 200 neutrons interacting on a 10^3 discretized lattice with spacing 1.5 fm, consistent with a momentum-space cutoff of 414 MeV. The evolution Hamiltonian is chosen to best reproduce broad features of chiral nuclear forces while at the same time avoiding the Fermion sign problem, and to account for the presence of nuclear three-body forces it is constructed as a function of the nucleon density. Differences between this evolution Hamiltonian and the full chiral nuclear interaction are then treated perturbatively. Our results for the equation of state are in good agreement with previous auxiliary-field quantum Monte Carlo simulations which employed only chiral two-body forces at next-to-next-to-leading order (N2LO). In addition we include the effects of three-body forces at N2LO, which provide important repulsion at densities higher than 0.02 fm^{-3}, as well as two-body forces at N3LO.

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Jeremy Holt
Univ of Washington

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