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# Nuclear matter calculations with modern microscopic interactions

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## Summary

The energy per particle of symmetric nuclear matter and pure neutron matter is calculated using the many-body Brueckner-Hartree-Fock approach and employing the Chiral Next-to-next-to-next-to leading order (N3LO) nucleon-nucleon (NN) potential, supplemented with various parametrizations of the Chiral Next-to-next-to leading order (N2LO) three-nucleon interaction. Such combination is able to reproduce several observables of the physics of light nuclei for suitable choices of the parameters entering in the three-nucleon interaction. We find that some of these parametrizations provide a satisfactory saturation point of symmetric nuclear matter and values of the symmetry energy and its slope parameter L in very good agreement with those extracted from various nuclear experimental data. Thus, our results represent a significant step toward a unified description of few- and many-body nuclear systems starting from two- and three-nucleon interactions based on the symmetries of QCD.

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