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Finite particle number description of nuclear matter using the unitary correlation operator and high-momentum pair methods

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By using the unitary correlation operator and high-momentum pair methods, the nuclear equations of state for pure neutron and symmetric nuclear matter are calculated with bare Argonne V4' (AV4') nucleon-nucleon (NN) interactions. The nuclear matter is described in a finite size of cubic box with finite magic mass numbers under periodic boundary condition. The unitary correlation operator method (UCOM) for central correlation is employed to treat the short-range repulsion in the NN interaction, and the two-particle two-hole (2p2h) excitations of nucleon pair with a large relative momentum, which is called high-momentum pair (HM), are further included. With the 2p2h configurations increasing, the total energy per particle of nuclear matter is well converged under this UCOM+HM framework. Moreover, the contributions of each Hamiltonian components to the total energy per particle are obtained as well. By comparing the results calculated with the present UCOM+HM and those with other microscopic many-body theories, the fairly consistent is found between these calculations.

Abstract Type

Poster

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