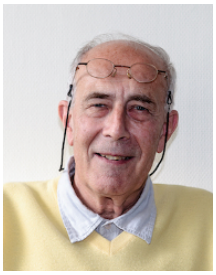

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Equation of state of superfluid neutron matter with low-momentum interactions

mardi 21 mars 2023 17:30 (1h 30m)

In this work, we calculate the ground state energy of pure neutron matter using the renormalization group based low-momentum effective interaction $V_{\text{low-}k}$ in Bogoliubov many-body perturbation theory (BMBPT), which is a perturbative expansion around the Hartree-Fock-Bogoliubov (HFB) ground state. In order to capture the low-density behavior of neutron matter, it turns out to be better to use a density dependent cutoff in the $V_{\text{low-}k}$ interaction. Perturbative corrections to the HFB energy up to third order are included. We find that at low densities corresponding to the inner crust of neutron stars, the HFB state that includes pairing is a better starting point for perturbation expansion. It is observed that including the higher order perturbative corrections, the cutoff dependence of the ground state energy is reduced.

Reference: V. Palaniappan, S. Ramanan, M. Urban, Phys. Rev. C 107, 025804 (2023)

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