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The properties of nuclear matter under the Bethe-Brueckner-Goldstone Expansion

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The accurate computation of the properties of bulk nuclear matter is a long-lasting theoretical problem in nuclear physics. The basic difficulties stem from the strong short-range repulsion between nucleons.This renders a straightforward perturbative calculation impossible. In the last few decades, different many-body perturbation theories have been devised to affront this problem. We mainly employ Bethe-Brueckner-Goldstone (BBG) theory. Recently, we investigate the properties of both symmetric nuclear matter (SNM) and pure neutron matter (PNM) under BBG expansion up to the third order. Various representative nucleon-nucleon (NN) interactions are used, such as AV18 and CDBONN as well as the recent popular chiral potentials like N3LO and N4LO. The convergence of BBG expansion are well proved with high-precision modern NN interactions. However, for SNM, no satisfactory saturation points are obtained which means strong three-body forces (TBF) are required for all considered cases.

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