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Investigations of the perturbativeness of the particle-hole channel in nuclear matter SUNETHRA RAMANAN, Centre for High Energy Physics, Indian Institute of Science, Bangalore, India, RICHARD FURNSTAHL, Department of Physics, The Ohio State University, Columbus, Ohio 43210, USA, SCOTT BOGNER, NSCL and The Department of Physics and Astronomy, Michigan State University, East Lansing, USA — Conventional nuclear many-body calculations are strongly non-perturbative in the inter-nucleon interactions. This non-perturbative behavior arises from several sources: 1. a strongly repulsive short-range interaction, 2. a tensor force, e.g. from pion exchange, which is highly singular at short-distances, 3. the presence of low-energy bound states or nearly bound states (in the S waves). The Renormalization Group based effective potentials exploit the insensitivity of the long-distance physics to the details of the short-distance physics. When these effective potentials are used in nuclear many-body calculations, it has been observed that these sources of non-perturbative behavior are density and/or resolution scale dependent. As a result, the bulk properties of nuclear matter turn out to be perturbative at least in the particle-particle channel. In this talk the question of "perturbativeness" of the particle-hole channel in nuclear matter is investigated by comparing the exact RPA correlation energy to a perturbative one. The cut-off and/or regulator dependence of these result give us an estimate of size of the missing many-body forces.

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