Effects on the saturation properties of infinite nuclear matter from the angular structure of the p-p propagator

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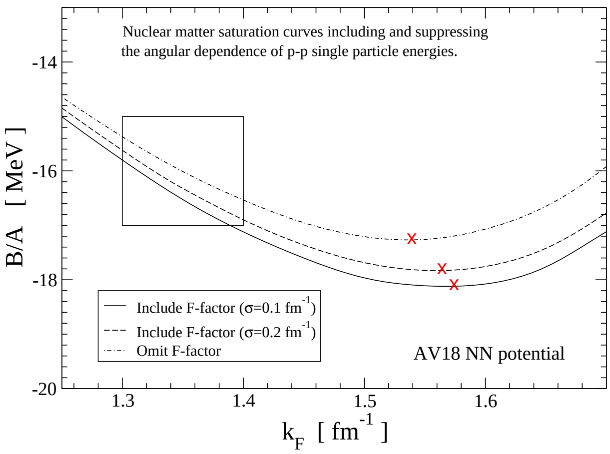
Within the framework of the Brueckner-Bethe-Goldstone (BBG) theory for infinite nuclear matter, angular correlations arising from particle-particle (p-p) propagation have been disclosed. Their account follows an exact treatment of the Pauli blocking operator on intermediate states, while retaining the the angular structure of the energy denominator. As a result, a correlation form factor emerges from the Cauchy principal-value of the particle-particle propagator, while the imaginary part becomes structurally different from those in Lippmann-Schwinger-type equations. Indeed, if $\bar{\lambda}(q) = \Delta/(\omega - e_q)$ represents the usual p-p propagator, where both Δ and e_q correspond to angle averages of the Pauli blocking and p-p single particle energies, then the explicit account of the angular dependence of the energy denominator leads to a propagator of the form

$$\lambda(q) = \bar{\lambda}(q)\, F(q) \ ,$$

with $F(q)$ a form factor which contains information on the angular structure of the p-p single particle energies. The inclusion of these features in numerical codes result in a deepening of the self-consistent solutions below the Fermi momentum, lowering the saturation point by about 0.7-0.9 MeV for the Argonne AV18[1] nucleon-nucleon potential (see Fig.). These findings, and others pertaining to the use of the BBG g matrix at low energy nucleon-nucleus scattering[2], will be discussed.



[1] R. B. Wiringa, V. G. J. Stoks, and R. Schiavilla, Phys. Rev. C 51, (1995) 38.

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