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Many-Body Factorization and Position-Momentum Equivalence of Nuclear Short-Range Correlations[1]

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In this talk I will present recent developments in the theoretical study of nucleon-nucleon short-range correlations. By combining the effective pair-based Generalized Contact Formalism with ab-initio Quantum Monte Carlo calculations of nuclei from deuteron to ^{40}Ca, the short-distance and high-momentum components of the nuclear many-body wave function have been investigated, and implications for short-range correlations have been derived. A universal factorization of the many-body nuclear wave function at short-distance into a strongly-interacting pair and a weakly-interacting residual system is observed. The residual system distribution is consistent with that of an uncorrelated system, showing that short-distance correlation effects are predominantly embedded in two-body correlations. Spin- and isospin-dependent "nuclear contact terms" are extracted in both coordinate and momentum space for different realistic nuclear potentials. The contact coefficient ratio between two different nuclei shows very little dependence upon the nuclear interaction model. These findings allow one to extend the application of mean-field approximations to short-range correlated pair formation by showing that the relative abundance of short-range pairs in the nucleus is a long-range (*i.e.*, mean-field) quantity that is insensitive to the short-distance nature of the nuclear force.

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