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Effects of Two-Nucleon Correlations in the Formation of Multi-quark Clusters in Nuclei PAUL W. WIECKI, DREW A. FUSTIN, Drake University, JAMES P. VARY, Iowa State University, ATHANASIOS N. PETRIDIS, Drake University — If the wavefunctions of two or more 3-valence-quark nucleons bound in a nucleus overlap sufficiently, quark clusters made of 6, 9 or more valence quarks may be created. The quark cluster probabilities depend on the single-body nuclear densities and correlations. The radial single-particle nuclear density is approximately calculated analytically, using a harmonic oscillator mean potential with spin-orbit coupling, or, more accurately, by numerically diagonalizing the Hamiltonian with potentials, such as Woods-Saxon, in the Independent Particle Model. These theoretical results are compared to scattering data to isolate the two-body nuclear correlations. The resulting single-particle density and two-nucleon correlation function are incorporated into a quasi-classical Monte-Carlo algorithm, using network theory, which calculates the multi-quark cluster formation probability for several nuclei. The parton momentum distributions in quark clusters differ from those in single nucleons. The calculated cumulative cluster probabilities together with appropriate parton distributions are sufficient to describe the EMC effect for all Bjorken-x, dilepton production off nuclei, and $J\Psi$ suppression.

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