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Mass and isospin dependence of short range correlations in nuclei

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The nuclear momentum distribution (NMD) is often quoted as being composed of two separate parts. Below the Fermi momentum (250 MeV/c) single nucleons move as independent particles in a mean field created by their mutual interactions. Above the Fermi momentum nucleons predominantly belong to short-range correlated (SRC) pairs with high relative and low center-of-mass momenta, where high and low are relative to the Fermi momentum. In addition to its intrinsic interest, the NMD is relevant to two-component Fermi systems, neutrino physics, and the symmetry energy of nuclear matter. The nuclear mass dependence of the number of SRC proton-proton (pp) and proton-neutron (pn) pairs in nuclei is a sensitive probe of the dynamics of short-range pairs in atomic nuclei. The amount of the number of SRC pairs in a nucleus can be investigated with electroinduced two nucleon knockout reactions ($A(e,e'NN)$ in brief). Thereby, a nucleon and its correlated partner are knocked out. We present an analysis of $(e,e'pp)$ and $(e,e'p)$ data on ^{12}C , ^{27}Al , ^{56}Fe , and ^{208}Pb in kinematics dominated by scattering off SRC pairs and compare the results with theoretical models. The nuclear mass dependence of the extracted number of pp- and pn-SRC pairs is very soft. Final state interactions of the outgoing nucleons with the $A-2$ nucleus play a significant role. The two dominant contributions are (1) attenuation through elastic and soft inelastic rescattering and (2) charge exchange reactions, changing the isospin projections of the outgoing nucleons.

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