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Hard proton knockout from ^{12}C in inverse kinematics: quasi-elastic scattering and short-range correlations

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The second Short-Range Correlations (SRC) experiment at JINR, performed in 2022, used a 44.8 GeV/c ^{12}C beam incident on a liquid-hydrogen target to study hard proton knockout from ^{12}C in inverse kinematics. The reaction products were detected with a modified BM@N spectrometer. The experimental setup was optimized for proton-proton scattering near 90° in the center-of-mass frame, corresponding to a squared four-momentum transfer of approximately $2.5 \text{ GeV}^2/c^2$.

Under these kinematic conditions, the cross section for the $^{12}\text{C}(p, 2p)^{11}\text{B}$ reaction was measured for the first time. The result was compared with single-particle distorted-wave impulse-approximation calculations incorporating well-constrained initial- and final-state interactions within the Glauber framework. The extracted spectroscopic reduction factor, $R_s = 0.96 \pm 0.01(\text{stat.}) \pm 0.05(\text{syst.})$, is consistent with results from high- Q^2 $A(e, e'p)$ measurements. It is, however, significantly larger than the reduced single-particle strengths, $R_s = 0.6$, typically obtained from low-energy quasi-elastic electron- and hadron-induced reactions. This comparison supports a scale-dependent picture of the observed single-particle strength in nuclei.

The ongoing analysis of events with an identified ^{10}B residual nucleus searches for exclusive signatures of scattering from short-range-correlated nucleon pairs in ^{12}C . The event selection is guided by detailed simulations of the SRC signal and relevant background processes. The talk will present the measured quasi-elastic cross section and spectroscopic strength, discuss the observed exclusive event topologies, and report the current status of the SRC-pair knockout analysis.

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