

Recent results in the deuteron break-up with high momentum transfer at COSY

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The hadron reactions with the production of a diproton final state, which is a proton pair $\{pp\}_s$ with small excitation energy, have been studied extensively at ANKE-COSY.

These included the break-up process $pd \rightarrow \{pp\}_s n$ at high and low momentum transfer, the $pN \rightarrow \{pp\}_s \pi$ one pion production, the $pp \rightarrow \{pp\}_s \gamma$ reaction and study of the ABC effect in the $pp \rightarrow \{pp\}_s \pi \pi$ reaction. The low excitation energy ensures the final pp -pair to be in the 1S_0 state, thus reducing the number of the partial waves accessible and simplifying the theoretical description of the process.

The hard break-up process $pd \rightarrow \{pp\}_s n$ in the colinear kinematics has been studied at ANKE in the energy range 0.5-2.0 GeV, where the main reaction mechanisms are the one nucleon exchange (ONE), Δ -excitation and the single scattering (SS). Selection of a diproton in the final state suppresses the Δ mechanism, allowing one to probe the deuteron structure at short distances. The obtained results, that included the differential cross-section and the vector analysing power, were compared to the model predictions produced with several modern NN -potentials.

Recently, this study was complemented by the data on the cross section and A_y at 353 MeV, where one expects the dominance of ONE mechanism, what provides an accurate test of the ONE+ Δ +SS model. These results, analysed together with the ANKE data on the $pn \rightarrow \{pp\}_s \pi^-$ and $pp \rightarrow \{pp\}_s \pi^0$ reactions, previously extracted at the same energy, may solve the existing ambiguity in the partial wave analysis of the pion production processes.

Primary author: Dr DYMOV, Sergey (INFN)

Presenter: Dr DYMOV, Sergey (INFN)

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