Reconstruction of Neutron Momentum in Deuteron Breakup Reaction Studies.

B. Włoch, I. Ciepał, A. Kozela

Institute of Nuclear Physics PAN, Kraków, Poland

Investigations of few-nucleon systems provide suitable testing ground for different models of the nucleon-nucleon interaction. In three-nucleon systems, at intermediate energy, below the pion production threshold, the effects of three-nucleon forces (3NF) are generally small and hard for experimental study. To take a step forward into larger system, a four-nucleon (4N) were studied, where sensitivity to the 3NF effects becomes higher. Recently, the development of the 4N system calculations became a hot topic in theoretical nuclear physics [1].

Number of experiments devoted to the study of few nucleon system dynamics were carried out at KVI with the use of the BINA detector and 160 MeV deuteron beam on deuteron or proton targets. A set of techniques aimed at the direct identification of neutrons in BINA detector setup is being developed. Using time of flight method and signal asymmetry from a long scintillator allows one to reconstruct neutron momentum and reach into a phase-space regions, which has not been explored yet due to the detector acceptance. Having determined the differential cross sections for three-body ^{2}H(d,dn)p breakup reaction with the neutron momentum reconstructed one can compare it with already analysed ^{2}H(d,dp)n channel [2] at the same kinematic conditions and directly study the Coulomb effects and possible charge symmetry breaking, like it was suggested in [3].

In this contribution I will present crucial steps of the analysis covering neutron identification, position and energy reconstruction as well as data consistency checks.

Bibliography

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[2] G. Khatri et al., Acta Phys. Pol., B 47 (2016) 411
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