

Experimental study of three-nucleon dynamics in the dp breakup collisions using the WASA detector

Saturday, 4 June 2016 16:00 (1:30)

Collaboration

WASA-at-COSY

Abstract content

An experiment to investigate the ${}^1\text{H}(d, pp)n$ breakup reaction using a deuteron beam of 340, 380 and 400 MeV and the WASA detector has been performed at the Cooler Synchrotron COSY Jülich. The studied energy region, below but close to a pion production threshold, may provide information on various aspects of nuclear interactions, in particular on relativistic effects and their interplay with the three nucleon force ($3NF$). Calculations including various pieces of dynamics like $3NF$ [1], long-range Coulomb interaction [2] or relativistic effects, predict their influence to reveal with different strength at different parts of the breakup reaction phase space. Cross section observables are very sensitive to all of these effects. The calculations in relativistic regime have recently been performed for the ${}^1\text{H}(d, pp)n$ breakup reaction at the beam energies of 340, 380 and 400 MeV [3], clearly demonstrating importance of relativistic description at these energies. The almost 4π geometry of the WASA detector gives an unique possibility to study interplay of all the effects in the large part of phase space. Currently, the data analysis is focused on the proton-proton coincidences registered in the Forward Detector with the aim to determine the differential cross sections on dense angular grid of kinematical configurations defined by the emission angles of the two outgoing protons: two polar angles θ_1 and θ_2 (in the range between 4° and 18°) and the relative azimuthal angle ϕ_{12} . Elastically scattered deuterons are used for precise determination of the luminosity. The main steps of the analysis, including energy calibration, PID and studies of efficiency, and their impact on final accuracy of the result, will be discussed.

[1] W. Glockle et al., Phys. Rep. 274 (1996) 107.

[2] A. Deltuva et al., Phys. Rev. C72 (2005) 054004.

[3] H. Witala, private communication.

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Session Classification : Poster Session