Contribution ID: **234** Type: **Oral Presentation**

Differential Cross Section for Proton Induced Deuteron Breakup at 108 MeV

Tuesday 23 September 2025 15:35 (20 minutes)

Studies of few-nucleon systems form the basis for understanding nuclear interactions and properties of nuclei. The very accurate theoretical calculations for three-nucleon systems should be confronted with a rich set of precise experimental data.
For this purpose, the BINA (Big Instrument for Nuclear-polarization Analysis) detection system has been installed at CCB (Cyclotron Center Bronowice) [1]. The BINA setup is designed to study the elastic and breakup reactions at intermediate energies. It consists of the liquid target facility and the low threshold detector covering nearly 4π solid angle, enabling studies of almost full phase space of these reactions [2,3].
The part of the results of the first experimental run of proton-induced deuteron breakup at a beam energy of 108 MeV have been already published [4, 5]. These data will be supplemented with cross section for breakup reaction in configurations near FSI (Final State Interaction) of pp pairs. The data are normalized to the known cross section for proton-deuteron elastic scattering [6]. Differential cross section determined for a set of over 200 kinematic configurations of proton pairs registered in the forward part of BINA will be compared to state-of-the-art theoretical calculations to study the role of the Three Nucleon Force, Coulomb, and relativistic effects.
Moreover, the research was extended by introducing a new detector, which enabled the determination of pn pairs from the breakup reaction and their direct comparison with the previously determined pp pairs for selected FSI configurations. The data are important for testing the state-of-the-art calculations and the potentials developed within Chiral Effective Field Theory.

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Session Classification: Few-Body Systems

Track Classification: Few-Body Systems