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Experimental studies of the deuteron-proton breakup reaction.

Scattering in three-nucleon systems at intermediate energies atracts attention due to sensitivity of the observables to subtle effects of the dynamics beyond the pairwise nucleon-nucleon force, so-called three nucleon force (3NF). Recently, the data for nucleon-deuteron collisions have also been considered as a tool for fine-tuning of the 3N Hamiltonian parameters in Chiral EFT. Deuteron breakup in collision with proton is characterised with a 3-body final state, meaning the continuum of kinematic configurations. This creates the conditions for studying contributions to the reaction dynamics (3NF, Coulomb interaction, relativistic effects) in the areas of their greatest visibility, or fit the ChEFT parameters to the large and diverse database. A series of experiments studied the dp breakup with the use of large acceptance detectors: SALAD and BINA at KVI Groningen and CCB PAS Krakow, GeWall and WASA at FZ-Juelich. Differential cross section and, in some cases, vector and tensor analyzing powers were measured over a significant part of the reaction phase space. The results of such experiments conducted over a wide range of beam energies, between 50 and 200 MeV/nucleon, will be discussed.

Polarization observables reveal strong sensitivity to details of the nuclear potential. The breakup reaction provides an opportunity to study many polarization observables beyond the analyzing powers, but the existing database is very limited in this regard. The new project to measure proton polarization induced in the breakup reaction at proton beam energy of 160 MeV has been proposed at CCB PAS Krakow. For this purpose, a polarimeter was designed that, in conjunction with the existing BINA detector, would be used to detect protons from the breakup reaction and determine the induced polarization for a set of kinematic configurations. The current status of the project will be presented.

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