Few-Nucleon System Dynamics Studied via Deuteron-Deuteron Breakup Reactions at 160MeV.

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Few-nucleon systems are basic laboratories to study nuclear forces. Among them, the system composed of three nucleons (3N) is the simplest and non-trivial environment, in which models of nuclear interaction can be tested. Nucleon-nucleon interaction is here dominant; there are, however, reasons to assume existence of additional dynamics, referred to as the three-nucleon force (3NF) [1]. Nowadays, there are many theoretical predictions based on solutions of Faddeev equations with realistic potentials combined with models of 3N forces (like TM99 or Urbana IX). Recently, the Coulomb interaction has also been included into calculations within the coupled-channel framework [2]. In parallel, the theoretical approach based on dynamics generated via Chiral Perturbation Theory (ChPT) [3] is being gradually developed. For verification and further developments of 3NF models, possibly large basis of precise data is necessary.

We have performed an experiment at KVI laboratory (The Netherlands) with use of the BINA detector and 160 MeV deuteron beam impinging on deuteron target. Aim of the measurement was to determine the differential cross-sections for three- (dd→dpn) and four-body breakup (dd→ppnn) reactions. The experiment is a continuation of previous very successful measurements at other medium energies [4-8]. Simultaneously the elastic dd process was measured for purpose of the cross section data normalization. The apparatus is a new-generation construction which offers access to almost full phase-space of the studied breakup process, well suited for such experiments at intermediate energies.

The preliminary results covering test of data consistency, geometry cross-check, calibration, identification of the reaction channels and precision of kinematical reconstructions, as well as sample distributions of differential cross section will be presented.

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