Deuteron break-up $p + d \to (pp)_s + n_{backward}$ with a forward emitted S-wave proton pair at proton energies of 0.6 GeV - 1.9 GeV.

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The proton-deuteron backward elastic scattering $pd \to dp$ is a long-explored topic with the goal to study the short-range structure of the deuteron and of nucleon-nucleon scattering. Deuteron break-up in collinear kinematics close to that for the $pd \to dp$ process may give a new additional information. However, it has never been studied exclusively at intermediate energies. The break-up channel $p + d \to (pp)_s + n_{backward}$ (1) in which a proton pair $(pp)_s$ is emitted forward in an S-wave state attracts particular attention. As shown in ref.[1], a significant suppression of the Δ-excitation in the intermediate state (Δ-mechanism of the process) should occure in that case. Hence the one-nucleon-exchange (ONE) mechanism very important in a wide range of the incident energies from 0.5 to 2.5 GeV, except for energies of about 0.8 GeV, where a node in the half-off-shell amplitude of the NN($^1S_0$)-scattering should exist. Therefore, process (1) is more sensitive to the short-range NN-properties than the $pd \to dp$ scattering, where both the Δ-mechanism and D-wave of the final deuteron wave function obscure the effect. The ONE+Δ+(Single Scattering) model [2] predicts an energy dependence of the cross section with a minimum around 0.8 GeV and a plateau in the 1.3 - 2.5 GeV range [3]. To check this prediction we have performed cross section measurements at the ANKE spectrometer [4] of COSY-Jülich at beam energies: 0.6; 0.7; 0.8; 0.95; 1.35 and 1.9 GeV. Proton pairs produced in the interaction of the stored beam with the deuterium cluster-jet target [5] passed the magnetic field of the spectrometer and were recorded in MWPCs for track reconstruction and a scintillation hodoscope for triggering and particle identification.

The 3-momentum of each proton was determined and the pairs with relative energy in their c.m.s of less than 3 MeV were selected. Cross sections for pair emission with c.m. polar angles of its total momentum in the range $0° - 8°$ have been obtained. The experiment and results will be discussed.

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