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Invariant variables for breakup reaction

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Collaboration

Abstract content

A large set of high precision data of $^1H(\vec{d}, pp)n$ reaction at beam energy of 130 MeV were collected with SALAD and GeWall detectors. The polarized deuteron beams were produced with the use of the ion sources of the AGOR (KVI Groningen, The Netherlands) and COSY (IKP FZ-Juelich, Germany) accelerators, respectively.

The $\vec{d}p$ breakup reaction is one of the simplest processes to study dynamics of three nucleons. The process is characterised by a rich kinematics of the final state what makes it selective regarding the employed model of interaction. Experiments with polarized beams (or targets) give opportunity to study a large number of observables (e.g. analyzing powers) sensitive to dynamical components, which are hidden in the unpolarized case. All studied observables (e.g. cross section, vector and tensor analysing power) are interesting for testing theoretical calculations based on various approaches to model the interaction in few-nucleon systems.

The kinematics of breakup reaction can be described in many different ways, e.g. using particles energies and their emission angels, with Jacobi momenta or in terms of invariant variables. In this work we concentrate on the Mandelstam variables which have been rewritten in a convenient way for breakup reaction (three-nucleon in final state).

The experimental data will be transformed to the variables based on Lorentz-invariants and compared with modern theoretical calculations. The main purpose of such analysis is to check its applicability for studies of various dynamical effects. In particular, studies in terms of invariant variables can encompass and treat in a consistent way very rich data sets collected for breakup reaction at various energies.

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