Determination of the Azimuthal Asymmetry of Deuteron Photodisintegration in the Energy Region E_γ=1.1—2.3 GeV

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The deuteron photodisintegration is a benchmark process for the investigation of the role of quarks and gluons in nuclei. Existing theoretical models of this process describe the available cross sections with the same degree of success. Therefore, spin-dependent observables are crucial for a better understanding of the underlying dynamical mechanisms. However, data on the induced polarization (Py), along with the polarization transfers (Cx′ and Cz′), have shown to be insensitive to differences between theoretical models. On the other hand, the beam-spin asymmetry Σ is predicted to have a large sensitivity and is expected to help in identifying the energy at which the transition from the hadronic picture of the deuteron (well established in photodisintegration for energies below ~1 GeV) to the quark-gluon picture (expected to hold for energies above several GeV) takes place.

Here, we present the results for the beam-spin asymmetry of deuteron photodisintegration for photon energies between 1.1--2.3 GeV and proton center-of-mass angles between 20--160 degrees. The data were taken with the CLAS detector at the Thomas Jefferson Laboratory during the g13 experiment. Photons with linear polarization of ~75% were produced used the coherent bremsstrahlung facility in Hall B. Our work shows that the collected data provide the kinematic coverage and statistics needed to test the QCD based models at hand.