Beam and Beam-Target Asymmetry for $\gamma n(p) \to \pi^- p(p)$ in N^* Resonance Region

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Abstract

The excited-state spectrum of the nucleon is a complicated overlap of many resonances that must be disentangled through multipole analyses of reaction amplitudes. Meson photoproduction, which has been a fruitful probe of N^* structure, requires data on many different polarization observables to constrain its four complex amplitudes. While considerable data has been accumulated with proton targets, comparatively little information is available from neutron targets. Recently, the first beam-target helicity asymmetries with circular beam polarization in the $\gamma n(p) \to \pi^- p(p)$ reaction have been reported in Physical Review letters 118, 242002 (2017). This talk presents a parallel analysis from the same experiment of the beam-target double-polarization observable "G" with linearly polarized beam for the same reaction. Linearly polarized photons and longitudinally polarized deuterons in a solid hydrogen deuteride (HD) target were used with the CEBAF Large Acceptance Spectrometer (CLAS) at Jefferson lab (JLab). Data are combined to extract the beam (Σ) and beam-target (G) asymmetries. Preliminary results for the Σ observables are consistent with measurements from G11 experiment at JLab and theoretical model predictions. The energy and angular dependence of G will be reported, together with comparisons to predictions from existing partial wave analyses.