

CEBAF EXPERIMENT 89-019

Measurement of Proton Polarization in the $d(\gamma, p)n$ Reaction

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We plan to measure proton polarizations in the reaction $d(\gamma, \vec{p})n$ for photon energies from 0.8 to 2.8 GeV and a range of angles. This measurement is an extension of cross section experiments NE8 and NE17 at SLAC, and 89-012 at CEBAF Hall C.

Existing cross section data from SLAC experiments NE8 and NE17 exhibit an energy dependence near 90°_{cm} consistent with that expected for asymptotic scaling, for photon energies above about 1.3 GeV. The energy dependence is not reproduced over the range of the data by conventional nuclear calculations. Similar behavior has in the past been taken as evidence for the applicability of a quark / gluon picture of the reaction, as can be calculated within the framework of perturbative quantum chromodynamics. However, it has been estimated that the theory should not be applicable within the kinematic range of the data.

The purpose of the present work is to provide proton polarization measurements, as a more sensitive test of the reaction mechanism. The asymptotic scaling picture requires zero proton polarization, whereas rescattering and resonance excitation in nuclear models generally results in large negative polarizations.

This experiment will use bremsstrahlung photons produced from the CEBAF electron beam. The photons will irradiate a deuterium target, and protons will be detected in the Hall A hadron spectrometer. Previous experiments have shown that backgrounds are small, for data obtained near the bremsstrahlung end point.