CEBAF EXPERIMENT 89-033

Measurement of Recoil Polarization in the ^{16}O (e,e'p) Reaction with 4 GeV Electrons

C.C. Chang, C. Glashausser, S. Nanda,
and J. W. Van Orden, Spokespersons

This is an initial testing ground for the measurement of polarization observables in electron scattering on nuclei; it is one of the few experiments on a target heavier than helium proposed at this time for CEBAF. All three components of the polarization of the recoil proton will be measured for proton recoil momenta up to 300 MeV/c at a constant momentum transfer of 500 MeV/c using the focal plane polarimeter in the proton arm of the Hall A spectrometers. Funding has been obtained for this polarimeter from the National Science Foundation; it is currently under construction at Rutgers and William and Mary. The aim of the experiment is a detailed understanding of the reaction mechanism for quasifree electron scattering.

The ability to knock out a spinning proton from well inside the nucleus and observe its polarization outside with precision and accuracy is a most appealing feature of CEBAF. Calculations indicate that such observations should yield insight into many features of the scattering. Anomalies in the Coulomb sum rule and in the ratios of the response in the longitudinal and transverse channels have been of concern for a long time now, and a number of exotic explanations proposed. We are following here a more conservative approach, in which we examine closely a number of observables never before measured to isolate different features of the reaction and then determine whether theory is adequate to account for them. Such an approach is particularly important in examining claims for color transparency at higher energies and momentum transfers. This is a final state interaction effect, for which polarization measurements are particularly sensitive indicators. The difference between plane wave and distorted wave calculations is particularly marked for the normal component of the polarization which is identically zero under the present conditions without distortions. Large effects of the use of Dirac optical potentials instead of the Schrodinger optical potentials have also been predicted. Successful interpretation of the present results will be a strong basis for extension to the higher energy regime.