

Abstract

We propose to measure the polarization transfer (P'_x and P'_z) and induced polarization P_y in the $^{16}\text{O}(\vec{e}, e'\vec{p})$ reaction at a Q^2 of 0.8 (GeV/c)^2 . Recent measurements have shown that the full relativistic distorted wave impulse approximation model of Udias *et al.* could become a “standard model” for the $(e, e'p)$ reaction. The $^{16}\text{O}(e, e'p)$ data from Jefferson Lab experiment 89-003 gave evidence of the need for full relativistic calculations which include dynamical enhancements of the negative energy components of the relativistic wave functions (spinor distortions). The conclusion is based primarily on a comparison of the measurements of A_{LT} at high missing momentum with the predictions of the Udias model. Because A_{LT} is not sensitive to spinor distortions at low missing momentum, this supplies only a limited test. The Udias calculations also provided a significantly improved description of polarization transfer data for $^4\text{He}(\vec{e}, e'\vec{p})^3\text{H}$. The remaining discrepancies with the latter data provide a tantalizing indication of a possible modification of the nucleon form factors, in agreement with the density dependent form factor modifications predicted by a quark-gluon coupling (QMC) model of Lu *et al.* This finding needs to be explored further in a heavier nucleus.

The $^{16}\text{O}(\vec{e}, e'\vec{p})$ reaction provides both the denser nuclear environment and the sensitivity to spinor distortion at low missing momentum, where the reaction mechanism is better understood. Polarization observables are sensitive to the off-shell current operator and thus provide an excellent probe of medium-dependent form factors. The high precision data for several states with very small overall errors will provide a benchmark for comparison with theory.

The data of this experiment are a necessary complement to the cross section data E89-003 and the recently approved E00-102; together, they will provide the most extensive set of quasi-elastic electron scattering measurements on any complex nucleus. This measurement will provide a stringent test of both the best relativistic model available and of the QMC predictions for medium modification of the proton form factors. We request 27 days of beam time.