TJNAF Experiment E00-112

Exclusive Kaon Electroproduction in Hall B at 6 GeV

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This experiment is designed to study strangeness electroproduction via the $ep \rightarrow e'K^+Y$ ($Y = \Lambda, \Sigma^0$) reactions at a beam energy of 6 GeV using the CLAS spectrometer in Hall B at Jefferson Laboratory. At this beam energy with CLAS at its maximum magnetic field setting, the physics of this process can be studied over the range of four-momentum transfers Q^2 from 1.5 to 5 $(\mathrm{GeV/c})^2$ and $|t|$ up to 5 $(\mathrm{GeV/c})^2$, while allowing reconstruction of invariant energies W up to 3.0 GeV. This will allow for study of open strangeness production at energies well above the resonance region, while also providing substantial overlap with the kinematic coverage of Hall B experiments E93-030 and E99-006 at 4 GeV. These lower energy experiments in the CLAS strangeness physics program span Q^2 from 1.0 to 2.5 $(\mathrm{GeV/c})^2$, $|t|$ up to 3 $(\mathrm{GeV/c})^2$, and W up to 2.4 GeV.

The measurements of experiment E00-112 will extend the kinematic range over which the production mechanism and dynamics for s-channel N^* baryon and t-channel meson exchange are probed. The experiment is designed to measure differential cross sections, along with the induced and transferred polarization components for both the ground state Λ and Σ^0 hyperons. The data acquired will allow for detailed tests of hadrodynamic models, QCD inspired constituent quark models, and models based on Reggeon exchange. The intercomparison of data and theory is important to address for a better understanding of the reaction mechanism of open strangeness production.

While these data are essential to improve existing low-energy theoretical descriptions of the elementary strangeness production process, the extension of strangeness production studies to higher beam energies will also help to elucidate the transition from hadronic to quark-gluon degrees of freedom. This will allow for tests of the validity of non-perturbative QCD in these kinematics. Additionally, the higher energy data will allow for exploration of the wavefunction of the $s\bar{s}$ quark pair created through the color flux-tube breaking in the intermediate state and possible access to the underlying quark-distribution functions of the proton.