Abstract

We propose to measure the kaon electroproduction cross section, picking specific reaction channels via a separation of response functions in the exclusive H(e,e'K^+) reaction. Current experimental knowledge is unsatisfactory with no systematic separation of the response functions. Multi-parameter models based on hadron dynamics (QHD) have attempted to explain the existing data, but a wider kinematical region has to be accessed in order to constrain the models and the g_{KNY} coupling constants.

Over a range in Q^2, W, and t, the separation of three of the four unpolarized response functions will be performed. The longitudinal and transverse response functions will be separated through the detection of kaons along the direction of the virtual photon, where only these terms contribute to the cross section. For each Q^2 kinematic three different points in t will be measured. From the extrapolation in t of the longitudinal term, the electromagnetic form factor of the kaon will, in principle, be determined. The separation of the longitudinal-transverse interference term will also be performed for selected kinematics. In a quark model description, the measurement of the longitudinal-transverse interference term is sensitive to the magnitude of the quark transverse momentum. The t-dependence of the full cross section will also be investigated to enlarge the accessed kinematical region, reaching large values of $|t|$ covering the transition from a semiphenomenological description in terms of mesons and baryons to a pQCD-based description in terms of quarks (or diquarks).

The square of the 4-momentum transferred by the electron will cover the range $1.5 \leq Q^2 \leq 3$ (GeV/c)^2, the hadronic 4-momentum transfer squared will cover the range $-0.3 \geq t \geq -3.0$ GeV^2, and the invariant mass will cover the range $1.8 \leq W \leq 2.2$ GeV. The measured cross sections will be compared to both hadronic and subnucleonic reaction models. This will considerably extend the present electroproduction data. Incident beam energies from 3.6 to 6 GeV will be utilized, along with the Hall A spectrometers. It should be emphasized that with 560 hours, this experiment will provide a consistent data set in a wide region of Q^2, W, and t, which cannot be accessed elsewhere at CEBAF.