

Polarization Transfer in Kaon Electroproduction

Abstract

This proposal describes an experiment to study the mechanism of polarization transfer in kaon electroproduction. The physics goal is to extract information about the hyperon electromagnetic form factor at large momentum transfer. In the electromagnetic production of kaons from a proton, the associated Λ -hyperon will be identified by missing mass in the reaction, and the decay proton from the hyperon will be detected. Since the Λ -hyperon is self-analyzing, a determination of the proton momentum vector can be used to measure the hyperon spin polarization vector. Thus the experiment will serve to elucidate the process of polarization transfer from the polarized electron to the Λ -hyperon.

The polarization transfer response functions, $R_{TT'}$ and $R_{LT'}$ will be determined for squared momentum transfer, Q^2 , from 0.4 to 2.1 $(\text{GeV}/c)^2$, with kaons (hyperons) detected along (opposite to) the momentum transfer direction (in the center of mass frame). In the laboratory frame, both kaon and hyperon momentum vectors lie parallel to the momentum transfer direction. The experiment will be carried out in Hall C using standard equipment; the HMS and SOS with the same detector packages as were used in the kaon electroproduction experiments which were completed in the fall of 1996, and the cryogenic (unpolarized) hydrogen target.

The response functions $R_{LT'}$ and $R_{TT'}$ exhibit sensitivity to the Λ -hyperon electromagnetic form factor at nonzero Q^2 ($Q^2 > 0$). Presently, this is the best way to measure hyperon form factors for large space-like momentum transfer. At the higher momentum transfers, the experimental data can shed light on the hyperon spin structure.