Electroproduction of K^+ mesons from the proton

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The CLAS detector [1] has measured a variety of reactions produced by electron scattering from a hydrogen target. Here, we focus on events where a K^+ has been detected and the scattered electron is used to reconstruct the final state of a Λ or Σ^0 by missing mass. CLAS has a large acceptance, so the angle ϕ between the electron scattering plane and the K^+-hyperon plane is measured for essentially the entire range of θ_K, the angle of the kaon measured from the virtual photon direction. Results will be presented for the unseparated cross section $\sigma_U = \sigma_T + \epsilon\sigma_L$ and the interference structure functions σ_{TT} and σ_{LT} for a beam energy of 2.56 GeV. The θ_K dependence of these cross sections show a marked difference in the reaction mechanisms, where Λ production has a large component from t-channel diagrams and Σ production has an angular dependence that suggests s-channel dominance. The W dependence of the data will be presented and compared with a variety of theoretical predictions based on either hadrodynamic models, where the intermediate N^* resonances are modeled explicitly, or Regge trajectories, which have relatively few free parameters. We find that the new high-statistics data from CLAS provides significant constraints on the theoretical models, and will aid in understanding the role of old and new N^* resonances within the context of a given model.

Additional information on the reaction mechanisms of hyperon production, especially in the t-channel, can be obtained from production of K^* vector mesons. Virtual K^* mesons play a vital role in K^+ production mechanisms, especially at forward angles. By direct measurement of K^* production, the coupling constants for virtual K^* diagrams are constrained. Cross sections for K^{0*} production have not been reported previously and data from CLAS data will be presented along with theoretical model predictions.

References

[1] W. Brooks *et al.*, Nucl. Phys. **A684** (2001) 1077.