

Exclusive π^0 electroproduction in the resonance region.

N. Markov, K. Joo
University of Connecticut
M. Ungaro
Jefferson Lab
L.C. Smith
University Of Virginia
V. Mokeev
Jefferson Lab

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Abstract

The exclusive electroproduction process $ep \rightarrow e'p'\pi^0$ was measured in the range of the photon virtuality $Q^2 = 0.4 - 1.0 \text{ GeV}^2$, and the invariant mass range of the $p\pi^0$ system of $W = 1.1 - 1.8 \text{ GeV}$. For the first time, these kinematics are covered in exclusive π^0 electroproduction off the protons with nearly complete angular coverage in the $p\pi^0$ center of mass system with extremely high statistics. Cross section and beam spin asymmetry were measured and structure functions $\sigma_T + \epsilon\sigma_L$, σ_{TT} , σ_{LT} and σ'_{LT} were extracted via the fitting of the ϕ^* dependance. Comparison between the experimental results on exclusive structure functions $\sigma_T + \epsilon\sigma_L$, σ_{TT} , σ_{LT} and evaluations within the JLAB/YerPHY unitary model revealed the data sensitivity to the variations of the electroexcitation amplitudes for the nucleon resonances $N(1685)5/2^+$, $\Delta(1620)1/2^-$, and $\Delta(1700)3/2^-$. Combined studies of $\pi^0 p$, $\pi^+ n$ and $\pi^+ \pi^- p$ electroproduction off protons data from CLAS at $W > 1.6 \text{ GeV}$ will provide the first results on the high lying N^* and Δ^* electrocouplings at $Q^2 < 1.0 \text{ GeV}^2$ for all excited nucleons with substantial decays to the $N\pi$ final states.