Exclusive π^- Electroproduction off the Neutron in Deuterium in the Resonance Region

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Abstract

The nucleon resonance (N^*) studies is crucial to our understanding of the structure and interaction of hadrons. Although the excited states of the proton have been studied in great detail, there are very few data available for the neutron excitations because of the inherent difficulty in obtaining a free neutron target. The deuterium target, as in the "e1e" run with CLAS, is the best alternate target for neutrons. Furthermore, the "e1e" run, that includes both a hydrogen and deuterium target run period, allows a combined analysis of pion electroproduction off the free proton, bound proton, and bound neutron. It hence will provide the experimentally best possible information about the off-shell and final state interaction effects in deuterium, which must be considered in order to extract the neutron information. The goal of my research is to provide the exclusive $\gamma^*(n) \to \Delta^0 \to p^+\pi^-$ reaction cross section from which the n-N^* transition form factors will be extracted by phenomenological models. The good agreement of the inclusive cross section off deuterium with the world data not only verified that the electron identification and fiducial cut are proper, but also confirmed that the normalization used in the exclusive channel ($\gamma^*(n) \to \Delta^0 \to p^+\pi^-$) is right. Furthermore, I could also verify that the Cherenkov detector inefficiencies encountered during the hydrogen target part of the CLAS "e1e" run are not occuring in the deuteron part. This presentation will focus on data quality check, particle identification, fiducial cuts, momentum corrections, and potentially preliminary exclusive cross section results.