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(G*) Charged pion electroproduction reaction studies at Jefferson Lab

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There are many open questions in the field of hadronic structure, as the properties of constituent quarks and gluons (e.g. spin and mass) do not explicitly add up to the properties of hadrons. The pion is a simple hadron, consisting of only two valence quarks (up and down), which makes it an ideal candidate for studies of hadronic structure. The exclusive pion electroproduction reaction, with a ground state nucleon $p(e, e'\pi^+)n$ has been studied in detail at low momentum transfer (Q^2). The longitudinally polarized virtual photons dominate the cross-section of this reaction at low $-t$. A number of physical observables such as form factors and Generalized Parton Distributions (GPDs) can be extracted from this cross-section using models. Experimental Hall C at Jefferson Lab is the only active facility in the world that can host high precision studies of exclusive pion electroproduction reactions. With the 12 GeV upgrade, it allows the extraction of pion form factor at moderate Q^2 , as well as giving a unique opportunity to study higher resonance of pion electroproduction reaction $p(e, e'\pi^+)\Delta$. This research aims to measure the separated cross-section of the ground state reaction, as well as first measurement of the higher resonance reaction. The comparison of separated cross-section of two reactions will be invaluable for our understanding of hadronic structure.

Keyword-1

Hadron Structure

Keyword-2

QCD Physics

Keyword-3

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