Contribution ID: **43** Type: **Contributed Oral**

Probing Hadron Structure with Exclusive Pion Production Reaction at Jefferson Lab

Saturday, 14 February 2026 09:15 (15 minutes)

One of the central challenges in modern physics is to unravel hadronic structure, as the strongly coupled, non-perturbative nature of QCD at low energies makes it difficult to derive the observed properties of hadrons from their underlying quarks and gluons. The pion (π-meson) is the lightest quark system, and its properties are deeply linked to our understanding of how quarks are confined in hadronic matter. The pion form factor (F_π) is a key observable that can be accessed through the exclusive pion electro-production reaction $p(e, e'\pi^+)n$. The Pion-LT experiment was conducted to measure F_π to high Q^2 across a broad kinematic range at the Thomas Jefferson National Accelerator Facility (JLab) in Newport News, Virginia, USA. This experiment aims to measure the separated longitudinal (σ_L) and transverse (σ_T) cross-sections using the unique Rosenbluth LT-separation technique to extract F_π with high precision. In this talk, I will present preliminary results for LT-separated cross-sections at $Q^2 = 3.85$ GeV measured using the Rosenbluth technique, on behalf of the PionLT Collaboration.

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Session Classification: QCD

Track Classification: QCD and Hadrons