

From Spin to Structure: Beam Single-Spin Asymmetry in Exclusive Pion Production

Friday, 17 February 2023 11:30 (15 minutes)

The KaonLT/PionLT Collaboration probes hadron structure by measuring deep exclusive meson production reactions at Jefferson Lab. A set of high momentum, high resolution spectrometers in Hall C allow for precision measurements of cross sections at different kinematics, from which form factors and other observables can be extracted. One possible measurement from these reactions is the beam single-spin asymmetry. This asymmetry measures the fractional difference in yield caused by an electron of positive or negative helicity, and is caused by interference between longitudinally and transversely polarized virtual photons. Measuring the asymmetry probes the Generalized Parton Distributions (GPDs) of the proton, which describe its three-dimensional parton and spin structure. In this work, the asymmetry is studied for the $p + e \rightarrow e' + \pi + n$ data from the recent KaonLT experiment. The asymmetry is calculated for a photon virtuality Q^2 in the range between 2 and 5.5 GeV^2 , above the resonance region ($W > 2 \text{ GeV}$), and the dependence of the asymmetry on the four-momentum transfer to the target t is determined. These results are then compared to theoretical models to determine what information can be extracted about the GPDs of the proton.

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Session Classification: February 17 Morning Session

Track Classification: QCD and Hadrons