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Multi-Dimensional studies of the $ep \rightarrow e'p' + X$ Single Spin Asymmetries

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Studies of the properties and the azimuthal distribution of hadrons produced in the Target Fragmentation Region serve as a test of our complete understanding of the different mechanisms in the SIDIS production of hadrons and provide additional information on the QCD dynamics that are not accessible with single hadron production in the Current Fragmentation Region. We present first Multi-dimensional studies of beam SSA for semi-inclusive protons ($ep \rightarrow e'p' + X$), produced in the TFR, that can be related to higher twist Fracture Functions describing the F_{LU} structure function. Such measurements were performed with the CLAS12 detector in Hall B at Jefferson lab using a longitudinally polarized 10.6-GeV electron beam on an unpolarized hydrogen target. Preliminary results of this study captured the transition between the TFR and CFR regions showing a clear sign change of the SSA for protons produced in the backward region in CM, dominated by TFR protons providing a criteria for experimental separation of CFR and TFR regions. These findings are opening a new avenue for studies of nucleon structure.

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