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Azimuthal distributions in unpolarized SIDIS

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Studies of spin-azimuthal asymmetries in semi-inclusive production of hadrons have been widely recognized as key objectives of the JLab 12 GeV upgrade and a driving force behind the construction of the Electron Ion Collider. Various assumptions involved in preliminary extraction of underlying transverse momentum dependent partonic distributions (TMDs) from available data, have yet to allow credible estimates of systematic errors associated with those assumptions.

One of the challenges in extraction of underlying transverse momentum dependent partonic distributions from precision measurements of hard scattering processes is the clear understanding of the QCD fundamentals of quark-gluon correlations and higher twist effects.

In recent years it became clear, that observables which are constructed by taking ratios are not ideal grounds for studies of TMDs, and in particular transverse momentum of TMDs and their evolution effects, which are the most intriguing part of 3D non-perturbative partonic distributions. The high-statistics data samples from HERMES and COMPASS collaborations have been used in phenomenological analyses to extract information on the flavor dependence of unpolarized TMD distribution and fragmentation functions. The hadron multiplicities study is now being extended to a multi-dimensional analysis, in particular looking to the transverse momentum dependence and its correlations

with other kinematic variables, including the azimuthal angle between lepton scattering and hadron production planes.

In this contribution we present recent studies of azimuthal dependences of charged pion distributions in SIDIS using the CLAS data at 5.5 GeV, and comparison with measurements performed at higher energy by the HERMES collaboration.

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