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Studies of 3D PDFs with CLAS12

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The quark-gluon dynamics manifests itself in a set of non-perturbative functions describing all possible spin-spin and spin-orbit correlations. The Transverse Momentum Dependent parton distributions (TMDs) and Generalized Parton Distributions (GPDs) carry information not only on the longitudinal but also on the transverse momentum and position of partons, providing rich and direct information on the orbital motion of quarks. Studies of the 3D PDFs are currently driving the upgrades of several existing facilities (JLab, COMPASS and RHIC), and the design and construction of new facilities worldwide (EIC, FAIR, and JPARC).
Although the interest in GPDs and TMD PDFs has grown enormously, we are still in need of fresh theoretical and phenomenological ideas.

The main remaining challenges are extractions of actual 3D PDFs from different spin and azimuthal angle dependent distributions in a reliable and model independent way. In this talk, we present an overview of current status and future measurements of the 3D structure of the nucleon using exclusive and semi-inclusive production of photons and hadrons with the CLAS12 detector at Jefferson Lab.

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