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Hermes results on 3D imaging of the nucleon

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In the context of rapid theoretical developments in non-perturbative QCD, a formalism of Transverse Momentum Dependent parton distribution functions (TMDs) and of Generalized Parton Distributions (GPDs) was introduced in the last two decades, providing a more comprehensive multi-dimensional description of the nucleon. TMDs and GPDs allow in fact for complementary descriptions of the nucleon in three dimensions (nucleon tomography), spanned by the quarks longitudinal momenta and, respectively, by their transverse momenta components and transverse spatial coordinates. They thus contribute, with different approaches, to the full phase-space description of the nucleon structure. Furthermore, they provide complementary insights into the yet unmeasured quark orbital angular momentum. Experimentally, TMDs and GPDs can be accessed through the analysis of specific azimuthal asymmetries measured, respectively, in semi-inclusive deep-inelastic scattering and hard exclusive processes, such as hard lepton production of real photons or mesons. The HERMES experiment has collected wealth of data on scattering of a longitudinally polarized lepton (electron or positron) beam from HERA off unpolarized, longitudinally and transversely polarized internal gas targets. Collected data allowed to measure a variety of asymmetries with respect to beam charge, beam helicity and target polarization. A selection of HERMES results on observables sensitive to TMDs and GPDs will be presented.

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