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Study of GPDs at HERMES

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The HERMES experiment has collected a wealth of deep-inelastic scattering data using the 27.6 GeV polarized electron or positron beams at HERA and various pure gas targets, both unpolarized and polarized. This allowed for a series of unique measurements. Among them are measurements in hard exclusive processes, such as deeply virtual Compton scattering process or exclusive meson production processes. They provide information on the three-dimensional structure of the nucleon both in momentum space and in mixed momentum and position space. Results on various cross-section asymmetries, sensitive to generalized parton distributions and thus to the three-dimensional nucleon structure in mixed momentum and position space, are shown. The operation of a recoil detector during the last two years of HERMES running enabled for the full kinematic reconstruction of the events of exclusively produced real photons and a clean (with a background well below the 1%) measurement of the beam-helicity asymmetry. Also, first measurement of the beam helicity asymmetry related to the associated deeply virtual Compton scattering process, where the proton is excited to a Δ -resonance state, was possible using the recoil detector information. Spin density matrix elements and transverse-target spin asymmetries in exclusive meson production on unpolarized protons and deuterons and on transversely polarized protons, respectively, as well as helicity amplitude ratios from exclusive rho production on transversely polarized protons are presented as well.

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