Kornelija Passek: On hard exclusive processes, meson production, and hadron tomography

We investigate hadron structure by studying the so-called hard exclusive processes. These processes are performed at high energies where the strong force becomes weak allowing for a perturbative QCD description of the partonic subprocesses. The factorization of short- and long-distance dynamics enables access to hadron structure in terms of distribution amplitudes (DAs) and generalized parton distributions (GPDs). GPDs, in particular, provide a three-dimensional generalization of the well-known parton distribution functions (PDFs) from deep inelastic scattering (DIS). A unified framework describing DIS, deeply virtual Compton scattering (DVCS), and deeply virtual meson production (DVMP) through universal GPDs offers valuable insights into the internal structure of the proton. We demonstrate that, for vector mesons, a consistent description requires next-to-leading order (NLO) accuracy in the perturbative expansion. In contrast, to reliably describe the production of deeply virtual pseudoscalar mesons at experimentally accessible energies, the inclusion of higher-twist contributions is essential.