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Exclusive cross section measurements at COMPASS

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Deeply Virtual Compton Scattering (DVCS) and Hard Exclusive Meson Production (HEMP) are very promising reactions to study Generalized Parton Distributions (GPDs). GPDs correlate the longitudinal momentum of the partons to their transverse spatial distribution inside the nucleon, and thus provide the 3-dimensional structure of the nucleon in QCD. Following a one-month test run in 2012, exclusive measurements were performed at COMPASS in 2016 and 2017 at the M2 beamline of the CERN SPS. The 160 GeV muon beam impinged on a 2.5m long liquid hydrogen target that was surrounded by a barrel-shaped time-of-flight system to detect the recoiling target proton. The scattered muons and the particles produced were detected by the COMPASS spectrometer, which was supplemented by an additional electromagnetic calorimeter for the large-angle-photon detection.

The DVCS cross section are extracted from the sum of cross-sections measured with opposite beam charge and polarization, with special attention made to separate DVCS from exclusive π^0 production. In the COMPASS kinematic domain, the DVCS cross section is closely related to the GPD H and provide the transverse extension of the partons in the Bjorken-x regime between valence quarks and gluons. On the other hand, the measurement of the cross-section of exclusive π^0 production, and the Spin Density Matrix Elements (SDMEs) of ρ^0 and ω can not only serve as important inputs for the chiral-odd GPDs, together with the chiral-even ones, but also provide insights into their reaction mechanisms. The current progress on the study of these exclusive channels will be presented.

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