Hard Exclusive Processes and Deeply Virtual Compton Scattering measured by HERMES

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Much of the internal structure of the nucleon has been revealed through *inclusive* scattering of high energy leptons in deeply inelastic scattering. A rigorous and highly successful theoretical description of inclusive experimental data has been achieved in the framework of QCD. These successes are to a large extent based on the existence of powerful theoretical tools like factorisation proofs and the operator product expansion.
The theoretical treatment of hard *exclusive* reactions has been raised to similarly high standards. The recently developed formalism of Generalised Parton Distributions (GPDs) enlarges the scope of the QCD factorisation approach to hard exclusive processes [1].
A particular promising way of studying the nucleon structure is through Deeply Virtual Compton Scattering (DVCS), where a virtual photon couples to the proton and a real photon is emitted. In electron (or positron) scattering experiments, this process and the Bethe–Heitler process (BH) lead to the same final state. Hence in the process $ep \rightarrow ep\gamma$ the amplitudes of DVCS and BH interfere.
Using polarised electron and positron beams on polarised targets, this interference can be exploited to access the real and imaginary parts of the DVCS amplitude. HERMES is the pioneering experiment for this process. Data on the Beam Spin Asymmetry of DVCS on the proton are already published [2]. Extended data on the proton and new data on the deuteron including kinematical dependencies for the Beam Spin Asymmetry and the Beam Charge Asymmetry will be presented.
In addition a review of HERMES data on the hard exclusive electroproduction of mesons will be given. An outlook to further measurements at HERMES using a newly developed Recoil Detector will be presented[5].

References

[1] K. Goeke *et al.*, Prog. Part. Nucl. Phys. **47** (2001), 401. [2] HERMES Collaboration, A. Airapetian *et al.*, Phys. Rev. Lett. **87** (2001) 182001. [3] HERMES Collaboration, A. Airapetian *et al.*, accepted by Phys. Lett. B, in press [4] HERMES Collaboration, K. Ackerstaff *et al.*, Eur. Phys. Journ. **C 18** (2000) 303. [5] HERMES Collaboration, HERMES Recoil Detector, Technical Design Report, DESY PRC 02–01 (2002).