

Deeply Virtual Compton Scattering and Deep π^0 production in Hall A at Jefferson Laboratory

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Electro-production of a photon is the simplest way to access the Generalised Parton Distributions (GPD) through Deeply Virtual Compton Scattering (DVCS) which interferes with the Bethe-Heitler (BH) process.

DVCS experiments on the proton and on the neutron using a longitudinally polarized 5.75 GeV electron beam in Hall A at JLab will be described [1]. The exclusivity of the reaction was ascertained using the missing-mass technique of the recoil nucleon and by subtracting π^0 contamination. The helicity-dependent cross-section difference at the $Q^2 = 2.3, 1.9$ and 1.5 GeV^2 and the unpolarized cross section at $Q^2 = 2.3 \text{ GeV}^2$ on the proton at $x_{Bj} = 0.36$ will be presented. A scaling test of DVCS based on the formalism of Compton form factors [2] was obtained from the cross-section difference. The influence of the pure DVCS² terms in the unpolarized cross section was found to be important. We will describe how to isolate the DVCS² term from the BH-DVCS interference in a new experiment [3]. A model-dependent constraint on the quark angular momentum was deduced from the DVCS neutron data.

The four polarized π^0 electro-production cross sections $d\sigma_T + \varepsilon d\sigma_L$, $d\sigma_{TT}$, $d\sigma_{LT}$ and $d\sigma_{LT'}$ have been extracted at $Q^2 = 2.3 \text{ GeV}^2/c^2$ on the proton at $x_{Bj} = 0.36$. A comparison with the available models will be given.

I will present also an overview of the DVCS program in the Hall A for the Jlab 12 GeV upgrade [4].

1. C. Munoz Camacho et al., Phys. Rev. Lett. **97**, 26202 (2006).
2. A.V. Belitsky, D.Mueller, and A. Kirchner, Nucl. Phys **B629**, 323 (2002)
3. C. Munoz Camacho et al., Complete separation of deeply virtual photon and π^0 electro production observable of unpolarised proton. JLab Proposal **E07-007**
4. J. Roche et al, Measurements of the Electron-Helicity Dependent cross sections of Deeply Virtual Compton Scattering with CEBAF at 12 GeV. Jlab. Experiment **E12-06-114**