

# GENERALIZED PARTON DISTRIBUTIONS AND DEEPLY VIRTUAL COMPTON SCATTERING AT CLAS

*R. De Masi*<sup>1</sup> for the CLAS Collaboration

Institut de Physique Nucléaire  
15, Rue G. Clemenceau  
F-91406 Orsay, France

## Abstract

The deeply virtual Compton scattering is the simplest process to access the generalized parton distributions of the nucleon. A dedicated large statistics experiment for the measurement of deeply virtual Compton scattering with a 6 GeV polarized electron beam on a proton target has been performed at the Hall-B of Jefferson Laboratory with the CLAS spectrometer. The experiment covered a wide kinematic range, allowing the study of the beam spin asymmetry as function of the Bjorken variable  $x_B$ , the Mandelstam variable  $t$ , the virtual photon four-momentum squared  $Q^2$  and the angle  $\phi$  between leptonic and hadronic planes. The preliminary results are in agreement with previous measurements and with the predicted twist-2 dominance.

## 1 Physics Motivation

The **Generalized Parton Distributions** (GPDs) [1, 2] parametrize the structure of hadrons. They include form factors and parton distributions as special limit, and contain in addition information on the transverse momentum distribution of partons and the correlation between quarks.

The GPDs can be accessed in hard exclusive leptonproduction of photons (**Deeply Virtual Compton Scattering** - DVCS) and mesons ( $\pi$ ,  $\rho$ ,  $\omega$ ,  $\phi$ , etc.).

In the Bjorken limit, the scattering can be assumed to happen at the quark level, as depicted in the so called “handbag” diagram in Fig. 1.

In the reaction  $ep \rightarrow ep\gamma$  the DVCS interferes with the Bethe-Heitler process, where the real photon in the final state is radiated from the incoming or scattered electron. By using a longitudinally polarized electron beam, this

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<sup>1</sup>presently at Institut Pluridisciplinaires Hubert Curien 23 Rue de Loess F-67037, Strasbourg, France.



- coplanarity angle between  $\gamma p$  and  $\gamma^* p < \pm 1.5(3)^\circ$ ;
- missing energy  $E^X < 300(150)$  MeV;

Due to the different energy resolution between the IC and the standard CLAS calorimeter (EC), the cuts have been optimized depending on which calorimeter has measured the photon energy.

A further selection required  $Q^2 > 1$  GeV<sup>2</sup> and the  $\gamma^* p$  invariant mass  $W > 2$  GeV.

The events from  $\pi^0$  decay with one photon not reconstructed, were subtracted in each  $x_B - Q^2 - t - \phi$  bin and in each helicity state with a Monte Carlo based method.

The kinematic range in  $x_B - Q^2$  has been divided in 13 bins as shown in Figure 2 and each bin has further been binned in  $t$ . The variation of the coefficient  $\alpha$  in the decomposition of the beam spin asymmetry has been studied and it is shown in Figure 3.

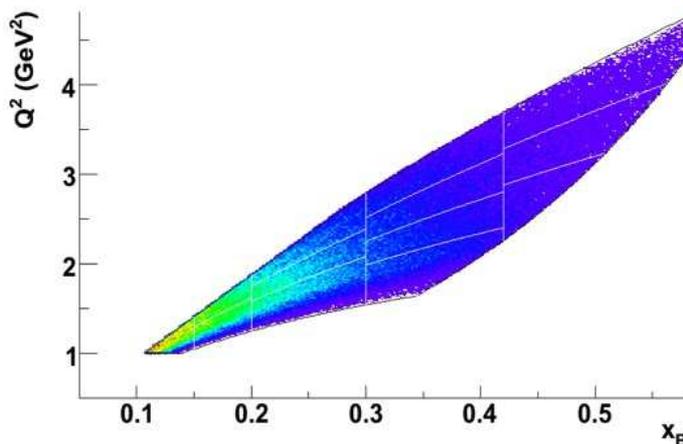


Figure 2: The kinematic region in  $x_B - Q^2$  covered by the experiment. The white lines define the bins studied in this analysis.

The data are in agreement with previous measurements from CLAS [5] and the JLAB Hall-A [3].

For a detailed description of this analysis see [6–8].

## References

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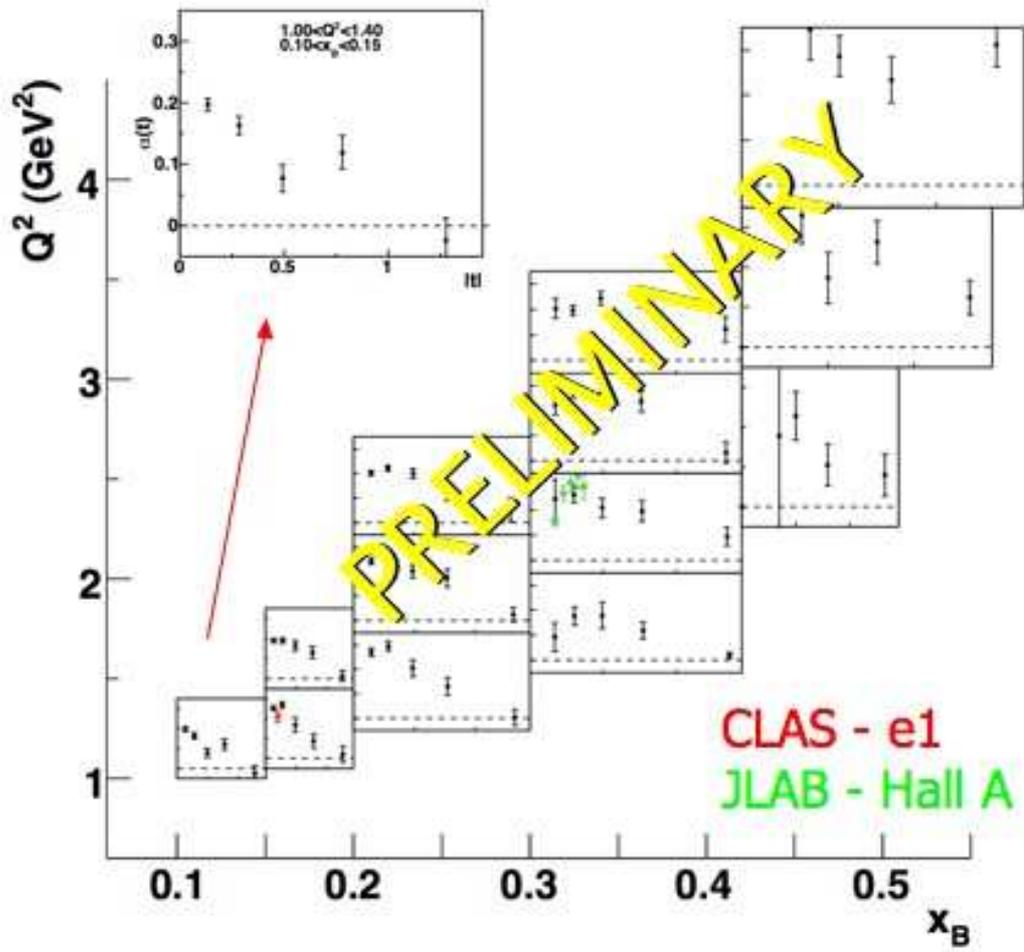


Figure 3:  $\alpha$  vs.  $t$  in .