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Internal structure of the nucleon (Proton / Neutron) by Virtual Compton Scattering at low and high energy

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We studied the internal structure of the nucleon with two complementary approaches:

1) At high-energy, the recently developed formalism of generalized parton distributions unifies the form factors and the parton distributions and provides access to new information. The simplest process sensitive to GPDs is the exclusive process "Deeply Virtual Compton Scattering (DVCS)". This work describes the measurement of the cross section of the DVCS reaction off the neutron using a Deuterium target. Theoretical models predict that the DVCS on the neutron is mostly sensitive to the GPD "E" which allows to access the orbital angular momentum of the quarks via Ji's sum rule. The analyzed data were taken in the Hall A of Jefferson Lab, with a polarized electron beam at Q2=1.75GeV2 and xB=0.36. We extracted, for the first time, a non-zero contribution of {neutron-DVCS + coherent-deuteron-DVCS}.

2) At low-energy, the internal structure of the nucleon is inaccessible in terms of its elementary constituents. The extracted observables refer to more global properties of hadrons. Under the pion production threshold, the Virtual Compton Scattering (VCS) is parametrized by new observables : the generalized electric and magnetic polarisabilities (GPs), α(Q2) and β(Q2) . These observables describe the induced local deformation in the nucleon under an external electromagnetic field. These Gps are measured at Q2=0.5GeV2 with an experiment conducted at the accelerator of Mainz in Germany. Two methods, based on the dispersion relations (DR) and a low-energy approach (LEX), were used to extract two linear combinations of GPs : (P_{LL}-(P_{TT}/ε)) and P_{LT}. Preliminary results show a good agreement between both methods and a measurement of α(Q2) and β(Q2) is obtained with the DR model.

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