PR12-11-003: *Deeply Virtual Compton Scattering on the Neutron with CLAS12 at 11 GeV*

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This proposal is devoted to a measurement of exclusive observables that should provide access to Generalized Parton Distributions (GPDs).

GPDs provide novel tools for the description of nucleon structure. Being hybrids of usual parton distributions, form factors and distribution amplitudes, GPDs accumulate more detailed information about hadrons than these "older" functions alone. On the other hand, the task of extracting from the data functions depending on a larger number of variables is more challenging. The cleanest process for GPD extraction is deeply virtual Compton scattering (DVCS), the study of which forms a rather large program of investigation at Jefferson Lab, and the proposed experiment complements other experiments that are already approved. In particular, the proposed study of DVCS on the neutron complements the proton target experiments, and is necessary for flavor separation of GPDs.

As noted in the proposal, beam-spin asymmetry (BSA) on the neutron (which is the main object of study in the proposal) is mainly governed by the GPD E, which, unlike GPDs H and $\tilde{H}$, is not constrained by information from the usual parton distributions. However, no details concerning why neutron BSA is dominated by the GPD E are given in the proposal. The relevant formula is not very long, so the authors could present it and give some discussion of the relative size of the terms which appear there (it contains not only E, but also H and $\tilde{H}$), and the role of various suppression factors accompanying each contribution.

The results for the neutron BSA generated by VGG are shown in Figure 2 of the proposal, and it is written that "One sees that these BSAs can extend from 10 up to 50%, with spectacular changes of sign depending on the relative signs of J_u and J_d, and therefore they can be as large, in magnitude, as the proton-DVCS beam-spin asymmetries that have been recently measured." The curves are given for different values of J_u and J_d, the parameters characterizing the normalization of E^u and E^d. As noted in the proposal, some of the chosen values of J_u and J_d are unrealistic. And it is these values that produce the curves reaching 50%. The curves corresponding to more realistic values $J_u = 0.3, J_d = 0.1$ do not reach even 10%. Here it may be mentioned that the values obtained by Guidal *et al.* (Phys. Rev. D 72, 054013 (2005)) from a fit of nucleon form factors are $J_u = 0.29, J_d = -0.04$

(and they agree with lattice results). Thus, it is quite possible that the neutron BSA is very small, and it would be very appropriate to discuss in the "physics motivation" part of the proposal what kind of information about GPDs could be obtained in such a situation.

Finally, we note that measurements of the helicity-flip GPD E are of intrinsic interest for nucleon structure, aside from the connection with quark angular momentum through the Ji sum rule inferred above. The helicity-flip GPD E represents a fundamental twist-2 structure which describes how the nucleon's anomalous magnetic momentum is distributed over the quark momentum fraction x, and what partonic configurations contribute to the Pauli form factor at different values of t.