CLAS Collaboration Review Report

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for the CLAS Collaboration

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PAC47 run grup addition proposal: Neutron DVCS Measurements with BONuS12 in CLAS12

Spokespersons: M. Hattawy, R. Dupré, S. Kuhn

Motivation:

The authors are proposing an addition to RG-F to study the deeply virtual Compton scattering on neutrons (nDVCS) using a deuterium gaseous target. The experimental setup of RG-F, and in particular the BONuS12 radial TPC, is particularly well suited for the detection of the low-momentum spectator proton giving the possibility to study the impact of Fermi motion and final state interactions (FSI) on nDVCS.

Measurements and feasibility:

This experiment is planning to use proton-tagged nDVCS ($\gamma^* + D \to \gamma + p + (n)$), and fully exclusive nDVCS ($\gamma^* + D \to \gamma + p + n$) events. Although a large difference in the expected statistics between the two channels, their comparison will allow one to better understand systematic uncertainties in the tagged nDVCS analysis. In addition, these proposed measurements will complement and possibly help in the understanding of the impact of Fermi motion and FSI on the analysis results of RG-B.

The already approved experimental setup of RG-F is well suited for the success of this proposal. In particular BONuS12 will run with few times less luminosity than RG-B, and in addition they will have a Møeller shield around the beam line which will further suppress the background in the forward tracking chambers. Because of this, we think there will be no major issues for the track reconstruction efficiency.

This proposal also does not require any modification of the BONuS12 trigger.

However a small modification is needed to the foreseen RG-F data taking plans: a highly polarized electron beam. This modification does not cause conflicts with the other approved experiments and the RG-F spokespersons already agreed to allocate the necessary time to perform polarization measurements.

Summary:

The investigation of the impact of Fermi motion and FSI on nDVCS studies is of very high interests. The proposed measurements of proton-tagged and fully exclusive nDVCS have different sources of systematic uncertainties with respect to one of E12-11-003 and therefore their complementarity will help to better understand the 3D structure of the neutron and the possible modifications due to the nuclear environment.

The request for a highly polarized electron beam represents a beneficial addition to the RG-F program, because it will enable not only the analysis of this particular channel but possibly many other analyses.