

PR12-17-012C: *Nuclear Exclusive and Semi-Inclusive Measurements with a New CLAS12 Low Energy Recoil Tracker*

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The present proposal is part of a comprehensive program to study the partonic structure of the ^4He nucleus through measurements of Deeply Virtual Compton Scattering (DVCS) and Deeply Virtual Meson Production (DVMP). Its specific focus is on (i) extending the DVMP measurements on ^4He to detect π^0 production in the final state, (ii) measuring coherent DVCS on the deuteron, and (iii) measuring DVCS in ^4He resulting in its three-body breakup.

The DVMP process is generally parametrized in terms of a number of chiral-even and chiral-odd generalized parton distributions (GPDs). In the case of a spin-zero target, such as ^4He , there is a single chiral-even and a single chiral-odd GPD at leading twist, and two chiral-even ones at twist three. Thus determination of these GPDs in a relatively dense system, at least in its central region, such as ^4He will provide information on the extent to which they are modified *in medio*.

In a spin-one target, such as the deuteron, there are nine GPDs that characterize the coherent DVCS cross section. Sum rules relate combinations of these GPDs to the charge, quadrupole, and magnetic form factors measured in elastic electron scattering off the deuteron. The present measurements would provide information on these GPDs complementary to that extracted from measurements on the nucleon. In particular, it would seem, but it is not clearly stated, that the authors will be able isolate the so-called H_3 GPD.

The last measurement deals, rather than with coherent DVCS, with DVCS resulting in a three-body breakup of ^4He with a final deuteron being detected along with the other recoil particles. It might be interesting to explore whether it is experimentally feasible to measure the breakup into two deuterons (rather than a deuteron and two nucleons). In a PWIA picture this would appear to be as quasi-free deuteron DVCS in ^4He . A comparison with the proposed measurements above could in principle shed further light on *in medio* modifications, as well as deviations from the PWIA picture.