The Study of the ^{3}He Nucleus in Perpendicular Kinematics at High Momenta

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Thomas Jefferson National Accelerator Facility (Jefferson Lab) experiment E89-044 probed the ^{3}He nucleus with high momentum virtual photons (1 - 3 GeV/c) up to a missing momentum of 1 GeV/c and missing energy of 200 MeV using the ^{3}He(e,e'p)X reaction. E89-044 is the first experiment to measure the structure of the ^{3}He nucleus under such extreme conditions of momentum transfer and missing momentum. Detailed and precise information on the residual bound state momentum distributions have been measured exhibiting significant strength at these high momenta, which most modern nuclear calculations fail to explain. Relativistic effects in the ^{3}He wave function, ground state short-range correlations, final state interactions, non-nucleonic degrees of freedom, and relativistic current operators can all play a role in determining the response functions and cross sections. This is particularly the case at the high missing momenta, well beyond the Fermi momentum, for which the reaction was studied. The results of these measurements and theoretical interpretations will be presented. An example of the cross sections measured with theoretical fits is shown in the figure.