

# A Preliminary Measurement of the Longitudinal Spin Asymmetry $A_1^n$

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## Abstract

The current world data of nucleon-virtual photon longitudinal spin asymmetry  $A_1$  for both proton and neutron have shown that the extracted ratio of helicity dependent-to-independent of the down-quark parton distribution functions in the proton,  $\Delta d/d$ , tends towards  $-1/3$  at large  $x$ , in disagreement with the perturbative QCD prediction that  $\Delta d/d$  should approach approach unity. As part of Jefferson Lab experiment E06-014 performed in Hall A, double-spin asymmetries were measured when scattering a longitudinally polarized electron beam of energies 4.73 and 5.89 GeV from a longitudinally and transversely polarized  $^3\text{He}$  target in the deep inelastic scattering region, allowing for the extraction of the neutron asymmetry  $A_1^n$ . We will discuss the analysis of our data and present preliminary results for the nuclear asymmetry  $A_1^{^3\text{He}}$  and  $A_1^n$  in the kinematic range of  $0.2 < x < 0.65$  and  $2 < Q^2 < 5 \text{ GeV}^2$  for the scattered electrons. Our measurement of  $A_1^n$  will provide a test of previous results with a higher statistical precision and continuous coverage of the  $x$  range above.