

A Preliminary Measurement of the Longitudinal Spin Asymmetry A_1^n

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Abstract

To date, measurements of the nucleon-virtual photon longitudinal spin asymmetry A_1 for both proton and neutron have shown that the extracted helicity dependent-to-independent ratio 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 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 ^3He 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.