A Preliminary Measurement of the Longitudinal Spin Asymmetry A_1^n

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Abstract

The current data for the nucleon-virtual photon longitudinal spin asymmetry A_1 on the proton and neutron have shown that the ratio of the polarized-to-unpolarized down-quark parton distribution functions, $\Delta d/d$, tends towards -1/2 at large x, in disagreement with the perturbative QCD prediction that $\Delta d/d$ approaches 1. As a part of experiment E06-014 in Hall A of Jefferson Lab, double-spin asymmetries were measured in the scattering of a polarized electron beam of energies 4.73 and 5.89 GeV from a longitudinally and transversely polarized ^{3}He target in the deep inelastic scattering region, allowing for the extraction of the neutron asymmetry A_1^n. We will discuss our analysis of the data and present ~~preliminary~~ results for the nuclear asymmetry $A_1^{^3\mathrm{He}}$ and A_1^n covering the kinematic range of $0.2 < x < 0.65$ and $2 < Q^2 < 5$ GeV^2 for the scattered electrons. Our measurement of A_1^n ~~will provide a test of previous results in advance of two upcoming experiments at Jefferson Lab.~~