

Precision Measurement of the Neutron d_2 : A Probe of the Color Force

The g_2 nucleon spin-dependent structure function measured in electron deep inelastic scattering (DIS) contains information beyond the simple parton model description of the nucleon. It provides insight into quark-gluon correlations and a path to access the confining local color force a struck quark experiences just as it is hit by the virtual photon due to the remnant di-quark. The quantity d_2 , a measure of this local color force, and can be expressed as the x^2 -weighted integral of a linear combination of spin structure functions g_1 and g_2 and thus is dominated by the valence-quark region at large momentum fraction x . To date, theoretical calculations and previous experimental measurements of the neutron d_2 in the DIS region differ by about two standard deviations. Therefore, Jefferson Lab experiment E06-014, performed in Hall A, made a dedicated precision measurement of this quantity. Double-spin asymmetries and absolute cross-sections were measured in both DIS and resonance regions by scattering longitudinally polarized electrons at beam energies of 4.74 and 5.89 GeV from a longitudinally and transversely polarized ^3He target. Results for the spin structure functions on ^3He , neutron d_2 and their physics impact will be discussed.