Probing Quark-Gluon Correlations in the Neutron: Precision Measurements of d_2^n and g_2^n

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The spin structure function g_2 and the higher twist reduced matrix element d_2 are fundamentally coupled to the quark-gluon interactions and transverse momentum of the quarks in the nucleon. Unlike most higher-twist processes which can not be separated from associated leading twist terms, g_2 contributes to leading order in the longitudinal-polarized lepton scattering on a transversely polarized nucleon. This makes g_2 one of the *cleanest* higher twist observables.

Within the OPE, the second moment of a linear combination of g_1 and g_2 may be connected to the higher twist reduced matrix element d_2. This quantity has been well studied in Lattice QCD and other theoretical models. While calculations on the proton are in good agreement with data, calculations on the neutron not only have the opposite sign, but are 3–4 sigma away from the world average.

JLab E06-014 (run in 2009) was focused on extracting d_2^n from $^3\vec{\mathrm{He}}(\vec{e}, e')$ over the range $0.2 < x < 0.95$ and $2 < Q^2 < 5\,\mathrm{GeV}^2/c^2$. Analysis of those data is nearly complete and preliminary results will be presented.