

SUMMARY OF E97-103

Search for Higher Twist Effects in the Neutron Spin Structure Function $g_2^n(x, Q^2)$

Spokespersons

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This experiment will make the first high precision measurement of the neutron spin structure function g_2^n in the kinematic range $0.16 < x < 0.20$ and $0.6 < Q^2 < 1.4$ (GeV/c)². This structure function has a unique sensitivity to higher twist effects and quark-gluon correlations which are suppressed in typical deep inelastic scattering measurements at large Q^2 . These higher twist effects provide direct information about non-perturbative QCD quark-gluon interactions. The ability to achieve errors at Jefferson Lab which are more than an order of magnitude smaller than the best current measurement (SLAC E155x), at a Q^2 which is a factor of three lower, provides a unique opportunity to quantify these higher twist effects at a level that was not previously achievable. The structure function will be determined by measuring the inclusive electron asymmetry for polarized electrons on a polarized ³He gas target.

The PAC has approved this experiment for 16 days of data in Hall A with a rating of B+. The success of the collaboration and target was recently demonstrated in Hall A experiments E94-010 and E95-001. The latter experiment ran with nearly 80% efficiency and was therefore able to obtain data at an additional kinematic setting beyond the original proposal. For this experiment, the target and detectors will be operated under the same conditions, and we have every reason to expect comparable success. Time is requested for target installation and checkout, and beam time is requested for 16 days (at 100% efficiency) to complete the measurement. Polarized beam ($\sim 80\%$) is requested at $15\mu A$ at energies of 3.6, 4.8 and 6.0 GeV. The standard Hall A spectrometers will be used to detect electrons, and will be configured as they were for the previous ³He experiments (with a shower counter in the hadron arm).