Measuring G_{En} at High Momentum Transfers

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Experiment 02-013 at Thomas Jefferson National Accelerator Facility will extend the measured range of the neutron electric form factor G_{En} to Q^2 =3.4 $(GeV/C)^2$ through a measurement of the cross section asymmetry in the reaction $^3\vec{H}_e(\vec{e}, e'n)$ [1]. Existing electric form factor data up to Q^2 ~- 1.5 $(GeV/C)^2$ are compatible the Galster "parameterization", an empirical fit to data on G_{En} obtained at lower values of Q^2. Recent theoretical investigations, which were motivated by the results of Jlab experiments 93-027 and 99-007 on the ratio of the proton electric and magnetic form factor [2, 3], predict higher values of G_{En} compared to Galster at higher momentum transfers [4].

The experiment utilizes the Hall A polarized ^{3}He target and the polarized CEGAF beam at moderate beam energies. Scattered electrons will be detected in the BigBite spectrometer, recoiling neutrons in an array of scintillators. Because of the high kinetic energy of the neutrons, a high neutron detection efficiency and at the same time an excellent background suppression can be achieved.

This talk will describe the experimental and theoretical developments needed to perform the measurement and extract the electric form factor of the neutron from 3He. Concepts of extending the measurement of G_{En} to even, higher momentum transfers will be discussed.

References

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