MEASUREMENT OF THE NEUTRON ELECTRIC FORM FACTOR USING THE d($\vec{e}$,e'$\vec{n}$)p REACTION†

J.M. Cameron, B. Ni and M. Spraker
Indiana University Cyclotron Facility, Bloomington, IN 47408

The neutron electric form factor G_E^n arises due to the spatial distribution of charge in a particle of net zero charge and, thus, is of considerable importance in testing models of nucleon substructure. Previously, data have been extracted from both elastic and inelastic electron-deuteron scattering where only the scattered electron is detected. These techniques, however, are subject to large model dependences due to the considerable importance of other processes to the experimental observables.[1] A much greater sensitivity can be obtained by a measurement of spin observables such as spin correlations or transfer which are linearly dependent on G_E^n. In the present experiment the polarization transfer coefficent $D_{LS'}$ where

$$D_{LS'} = \frac{2}{I_0} (1+\tau)^{\frac{1}{2}} G_M^n G_E^n \tan\left(\frac{\theta_e}{2}\right)$$

is measured. Here I_0 is the unpolarized cross section and $\tau = Q^2/4M_N^2$. Furthermore, such data at the quasifree scattering point are not expected to be sensitive to details of the deuteron structure or to final state interactions between nucleons.[2]

The first stage of the experiment has been completed at the Bates Linear Accelerator using a beam of 870 MeV polarized electrons. Electrons from quasifree scattering in a liquid deuterum target were detected in the OHIPS spectrometer and coincident neutrons were analyzed using the polarimeter discussed previously.[3] About 550 μA-hours of beam time have been used to date. Evaluation of these data will be carried out to determine a preliminary value and to find the relative error contributions from systematic and statistical causes.

† Bates experiment 85-05 collaboration. Spokespersons: R. Madey (Kent State University) and S. Kowalski (M.I.T.).

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2. H. Arenhovel, Phys. Lett. **B199** (1987) 13.
3. T. Eden, *et al.*, IUCF Scientific and Technical Report 1990, p. 93.