High Q^2 measurement of the ratio of the electric and magnetic form factors of the neutron with polarized ^{3}He using the HRS spectrometers

F. W. Hersman, L. C. Balling, V. Boykin, J. Calarco, J. Distelbrink,
L. Gelinas, J. Heisenberg, M. Kennedy, V. Pomeroy,
Timothy P. Smith, I. The, A. Tutein, J. Wright
University of New Hampshire

M. B. Leuschner
Indiana University

B. Wojtsekhowski
RPI

J.-P. Chen
MIT

O. K. Baker, T. Eden, R. Madey, L. Tang
Hampton University

B. Anderson, L. R. Baldwin, A. Lai, R. Madey, D. M. Manley,
R. Sulieman, J. Watson, W. M. Zhang
Kent State University

currently seeking endorsement of the Hall A Collaboration

F. W. Hersman, contact person

ABSTRACT

We propose to measure polarization observables of $^3\overrightarrow{\mathrm{He}}(\vec{e},e'n)$ in the quasielastic region to extract the neutron electric to magnetic form factor ratio (G_E^n/G_M^n). We plan to use the HRS spectrometers and large arrays of scintillation detectors to detect electrons and neutrons on both sides of the beam line. The high density target is based on existing techniques for polarizing helium by alkali spin exchange. Two beam-target asymmetries in the scattering plane and the normal target asymmetry are all measured to control systematic uncertainties. The anticipated relative precisions in the form factor ratio (2%, 6% and 17%) correspond to uncertainties of 0.0011 in G_E^n at 0.51 GeV/c^2, and approximately 0.0015 at 1.38 and 3.37 GeV/c^2.