

Individual Proposal Report

Proposal: PR-08-011

Scientific Rating: A-

Title: $\bar{e} - {}^2H$ Parity-Violating Deep-Inelastic Scattering (PVDIS) at CEBAF 6 GeV

Spokespersons: X.-C. Zheng, R. Michaels and P. E. Reimer

Motivation: The experimental team proposes to measure parity-violating longitudinal asymmetries from 2H in deep-inelastic kinematics. The asymmetries are very large by PV standards (100 times larger than Q_{weak}). The results will determine the combination of weak quark couplings $2C_{2u}-C_{2d}$. Charge-symmetry violation (CSV) and higher-twist (HT) effects can modify the PV asymmetries. The proponents estimate the CSV effect in two models and find that the modification of the asymmetry is 10 times smaller than the goal statistical error and can be neglected. For very large Q^2 , higher-twist effects are $\sim 1/Q^2$. The team proposes to measure asymmetries at $Q^2 = 1.1$ and 1.9 GeV^2 . If the PV asymmetries are found to be $\sim Q^2$, the PV asymmetries can be combined to determine the quark coupling. The quark coupling is poorly known; the experimental goal is to reduce the uncertainty by a factor of 7.

The same team proposed to extend this work to 12 GeV, first with the base-line 12 GeV spectrometers (PR12-07-102) and perhaps in a second round of 12 GeV experiments, with a dedicated large-acceptance spectrometer. In order to access the potential of PVDIS, it is necessary to begin the program in order to map out and understand phenomenologically HT and CSV effects. (CSV is very interesting in its own right.) The results from this pioneering proposal may begin a very exciting program of study that will extend into the 12 GeV era.

Measurement and Feasibility: The experimental team has many seasoned investigators. The target, beam, and spectrometers are well understood. The risk is minimal.

Issues: none

Recommendation: Approve for 32 days in Hall A