

Proposal: PR-05-007

Scientific Rating: A⁺

Title: Polarized e⁻H Parity Violating Deep Inelastic Scattering at CEBAF 6 GeV

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Motivation: A measurement of the parity-violating deep inelastic asymmetry of longitudinally-polarized electron scattering off deuterium is proposed. From the asymmetry measurement, precise information on a combination of the poorly known weak vector Z-electron times axial Z-quark couplings will be extracted. These couplings might be sensitive to physics beyond the Standard Model. Hadronic higher twist effects should also be considered, although they are expected to be small.

Measurement and Feasibility: The two Hall A HRS spectrometers will be used to detect the electrons scattered from a 25 cm long liquid deuterium target. The deuteron is chosen as target due to the isospin symmetry that relates u and d quark distributions in the proton and neutron. Two different angular and momentum settings will allow a measurement at Q^2 values of 1.1 and 1.9 (GeV/c)², at $x=0.25$ and 0.3, respectively.

A Compton polarimeter upgrade for a 1% precision measurement of the beam polarization and a fast DAQ to handle rates of about 1 MHz are specifically foreseen for this measurement.

The experiment appears feasible and the running time can be divided readily into two phases as described in the proposal.

Issues: The PAC recognizes the importance of the proposed measurement of the vector-axial (VA) couplings for which accurate Standard Model predictions are available. The precise evaluation of higher twist effects in the Q^2 range of the measurement is also relevant.

A careful investigation of the possible background from rescattering of polarized electrons inside the spectrometer should be performed.

The PAC recommends the approval of the first phase, which already results in a significant improvement in this field. It will also allow extremely useful preparation for a second phase of the experiment which can be presented in the future.

Recommendation: Approve for 13 days in Hall A