## **Individual Proposal Report**

Proposal: PR-07-010

Scientific Rating: N/A

Title: RES-Parity: Parity Violating Electron Scattering in the Resonance Region

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**Motivation:** The proposal is aimed at measuring Parity-Violating (PV) asymmetries on three different targets (H, D,  $^{12}$ C), over the full resonance region (up to a missing mass W = 2.1 GeV) in the Q<sup>2</sup> domain 0.5 - 1.0 (GeV/c)<sup>2</sup>. This is an exploratory measurement that might have an impact on many areas of hadronic physics and on the weak interaction sector. Examples mentioned are: isospin decomposition of the nucleon resonances; quark-hadron duality; flavor dependence of the EMC effect; parameterizations of hadronic background, higher twists and radiative corrections for other planned (E-05-007, DIS-Parity) and future (12 GeV) PV experiments; and finally neutrino cross sections, necessary for the interpretation of neutrino oscillation experiments.

**Measurement and Feasibility:** The experiment is proposed to run in Hall A, using the same equipment as E05-007 (DIS-Parity experiment). The DIS- and Res-Parity collaborations would be closely working together on the necessary developments (upgraded Compton polarimeter and fast DAQ). The key elements of the experimental set-up are the 2 HRS spectrometers, liquid cryogenic targets (H and D), a polarized electron beam with PV quality and a fast acquisition system allowing for a counting method to reject pion background. Concerning the beam, the size of the asymmetry to be measured is large (50-100 ppm) and the beam performances achieved in Hall A routinely exceed in quality the requirements of this proposal. The beam energy and spectrometer settings have been optimized leading to the choice of a 4.8 GeV beam and a 12.5° detection angle for the scattered electrons.

**Issues:** The PAC believes that the experiment could address a number of important issues. However, no single issue has been sufficiently investigated and quantitatively discussed such as to produce a compelling and convincing case, as already clearly requested in previous PAC reviews. The PAC strongly suggests to the proponents to concentrate on a single topic and work out the details as extensively as possible. In particular, the PAC suggests that extensive simulations even based on "toy models" under different assumptions would be very helpful to show how the data would impact each observable in other sectors. The proponents should also engage theorists and experimentalists in this field in order to determine what is needed for the various goals. Particularly important would be to clarify the importance of the proposed measurements for the neutrino oscillation program, much in line with what has been done for  $F_2$  and R in nuclei.

Recommendation: Defer