

Individual Proposal Report

Proposal: PR-06-005

Scientific Rating: N/V

Title: Parity Violating Electron Scattering in Resonance Region (Res-Parity)

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Motivation: The proposal is aimed at measuring Parity-Violating asymmetries on three different targets (H, D, ^{12}C), over the full resonance region (up to a missing mass $W = 2.1 \text{ GeV}$) in the Q^2 domain $0.5 - 1.0 (\text{GeV}/c)^2$. This region of the resonances is of concern for many experiments. It will be studied here with a weak probe/coupling, giving access to combinations of quark contributions different than the one obtained with the EM coupling, and for a combination of targets. The physics addressed by this proposal is broader than usual, and is related to several important issues: quark-hadron duality, isospin decomposition of the resonances, and the flavor dependence of the EMC effect. This experiment would also provide important inputs to neutrino cross sections, necessary for the interpretation of key neutrino experiments. Finally the data obtained from this proposal could also be of help for other PV measurements such as E-158 or DIS-Parity (background, higher twist corrections and modeling the radiative corrections).

Measurement and Feasibility: Little change was necessary to the experimental set-up of the previous proposal to PAC 28. The experiment is still proposed to run in Hall A, but has now requested 30 days (instead of 15 days for PAC 28). This has been motivated by the fact that to address issues related to neutrino experiment and EMC effect improved statistical errors were requested.

The experiment uses the same equipment as E05-007 (DIS-Parity experiment). The DIS- and Res-Parity collaborations are closely working together on the necessary developments (upgraded Compton polarimeter, 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 exceed in quality routinely 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: This PAC felt that the experiment addresses a number of important issues. However, in competition for very limited beam time, no single issue was sufficiently compelling to approve the experiment. The part related to the neutrino physics case would benefit, in a new proposal, from more quantitative arguments and might request inputs from theorists and physicists involved in this field.

Recommendation: Defer with regret