

# Potential of New Physics Searches Using Parity-Violating Deep Inelastic Scattering

Kent Pashcke, Xiaochao Zheng<sup>1</sup>  
*University of Virginia, Charlottesville, VA 22904*

Paul E. Reimer  
*Argonne National Lab, Argonne, IL 60439*

Robert Michaels  
*Thomas Jefferson National Accelerator Facility, Newport News, VA 23606*

## *Abstract*

The Parity-Violating asymmetry in electron deep inelastic scattering (PVDIS) off nucleon or nuclear targets is related to both parton distribution functions of the target and the weak neutral-current coupling coefficients  $C_{1q}$  and  $C_{2q}$ 's, where  $C_{1q} = g_A^e g_V^q$  and  $C_{2q} = g_V^e g_A^q$ . In the Standard Model, they are directly related to the Weinberg angle  $\sin^2 \theta_W$ . Precision measurements of these couplings can therefore provide information on possible new extensions of the Standard Model. In particular, precision data on  $C_{2q}$ 's are not accessible through other processes hence PVDIS is complementary to other indirect Standard Model test experiments such as Qweak, E158, and the possible Moller measurement at JLab.

We are planning on a PVDIS measurement using the upgraded 12 GeV beam at JLab and the new spectrometer in Hall C. We expect to extract the weak coupling combination  $2C_{2u} - C_{2d}$  to an uncertainty of  $\pm 0.015$ , an order of magnitude improvement compared to the current knowledge on this quantity published in the particle data group. As the first step of PVDIS program at JLab, an experiment using the current 6 GeV beam in JLab Hall A was approved. The 6 GeV experiment will serve as an exploratory measurement in which possible hadronic effects and the reliability of extracting  $2C_{2u} - C_{2d}$  precisely will be studied.

---

<sup>1</sup>Email: xiaochao@virginia.edu