

Proposal to Jefferson Lab PAC 16

CONSTRAINING THE NUCLEON STRANGENESS RADIUS  
IN PARITY VIOLATING ELECTRON SCATTERING

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*(This is a Hall A Collaboration Proposal)*

## ABSTRACT

We propose to measure the parity violating asymmetry in the elastic scattering of 3.2 GeV electrons from a liquid Hydrogen target in Hall A at a scattering angle of  $\theta_{\text{lab}} = 6^\circ$ , corresponding to an average  $Q^2$  of  $0.11 \text{ (GeV/c)}^2$ . The small scattering angle will be achieved with a combination of the HRS high resolution spectrometers and septum magnets that are planned to be installed in Hall A. The physics asymmetry is estimated to be about 1.7 parts per million. With  $100\mu\text{A}$  electron beam and a polarization of 75%, a statistical error of 4.6% and a projected systematic error of 2.9% can be achieved in 700 hours. The recent physics run of the HAPPEX experiment has demonstrated that systematic errors can be controlled at the required level with a high polarization photocathode.

This measurement would access the linear combination  $\rho_s + \mu_p\mu_s$  to an accuracy of  $\pm 0.31$  and would provide a direct sensitive constraint on the nucleon strangeness radius. The experiment would thus probe the importance of strangeness to the charge distribution inside nucleons and could potentially make a clean, nonzero measurement of a nucleon strangeness matrix element.