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Title

Measurement of the Parity Violating Asymmetry in Elastic Electron Scattering off 208Pb

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Abstract

The Lead Radius Experiment (PREX) was carried out in order to provide a model independent measurement of the RMS radius $\sqrt{\langle r^2 \rangle}$ of the neutron distribution in the ^{208}Pb nucleus. The parity-violating scattering asymmetry for longitudinally polarized 1.06 GeV electrons from an unpolarized ^{208}Pb target was measured at $Q^2 = 0.00880 \text{ GeV}^2$. This measurement was performed by the PREX collaboration in Hall A at Jefferson Laboratory in Newport News, VA, between March and June, 2010. The electron detectors used in this measurement were designed and fabricated by University of Massachusetts-Amherst and Smith College. The resulting parity-violating asymmetry was measured as $A_{\text{PV}} = 656 \pm 60(\text{stat.}) \pm 14(\text{sys.}) \text{ ppb}$. This asymmetry extrapolates to a difference in radii between the nuclear neutron and proton distributions of $\sqrt{\langle r_n^2 \rangle} - \sqrt{\langle r_p^2 \rangle} = 0.33 \pm 0.16 \text{ fm}$.

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