

Measurement of the Two-Photon Exchange Contribution to Elastic Lepton-Proton Scattering at the OLYMPUS Experiment

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Measurements of the ratio of the proton elastic form factors ($\mu_p G_E/G_M$) using Rosenbluth separation and those using polarization-based techniques show a strong discrepancy, which increases as a function of Q^2 . The contribution of hard two-photon exchange (TPE) to ep scattering, which is neglected in the standard treatments of elastic ep scattering, is the most widely-accepted hypothesis for the explanation of this discrepancy. While calculations of the hard TPE contribution are highly model dependent, the effect may be quantified experimentally by precisely measuring the ratio of the positron-proton and electron-proton elastic scattering cross sections. The OLYMPUS experiment collected approximately 4 fb^{-1} of e^+p and e^-p scattering data at the DORIS storage ring at DESY in 2012, with the goal of measuring the elastic $\sigma_{e^+p}/\sigma_{e^-p}$ ratio over the kinematic range ($0.4 \leq \epsilon \leq 0.9$), ($0.6 \leq Q^2 \leq 2.2$) GeV^2/c^2 at a fixed lepton beam energy of 2.01 GeV. Initial results from OLYMPUS will be presented.