

# Results from the OLYMPUS Two-Photon Exchange Experiment

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## Abstract

Measurements of the proton's electric-to-magnetic form factor ratio obtained by different methods disagree significantly in a way that depends on  $Q^2$ . The OLYMPUS experiment was designed to empirically quantify two-photon exchange in lepton-proton scattering, an effect that, in some models, can fully account for this disagreement. This was achieved at the DORIS storage ring at DESY by measuring the ratio of the elastic cross-sections for positron-proton and electron-proton scattering with alternating 2.01 GeV lepton beams incident on an internal hydrogen gas target. Over  $4.0 \text{ fb}^{-1}$  were collected using a large-acceptance tracking spectrometer in a toroidal magnetic field and multiple luminosity monitoring systems, allowing for precise results ( $<1\%$  uncertainty) over the range of  $0.6 \leq Q^2 \leq 2.6 \text{ (GeV}/c)^2$ .

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