

# The Qweak Experiment: A search for physics beyond the Standard Model via a measurement of the proton's weak charge.

*Wednesday, 20 June 2012 11:00 (30 minutes)*

The Qweak collaboration recently completed a two year long program of measurements, with the aim of making a precision measurement of the parity violating analyzing power from elastic scattering of 1.16 GeV, longitudinally polarized, electrons on protons at very low  $Q^2$ . At low momentum transfer, the measured asymmetry is directly related to the weak charge of the proton  $Q_W^p = 1 - 4 \sin^2 \theta_W$ . The Standard Model makes a firm prediction for the size of the weak charge, based on the "running" of the weak mixing angle  $\sin^2 \theta_W$ . Qweak constitutes the first precision measurement of this quantity and provides a test for physics beyond the Standard Model, at a mass scale of about 2 TeV. A 2400 hour measurement of the asymmetry at  $Q^2 = 0.028 \text{ GeV}^2$ , using a beam current of 150  $\mu\text{A}$  at 85% polarization on a 0.35 m long liquid hydrogen target determines the weak charge of the proton with a 4% combined statistical and systematic error. In the absence of new physics, the experiment provides a 0.3% determination of  $\sin^2(\theta_W)$ , making this a very competitive measurement of the weak mixing angle. Qweak was installed and commissioned during the summer and Fall of 2010 in Hall C, at Jefferson Laboratory, began data collection in November 2010, and concluded data collection on May 18, 2012. I would like to provide a basic overview of the physics that is being addressed and present a description of the experiment, along with some diagnostic data describing the performance of the apparatus, as well as a first look at some production data (preliminary and blinded).

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