Abstract Submitted
for the SES06 Meeting of
The American Physical Society

Qweak: A Precision Measurement of the Proton's Weak Charge
KLAUS GRIMM[1], College of William and Mary — The Q_{weak} experiment at Jefferson Lab aims to make a 4% measurement of the parity-violating asymmetry in elastic scattering at very low Q^2 of a longitudinally polarized electron beam on a proton target. The experiment will measure the weak charge of the proton, and thus the weak mixing angle at a low energy scale, providing a precision test of the Standard Model. Because the value of the weak mixing angle is approximately 1/4, the weak charge of the proton $Q_w^p = 1 - 4\sin^2\theta_W$ is suppressed in the Standard Model, making it especially sensitive to the value of the mixing angle and also to possible new physics. The experiment will be a 2200 hour measurement, employing: an 80% polarized, 180 μA, 1.2 GeV electron beam; a 35 cm liquid hydrogen target; and a toroidal magnet to focus electrons scattered at $8^\circ \pm 2^\circ$, a small forward angle corresponding to $Q^2 = 0.03$ (GeV/c)^2. With these kinematics the systematic uncertainties from hadronic processes are strongly suppressed. To obtain the necessary statistics the experiment must run at an event rate of over 6 GHz. This requires current mode detection of the scattered electrons, which will be achieved with synthetic quartz Čerenkov detectors. A tracking system will be used in a low-rate counting mode to determine the average Q^2 and the dilution factor of background events. The theoretical context of the experiment and the status of its design are discussed.

[1]for the Qweak Collaboration

Klaus Grimm
College of William and Mary

Date submitted: 08 Sep 2006 Electronic form version 1.4