

# A Search for New Physics via the Proton Weak-Charge Measurement

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Recent and proposed precision experiments to study the running of the weak mixing angle with energy scale have sensitivity to new physics beyond the Standard Model of electroweak interactions. Depending on the accuracy obtainable the discovery potential is for new particles well in the TeV range. Any new particles may be reflected indirectly in the deviation of the experimental result from the ‘running’ of the weak coupling in the Standard Model. These low energy measurements can establish detail about any new particles which are observed in high energy collisions at the Large Hadron Collider .

The “Qweak Experiment”, currently under construction, is Jefferson Laboratory's contribution to this program. The experiment will provide the first precision measurement of the proton's weak charge,  $Q_{\text{Weak}}^p = 1 - 4\sin^2\theta_w$  and will constitute one of the most rigorous tests of the Standard Model at low  $Q^2$ . The Standard Model makes a firm prediction of the proton's weak charge, based on the running of the weak mixing angle from the  $Z^0$  pole down to low energies, corresponding to a 10 sigma effect in our experiment. The required hadronic corrections have now been precisely determined from recently completed strange quark search parity violation measurements.