

Measurement of the Weak Charge of the Proton by the QWeak Collaboration

Sunday, 3 September 2017 12:15 (30 minutes)

The QWeak collaboration has un-blinded its final result from data taken at Jefferson Laboratory. We describe the longitudinally polarized electron-proton elastic scattering technique employed to isolate and extract the scattering asymmetry, which constituted our observable. The precision obtained from our combined two run periods was ± 9 ppb. The results from these run periods were in excellent agreement. Some of the backgrounds and corrections applied in the measurement will be discussed. We provide the results from several methods used to extract consistent values of the proton's weak charge Q_p^W from our measurement. From the proton's weak charge is obtained a result for $\sin^2\theta_W$ at the low Q^2 scale of the measurement, which is a sensitive Standard Model test of the running of $\sin^2\theta_W$. This defines a mass reach for any parity violating semi-leptonic physics beyond the Standard Model. Implications for specific physics models will be discussed. We also present results for the strange and axial form factors obtained from a fit which included additional existing parity-violating electron scattering data. In conjunction with existing atomic parity violation results on ^{133}Cs we also extract the vector weak quark couplings C_{1u} and C_{1d} . The latter are combined to obtain the neutron's weak charge.

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This work was supported by DOE Contract No. DEAC05-06OR23177, under which Jefferson Science Associates, LLC operates Thomas Jefferson National Accelerator Facility. Construction and operating funding for the experiment was provided through the U.S. Department of Energy (DOE), the Natural Sciences and Engineering Research Council of Canada (NSERC), and the National Science Foundation (NSF) with university contributions from the College of Willi

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Session Classification: Plenary