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Final results from QWeak

Tuesday, 4 September 2018 14:00 (30 minutes)

Experimental programs in the fields of nuclear and particle physics are searching for evidence of physics beyond that explained by current theories. The Standard Model cannot predict fundamental parameters such as the mass of the Higgs boson or account for dark matter/energy, gravity, and the matter–antimatter asymmetry in the Universe. These limitations have inspired direct searches for additional particles at high energy accelerators. Alternately, indirect searches using precise measurements of well predicted Standard Model observables allow highly targeted tests that can reach mass and energy scales beyond those directly accessible by today's high energy accelerators. Such indirect searches include the precise measurement of the weak charge of the proton. Because parity symmetry is violated only in the weak interaction, it provides a tool to isolate the weak interaction. With our precise measurement (-226 ±9 ppb) of the parity-violating asymmetry in the scattering of polarized electrons on protons, we extract the proton's weak charge and the weak mixing angle sin2⊠W at low Q2. This allows a mass reach for any parity violating semi-leptonic physics beyond the Standard Model at the multi-TeV scale. Implications for several specific models will be discussed. In conjunction with existing atomic parity violation results on 133Cs we also extract the vector weak quark couplings C1u and C1d and the weak charge of the neutron.

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