

Parity-Violating Electron Scattering as a Test of the Standard Model

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The technique of parity-violating electron scattering, involving measurements of the asymmetry in the scattering of longitudinally polarized electrons off fixed targets, has become increasingly precise over the past three decades. Such asymmetries are sensitive to weak neutral current interactions (mediated by the Z boson) between electrons and quarks, or between two electrons, and can be used to probe for the limits of validity of the electroweak theory in a manner complementary to direct searches for new physics at high energy scales at colliders. Experiments planned for the next decade in elastic electron-electron scattering (MOLLER at Jefferson Lab), elastic electron-proton scattering (P2 at the Mainz MESA facility), and parity-violating deep inelastic scattering (SOLID at Jefferson Lab), will significantly improve determinations of the electron's weak charge, proton's weak charge, and the axial-vector electron-quark coupling constants, respectively. All of these measured quantities can be used to extract values of the weak mixing angle at low energies that can be used to test the Standard Model and probe for new physics beyond the Standard Model at MeV and multi-TeV scales, complementary to direct searches at high energy colliders.

Category

talk

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