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MeV to TeV Physics with Parity-Violating Electron Scattering: An Overview[1]

KRISHNA KUMAR, University of Massachusetts, Amherst

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 and broad in its scope over the past three decades. Such asymmetries are sensitive to weak neutral current interactions between electrons and quarks, mediated by the Z^0 boson, and are being used to investigate the strangeness content of the nucleon, the neutron distribution in heavy nuclei and to probe for the limits of the validity of the electroweak theory in a manner complementary to direct searches for new physics at high energy scales at colliders. Steady improvements to the experimental techniques now allow for asymmetries to be measured with statistical and systematic errors better than 1 part per billion. Further precise measurements have now become feasible in parity-violating elastic and deep inelastic scattering off hadronic targets, and in electron-electron (Møller) scattering. In this talk, we introduce the experimental technique, provide an overview of recent experimental progress and physics results, and set the context for the development of the future program.

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