Tests of the theory of Quantum-Electrodynamics

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We describe recent developments in testing quantum-electrodynamics (QED), the theory of the interactions of matter with electro-magnetic fields and forces. The tests focus on consistency in the determination of parameters or constants within QED obtained via multiple independent means and, in particular, by comparisons of precision measurements with, equivalently accurate, theoretical calculations. The most-precise tests rely on a combination of the spectroscopy of atomic hydrogen, g-factor measurements of a free electron as well as that of an electron bound in a hydrogen-like ion, and finally the mass determination of the ions through atom recoil experiments and mass spectroscopy. These experiments determine the dimensionless finestructure constant and the mass of the electron to ten significant digits, orders of magnitude better than any other component of more unified models of nature. We also show that an international system of units (SI) based on fixed values of the Planck constant and the charge of the electron (in addition to the fixed value of the speed of light in vacuum) modifies the interpretation of some of these tests.