

Introduction to Quantum Electrodynamics

Quantum Electrodynamics (QED) is the relativistic quantum field theory of electrodynamics. It describes

The QED Lagrangian is given by:

$$\mathcal{L} = \bar{\psi} (i\gamma^\mu D_\mu - m) \psi - \frac{1}{4} F_{\mu\nu} F^{\mu\nu}$$

where $D_\mu = \partial_\mu + ieA_\mu$ is the gauge covariant derivative, $F_{\mu\nu} = \partial_\mu A_\nu - \partial_\nu A_\mu$

Feynman diagrams provide a pictorial representation of the perturbative expansion. The basic vertex re

Renormalization is essential in QED to handle the divergences that appear in loop diagrams. The theor

Further topics include vacuum polarization, the Lamb shift, and the Casimir effect, all of which are expla