5.6: The Predictive Power of QED

It is hard to say that a theory has predictive power without comparing it to experiment, so let me highlight a few successes of QED.

One of those is the so-called g factor of the electron, related to the ratio of the spin and orbital contributions to the magnetic moment. Relativistic theory (i.e., the Dirac equation) shows that $g = 2$. The measured value differs from 2 by a little bit, a fact well accounted for in QED.

$$\begin{aligned} \text{experiment} \quad & g/2 = 1.00115965241(20) \\ \text{Theory} \quad & g/2 = 1.00115965238(26) \end{aligned}$$

Some of the errors in the theory are related to our knowledge of constants such as $\hbar$, and require better input. It is also clear that at some scale QCD (the theory of strong interactions) will start playing a rôle. We are approaching that limit.