In quantum optical systems the coupling between a single dipole and a single cavity mode is always much smaller than the absolute energy scales involved, which allows us to understand and model light-matter interactions in terms of well-defined atomic and photonic excitations. With recent advances in the field of circuit QED it is now possible to go beyond this well-established paradigm and enter a fully non-perturbative regime, where the coupling between a single artificial atom (e.g. a superconducting qubit) and a microwave photon exceeds the energy of the photon itself. Such conditions can be associated with an effective fine-structure constant of order unity and in this talk I will give a brief introduction about the basics models and novel effects that govern the physics of light-matter interactions in this previously unaccessible regime.