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### Waveguide QED in superconducting circuits – an atom in front of a mirror, quantum sound and a giant atom

Superconducting circuits have recently been developed in order to realize a quantum computer. However, there are a number of interesting physics "spin-off"-results. The quantum bits consists of circuits giving a non-linearity at the single photon level, in the same way as ordinary atoms do. This enables exploration of the interaction between (artificial) atoms and the electromagnetic field in previously unavailable parameter regimes.

In this talk, I'll briefly introduce the circuit element responsible for the non-linearity, i.e. the Josephson junction. I'll then discuss a few experimental results on scattering off a single atom in 1 D open space, and the measurement of a suppressed vacuum-fluctuations in front of a mirror. If there is time, I'll also explain how the artificial atom can be made to couple predominantly to mechanical waves (Surface Acoustic Waves) and in what sense the atoms then are truly giant.

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