Coherent manipulation of Andreev states in an atomic contact

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Two superconducting electrodes coupled through a single conduction channel form the simplest Josephson weak-link. The Josephson effect can be fully described in terms of two quasiparticle states localized at the link and having energies within the superconducting gap. In this work we perform an exhaustive exploration of these so called Andreev bound states, including their coherent manipulation. The measurement is done by coupling a superconducting atomic contact to a microwave resonator. With this standard circuit QED architecture, we achieve single-shot measurements and observe quantum jumps.

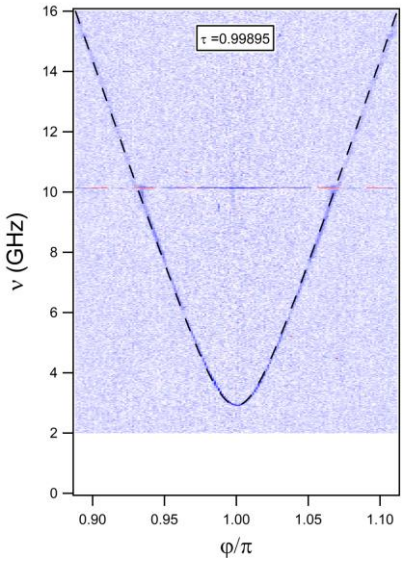

Figure : Two tone spectrum of the Andreev transition. The amplitude of resonator signal is shown as a function of the excitation frequency and the phase difference on the weak-link. In dashed black is shown a fit for a transmission coefficient of 99.895%