Method for preparing two-atom entangled states in circuit QED and probing it via quantum nondemolition measurements

Daniel Z. Rossatto and Celso J. Villas-Boas

We propose a probabilistic scheme to prepare a maximally entangled state between a pair of two-level atoms coupled to a leaking cavity mode in circuit QED, without requiring precise time control of the system evolution and initial atomic state. We show that the steady state of this dissipative system is a mixture of two parts, where the atoms are either in their ground state or in a maximally entangled one. Then, by applying a weak probe field to the cavity mode, we are able to discriminate those states without disturbing the atomic system, i.e., to perform a quantum nondemolition measurement via the cavity transmission. In this scheme, one has maximum cavity transmission only when the atomic system is in an entangled state, so that a single click in the detector is enough to be sure that the atoms are in a maximally entangled state. Our scheme relies on an interference effect as it happens in an electromagnetically induced transparency phenomenon.