
Embedding quantum dot circuits in a microwave cavity

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Résumé

Cavity QED allows one to study the interaction between light and matter at the most elementary level, by using for instance Rydberg atoms coupled to cavity photons. Recently, it has become possible to perform similar experiments on-chip, by using artificial two-level systems made from superconducting circuits instead of atoms. This circuit-QED offers unexplored potentialities, since other degrees of freedom than those of superconducting circuits could be used, and in particular, those of quantum dots. Such a hybrid circuit QED would allow one to study a large variety of situations not accessible with standard cavity QED, owing to the versatility of nanofabricated circuits.

Recently we demonstrated the photon mediated interaction between two quantum dot circuits embedded in a microwave cavity. This could be used to scale up quantum bit architectures based on quantum dot circuits, and simulate on-chip phonon-mediated interactions between strongly correlated electrons. Here we present a single contact quantum dot coupled to the electromagnetic field of the cavity mode. In this context we revisit the charge relaxation of the interacting quantum RC circuit.

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