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Coupling Qubits and Spins to Superconducting Cavities

Circuit quantum electrodynamics is a system that allows us to carry out new experiments in quantum optics using a superconducting integrated circuit on a chip. In circuit QED, microwave photons are guided and confined by superconducting transmission lines and cavities, and can then be coherently coupled to a transmon qubit. This system leads to a much stronger coupling of “light” and “matter” than is possible with traditional atomic systems. Making use of this strong coupling, it is possible to couple two qubits via the cavity [1,2]. Furthermore, the very small mode volume allows to couple spins of atoms and molecules to the resonator. In that way, it becomes possible to couple an ensemble of nitrogen vacancy defects to a superconducting resonator. vspace0.5cm

[1] J. Majer, . . . Nature extbf449, 443 (2007)

[2] L. DiCarlo, . . . J. Majer, Nature extbf460, 240 (2009)

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