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Two-resonator Circuit Quantum Electrodynamics: A superconducting Quantum Switch[1] MATTEO MARIANTONI, FRANK DEPPE, ACHIM MARX, RUDOLF GROSS, Walther-Meissner-Institut and TU Muenchen, Germany, FRANK K. WILHELM, Institute for Quantum Computing and Department of Physics and Astronomy, University of Waterloo, Waterloo, Canada, ENRIQUE SOLANO, Universidad del Pais Vasco and Ikerbasque Foundation (Bilbao, Spain) — We introduce a systematic formalism for two-resonator circuit QED, where two on-chip microwave resonators are simultaneously coupled to one superconducting qubit. Within this framework, we demonstrate that the qubit can function as a quantum switch between the two resonators. We also show that our quantum switch represents a flexible architecture for the manipulation and generation of nonclassical microwave field states as well as the creation of controlled multipartite entanglement in circuit QED. In addition, we propose a realistic implementation of two-resonator circuit QED.

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Matteo Mariantoni
Walther-Meissner-Institut and TU Muenchen, Germany

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