A coaxial circuit QED architecture for quantum computing
JOSEPH RAHAMIM, TANJA BEHRLE, MICHAEL PETERER, ANDREW PATTERSON, PETER SPRING, RICCARDO MANENTI, GIOVANNA TANCREDI, PETER LEEK, University of Oxford — A major obstacle in scaling up superconducting circuit architectures for quantum computing is the difficulty of having the many required control and measurement lines on the same chip as the qubits. As a solution, we present a coaxial circuit QED architecture in which a qubit and lumped element LC resonator are fabricated on opposing sides of a single chip, and control and readout are provided by coaxial wiring running perpendicular to the chip plane. We present spectroscopic and time-resolved measurements of a fabricated device, demonstrating excellent agreement with circuit QED in the dispersive regime. The architecture allows for scaling via nearest-neighbour coupling to large arrays of selectively controlled and measured qubits, with a straight-forward fabrication procedure and without the complexity of in-plane wiring.

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