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**Coherence properties of a capacitively-shunt flux qubit**[1] JEFFREY BIRENBAUM, UC Berkeley, ADAM SEARS, MIT-LL, CHRISTOPHER NUGROHO, UC Berkeley, TED GUDMUNDSEN, PAUL WELANDER[2], JONILYN YODER, MIT-LL, ARCHANA KAMAL, SIMON GUSTAVSSON, MIT, JAMIE KERMAN, WILLIAM OLIVER, MIT-LL, JOHN CLARKE, UC Berkeley — Coherence times for typical flux qubits have plateaued at $5-10$ $\mu$s for $T_1$ and $1-3$ $\mu$s for $T_{Ramsey}$. To achieve longer coherence times we study capacitively-shunted flux qubits using high-Q capacitors to individually shunt all four Josephson junctions (JJs). The additional shunt capacitance moves $90+$ % of the qubit energy from the lossy capacitance of the JJs into the high-Q shunts while preserving an anharmonicity greater than 100% and maintaining $f_{01} < f_{12}$. The band structure is also flattened providing moderately decreased sensitivity to flux noise. Using high-quality MBE aluminum [1] we fabricate a capacitively-shunted flux qubit inductively coupled to a lumped-element readout resonator. The qubit junctions are deposited via aluminum e-beam evaporation using a bridgeless mask. We characterize the influence of qubit design parameters such as capacitance and geometry on the coherence time of the device.
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