Abstract Submitted
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Effect of geometry and magnetic field on the coherence time of 3D transmons[1] CHEN WANG, Y. GAO, C. AXLINE, T. BRECHT, L. FRUNZIO, R.J. SCHOELKOPF, Departments of Applied Physics and Physics, Yale University — The three-dimensional circuit QED architecture has enabled nearly two orders of magnitude of improvement in the coherence time of transmon qubits over the last couple of years[1]. Continued improvement moving forward relies on a better understanding of the factors limiting coherence of the current generation of transmons. Here we present a systematic study of the energy relaxation time (T_1) of transmon qubits coupled to 3D waveguide cavities with various designs of capacitor geometries and its dependence on temperature and external magnetic field. Our measurement and analysis indicate both surface dielectric loss and quasiparticle loss play important roles in limiting T_1 of 3D transmons. More interestingly, with certain geometric design we found qubit T_1 can be improved by cooling in a small magnetic field. These results suggest more complex interplays of loss mechanisms than was previously appreciated and may have important implications for future design of transmons. [1] H. Paik, et al., Phys. Rev. Lett. 107, 240501 (2011).

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