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Energy relaxation in transmons coupled to superconducting lumped-element resonators B. SURI, S. NOVIKOV, Dept. of Physics, Univ. of MD., F.C. WELLSTOOD, JQI, CNAM, Dept. of Physics, Univ. of MD., B.S. PALMER, Lab. for Physical Sciences, Dept. of Physics, Univ. of MD, College Park, MD. — We report on the energy relaxation of a series of $Al/AlO_x/Al$ transmon qubits coupled to superconducting Al lumped-element resonators on a sapphire substrate measured at 20 mK. For some of our transmon devices, which have transition frequencies between 4 and 8 GHz, we find that the coupling of the transmon to the 50 Ω transmission line through the lumped-element resonator is the dominant mechanism of relaxation limiting the lifetimes to 1 μs or smaller. By increasing the resonator's resonant frequency from 5.4 to 7.2 GHz, increasing the loaded quality factor of the resonator, and lowering the transmon-resonator coupling, we were able to decouple the transmon from the dissipative environment by an order of magnitude. We observe an improvement in the lifetimes of the transmon, with new limits possibly set by material losses. Microwave simulations, analytical results and experimental measurements on multiple devices will be presented.

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