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Superconducting microwave resonators - low loss, tunability, and coupling HAOHUA WANG, RADOSLAW C. BIALCZAK, MIKE LENANDER, ERIK LUCERO, MATTEO MARIANTONI, MATTHEW NEELEY, AARON O'CONNELL, DANIEL SANK, MARTIN WEIDES, JAMES WENNER, TSUYOSHI YAMAMOTO[1], YI YIN, ANDREW CLELAND, JOHN MARTINIS, University of California, Santa Barbara — The superconducting microwave resonator is an important device for applications such as quantum computation and photon detection. A key parameter characterizing its performance is the energy decay time. We have optimized our superconducting coplanar resonators to achieve an energy decay time around 10 μs. By fabricating devices with different metals and measuring their quality factors as a function of temperature, power, and cooling field, we have identified an important dissipation mechanism: loss from two-level states at metal-oxide surfaces. We also find that the (classical) measurement of the quality factor at low power is consistent with the energy decay time measured in a (quantum) qubit-resonator swap experiment. Further experiments on tuning the resonator frequency while minimizing dissipation, as well as coupling two resonators, will also be discussed.

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