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Effects of 780 nm Optical Illumination on Loss in Superconducting Microwave Resonator[1] R.P. BUDOYO, J.B. HERTZBERG, C.J. BALLARD, K.D. VOIGT, JQI and CNAM, Dept. of Physics, University of Maryland, College Park, J.E. HOFFMAN, J.A. GROVER, P. SOLANO, J. LEE, S.L. ROLSTON, L.A. OROZCO, JQI, Dept. of Physics, University of Maryland, College Park, J.R. ANDERSON, C.J. LOBB, F.C. WELLSTOOD, JQI and CNAM, Dept. of Physics, University of Maryland, College Park — Understanding the effects of light incident on a superconducting circuit is an important step toward building a hybrid quantum system where a superconducting qubit or resonator is coupled to atoms trapped on a tapered optical fiber. We fabricated a microscale thin-film Al superconducting LC resonator (frequency 6.72 GHz) on sapphire substrate and mounted it inside an Al 3d cavity (TE101 mode frequency 7.50 GHz). Using an optical fiber, we illuminated the resonator with 780 nm light, and measured the change in internal quality factor and resonant frequency of the resonator as a function of applied optical power. The results suggest that the illumination causes an increase in rf drive-dependent dissipation. While optical illumination is expected to enhance dissipation due to quasiparticles, rf drive dependence is more typically seen in two-level-system dissipation. We compare the results with the change in loss from increased resonator temperature, and discuss various mechanisms of loss from optical illumination.

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Rangga P. Budoyo
JQI and CNAM, Dept. of Physics, University of Maryland, College Park

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