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Anomalous magnetic field effects in high Q superconducting resonators M. LENANDER, R. BARENDS, YU CHEN, J. KELLY, ERIK LUCERO, MATTEO MARIANTONI, A. MEGRANT, P.J.J. O'MALLEY, C. NEILL, D. SANK, A. VAINSENCHER, H. WANG, J. WENNER, T.C. WHITE, Y. YIN, J. ZHAO, C. PALMSTROM, A.N. CLELAND, JOHN M. MARTINIS, UCSB — Superconducting coplanar wave guide resonators are an important tool in quantum computing for use as memory elements. Recent process improvements have allowed for quality factors in excess of 1.5 million at single photon excitations. While allowing for more sensitive experiments, the most recent group of resonators exhibit very high sensitivity to magnetic fields. Ordinarily Abrikosov vortex physics is expected to govern the magnetic response of the resonators. During field cooling, vortices begin to form at a threshold field, B_{th}, that depends quadratically on the width of the resonator. However these resonators show an observed B_{th} two orders of magnitude lower than predicted by theory and without any scaling with resonator width. We explore increased sensitivity to frequency fluctuations at nonzero field as a possible explanation for reduced quality factor long before vortices are expected to form.

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