Abstract Submitted
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Quasiparticle Trapping and Dynamics in Superconducting Nanobridges[1] E.M. LEVENSON-FALK, QNL, UC Berkeley, F. KOS, Department of Physics, Yale University, R. VIJAY, Department of Condensed Matter Physics and Materials Science, Tata Institute of Fundamental Research, L. GLAZMAN, Department of Physics, Yale University, I. SIDDIQI, QNL, UC Berkeley — Quasiparticle excitations can cause loss and noise in superconducting circuits. Recent experiments [1-4] have probed the bulk density of nonequilibrium quasiparticles and their tunneling rates in aluminum superconducting qubits and resonators at low temperature. We perform dispersive measurements of quasiparticle trapping in phase-biased aluminum nanobridge Josephson junctions incorporated into a superconducting resonator. The trapped quasiparticles populate Andreev states formed in the biased nanobridge. We use our technique to not only infer the quasiparticle density, but also to probe the quasiparticles' energy distribution and trapping statistics, to perform spectroscopy on the trap states, and to measure trapping dynamics. We find that the quasiparticle energy distribution is non-thermal below 75 mK, with non-Poissonian trapping statistics. The evolution of the trapping time with the phase bias is consistent with electron-phonon relaxation as the dominant mechanism for quasiparticle trapping in Andreev states.

[1] Manucharayan et al., Science 326, 113 (2009)
[2] Paik et al., Phys. Rev. Lett. 107, 240501 (2011)
[3] Barends et al., Appl. Phys. Lett. 99, 113507 (2011)
[4] Risté et al., Nature Communications 4, 1913 (2013)

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