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**Quantum Dissipation in Nanomechanical Structures at Millikelvin Temperatures** GUITI ZOLFAGHARKHANI, Department of Physics, Boston University, Boston, MA 02215, ALEXEI GAIDARZHY, Department of Aerospace and Mechanical Engineering, Boston University, Boston, MA 02215, SEUNG-BO SHIM, CSCMR & School of Physics, Seoul National University, Seoul 151-747 Korea, PRITIRAJ MOHANTY, Department of Physics, Boston University, Boston, MA 02215 — We report measurement of dissipation (inverse quality factor) and resonance frequency shift in a series of nanomechanical resonators with megahertz-range resonance frequencies. These structures are fabricated from single-crystal silicon by electron-beam lithography and surface nanomachining. The measurements are done at down to a temperature of 60 millikelvin. The temperature dependencies show reproducible features, which indicate the coupling between acoustic phonons and surface and bulk two-level systems as the dominant mechanism of dissipation. We compare the data to a model of quantum dissipation in the Caldeira-Leggett model. This work is supported by the NSF (DMR, CCF, ECS), DOD (ARL), ACS (PRF) and the Sloan Foundation.

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