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Sideband Resolved Cooling of a Nanomechanical Resonator Parametrically Coupled to a Microwave Resonator TRISTAN ROCHELEAU, TCHEFOR NDUKUM, JARED HERTZBERG, KEITH SCHWAB, Department of Physics, Cornell University — We have fabricated a nanostructure formed by a radio-frequency nanomechanical (NEMS) resonator capacitively coupled to an aluminum 5 GHz superconducting, co-planar waveguide (CPW) resonator with 50 Ω characteristic impedance.By driving this coupled system at a frequency $\omega_{pump} = \omega_{CPW} - \omega_{NEMS}$, we demonstrate back action cooling effects of a single NEMS mode achieving cooling from temperatures of 100mK to <10mK, with the lowest occupation factor of N<30. We have recently demonstrated a Nb, 130 Ω 5 GHz, Q=15,000 microwave resonator which we expect to be capable of cooling the NEMS close to ground state.

Tristan Rocheleau
Department of Physics, Cornell University

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