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Sideband Resolved Cooling of a Nanomechanical Resonator Parametrically Coupled to a Microwave Resonator JARED HERTZBERG, Department of Physics, University of Maryland, TRISTAN ROCHELEAU, TCHEFOR NDUKUM, KEITH SCHWAB, Department of Physics, Cornell University — We have created a nanostructure formed by a radio-frequency nanomechanica (NEMS) resonator capacitively coupled to a 5 GHz superconducting, co-planar waveguide (CPW) resonator. Recently, we have shown that it is possible to passively cool a NEMS resonator to within a few tens of quanta of its ground state, N = 25 [1]. By driving this coupled system at a frequency $\omega_{pump} = \omega_{CPW} - \omega_{NEMS}$, we expect to produce an active cooling process in the sideband resolved limit which in principle [2] should be capable of preparing the ground state of motion,with occupation factors N ¡¡ 1. In future work, we expect to be able to demonstrate backaction evading position detection and ultimately squeezed quantum states of the mechanical device by using more advanced pumping schemes, such as double sideband pumping. [1] A. Naik et al, Nature 443, 193 - 196 (2006) [2] F. Marquardt et al, Phys. Rev. Lett. 99, 093902 (2007)

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