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Parametric feedback squeezing of an opto-electromechanical device below 3dB MENNO POOT, HONG TANG, Dept. of Electrical Engineering, Yale University — Parametric squeezing can reduce the uncertainty in one quadrature of the position of a mechanical resonator, even below the standard quantum limit, and it can improve measurement sensitivity. Here we demonstrate squeezing of the thermal motion of a 570 kHz opto-electromechanical resonator made out of high-stress SiN by modulating its spring constant at twice the resonance frequency. Parametric and direct actuation are achieved by applying a.c. voltages between strongly coupled electrodes on the resonator and a fixed one. It is well know that using this method the motion of one quadrature cannot be decreased more than 3 dB below the undriven case before instabilities kick in. However, by measuring the phase-space trajectory of the resonator and adjusting the phase of the parametric drive in real-time we achieve a stationary reduction in both quadratures that is far beyond this limit. Finally, due to the strong coupling between the drive electrodes, the nonlinearity of the resonator can be tuned all the way from a stiffening spring to a softening one.

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