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Correlation-enhanced Metrology with Mechanical Parametric Amplifiers[1] HIL FUNG HARRY CHEUNG, LAURA CHANG, YOGESH SHARAD PATIL, SRIVATSAN CHAKRAM, MUKUND VENGALATTORE, Cornell University — Quantum correlations between the two arms of a mechanical parametric amplifier [1, 2] can be used to realize sensing beyond the standard quantum limit. We use nondegenerate mechanical parametric oscillators made of silicon nitride membrane resonators to demonstrate mechanical amplitude squeezing. This is the acoustic equivalent of intensity difference squeezing observed in optical parametric oscillators. We use the strong correlations between the nondegenerate modes to realize sub-thermal force sensitivities through noise cancellation and signal enhancement schemes. Our classical realization of enhanced metrology in a platform amenable to quantum optomechanics and nonclassical state preparation paves the way for quantum nonlinear sensing.

[1] Y. S. Patil *et al.* arXiv:1410.7109
[2] S. Chakram *et al.* arXiv:1412.8536

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