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Observation of two-mode thermal squeezing through coherent coupling of positive- and negative-mass oscillators JONATHAN KOHLER, JUSTIN GERBER, EMMA DOWD, DAN STAMPER-KURN, Univ of California - Berkeley — Measurement and control of either the mechanical or rotational degrees of freedom of an atomic ensemble have been well demonstrated through coupling to an optical cavity. We have previously used autonomous cavity feedback to demonstrate the stabilization of a precessing collective spin near its high-energy stationary state, where excitations away from this state evolve like an effective negative-mass oscillator. When the dynamics of this negative-mass mode are coherently coupled to the collective atomic motion, we observe a parametric instability, which leads to the spontaneous amplification of a correlated mode of the hybrid system. Under the correct conditions, this interaction drives the system into a two-mode squeezed state. I will present the latest results of our measurements of the correlations created through this process.

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