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**Cavity coupling of atomic spin and motion** JONATHAN KOHLER, JUSTIN GERBER, NICOLAS SPETHMANN, SYDNEY SCHREPPLER, DAN STAMPER-KURN, Univ of California - Berkeley — Optical cavities have been used to realize sensitive, quantum limited measurements of both the spin and mechanical degrees of freedom of atomic ensembles. We have previously demonstrated cavity assisted measurement and control of a spin-oscillator, where the total atomic spin precesses around an external magnetic field. The spin-oscillator can realize an effective negative mass oscillator, for excitations around its highest energy state. In this talk, I will present our most recent work toward coupling the mechanical and spin degree of freedom of one or more atomic ensembles, with the goal of realizing Coherent Quantum Noise Cancellation for back-action evading measurements.

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