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Observing spin optodynamical analog of cavity optomechanics JUSTIN GERBER, JONATHAN KOHLER, NICOLAS SPETHMANN, SYDNEY SCHREPPLER, DAN STAMPER-KURN, Univ of California - Berkeley — Cavity Optomechanics has been realized in many diverse systems and led to many interesting results such as ponderomotive squeezing of light, beyond-SQL measurement sensitivity, and squeezing of mechanical oscillators. Optical cavities also allow sensitive measurements of the spin of an atomic ensemble. It has been proposed to utilize this sensitivity to realize an analog of optomechanics by measuring the precession of small excitations of a spin-oscillator around a transverse magnetic field. I will present our recent work in which we realize optomechanical analogs in our system such as cavity-assisted cooling and amplification and optical spring shifts. In addition, the presence of a high-energy 'ground state' of the spin oscillator allows the realization of an effective negative mass oscillator which is demonstrated by an inverted sideband asymmetry. In our ongoing work we attempt to realize coherent quantum noise cancelation by coupling spin oscillation with mechanical oscillation.

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