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Magnetic coupling of laser-cooled atoms to a micro-resonator ANDREW GERACI, YING-JU WANG, MATTHEW EARDLEY, Time and Frequency Division, NIST, Boulder, CO, JOHN MORELAND, Electromagnetics Division, NIST, Boulder, CO, JOHN KITCHING, Time and Frequency Division, NIST, Boulder, CO — The direct coupling of the spin-degrees of freedom of an atomic vapor to the vibrational motion of a magnetic cantilever tip has recently been demonstrated [1], and prospects for coupling a BEC on an atom-chip to a nano- mechanical resonator have been recently discussed [2]. Possible applications include chip-scale atomic devices, in which localized interactions with magnetic cantilever tips selectively influence or probe atomic spins. As a next step towards the realization of a strongly coupled ultra-cold atom- resonator system, we have constructed an apparatus to study the direct coupling between the spins of trapped laser-cooled Rb atoms and a magnetic tip on a micro-cantilever. The atoms will be loaded into a magnetic trap formed by the cantilever tip and external magnetic fields. The cantilever will be driven capacitively at its resonance frequency, resulting in a coherent precession of the trapped atomic spins with a matching Larmor frequency. Prospects for measuring the back-action of the ensemble of atomic spins on a cantilever beam will also be discussed. [1] Y.-J. Wang,M. Eardley, S. Knappe, J. Moreland, L. Hollberg, and J. Kitching, PRL 97, 227602 (2006). [2] P. Treutlein,D. Hunger, S. Camerer, T. W. Hansch, and J. Reichel, PRL 99, 140403 (2007).

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