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Micro-mechanical coupling of cold atoms CRIS MONTOYA, JOSE VALENCIA, ANDREW GERACI, University of Nevada, Reno, MATTHEW EARDLEY, JOHN KITCHING, National Institute of Standards and Technology — The boundary between quantum microscopic phenomena and macroscopic systems can be studied by coupling a quantum system with well understood coherence properties with a macroscopic system. Micro-mechanical resonators provide single-spin sensitivity and sub-micron spatial resolution; these micro resonators can be used to study decoherence and quantum control when applied to probe ultra-cold atoms. In the future, hybrid quantum systems consisting of cold atoms interfaced with mechanical devices may have applications in quantum information science. We describe our experiment to couple laser-cooled Rubidium atoms to a magnetic cantilever tip. This cantilever is precisely defined on the surface of a chip with lithography and the atoms are trapped at micron-scale distances from this chip. To match cantilever mechanical resonances, atomic magnetic resonances are tuned with a magnetic field.

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