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Excitation of Atoms with Magnetic Microstructures MATTHEW EARDLEY[1], YING-JU WANG, SVENJA KNAPPE, Time and Frequency Division, National Institute of Standards and Technology, JOHN MORELAND, Electromagnetics Division, National Institute of Standards and Technology, LEO HOLLBERG, JOHN KITCHING, Time and Frequency Division, National Institute of Standards and Technology — We report on the first observation of excitation of atoms in a gaseous state by motion of a magnetic, mechanical resonator. We excite Zeeman resonances in Rb^{87} atoms, confined in a microfabricated buffer gas vapor cell, that have been optically pumped on the D1 line at 795nm. A cantilever with a magnetic tip is placed near the cell and driven on resonance to provide an oscillating magnetic field that, in combination with a DC magnetic bias field, de-pumps the atoms and thus promotes absorption that is detected on a photodiode. As we sweep the oscillation frequency of the cantilever across resonance we see a narrow peak in absorption that corresponds to excitation of the atoms by the cantilever motion. We characterize this system by measuring the sensitivity of the atoms to external magnetic fields. Further improvements will include microfabricated torsional cantilevers that will provide a more homogeneous excitation field, and the use of a magneto-optical trap to drop cold atoms near the cantilever and thereby maximize the interaction time.

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