Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Experimental observation of magic-wavelength behavior of a microwave transition in optical lattice-trapped rubidium NATHAN LUNDBLAD, Bates College, MALTE SCHLOSSER, TU Darmstadt, TREY PORTO, NIST — We demonstrate the cancellation of the differential ac Stark shift of the microwave hyperfine clock transition in trapped ^{87}Rb atoms. Recent progress in metrology exploits so-called "magic wavelengths," whereby an atomic ensemble can be trapped with laser light whose wavelength is chosen so that both levels of an optical atomic transition experience identical ac Stark shifts. Similar magic-wavelength techniques are not possible for the microwave hyperfine transitions in the alkalis, due to their simple electronic structure. We show, however, that ac Stark shift cancellation is indeed achievable for certain values of wavelength, polarization, and magnetic field. The cancellation comes at the expense of a small magnetic-field sensitivity. The technique demonstrated here has implications for experiments involving the precise control of optically-trapped neutral atoms.

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Date submitted: 21 Jan 2010 Electronic form version 1.4