Abstract Submitted
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Systematic Study of the ^{87}Sr Clock Transition in an Optical Lattice[1] MARTIN BOYD, ANDREW LUDLOW, TANYA ZELEVINSKY, SETH FOREMAN, SEBASTIAN BLATT, MARK NOTCUTT, TETSUYA IDO, JUN YE, JILA and the Department of Physics, National Institute of Standards and Technology and the University of Colorado, Boulder CO 80309-0440 — The $^1S_0-^3P_0$ transition in ^{87}Sr is studied for the realization of an optical atomic clock, using μK atoms in a magic wavelength optical lattice [1]. The probe laser frequency is measured with an octave-spanning fs comb, which is referenced to a hydrogen maser (directly calibrated by the NIST primary Cs fountain clock) allowing high precision evaluation of potential systematic frequency shifts . By varying the lattice wavelength and trapping depth we find that the magic wavelength for the clock transition is 813.418(10) with a clock sensitivity to lattice deviations of ~2 mHz/MHz for lattice intensities of 10 kW/cm^2. To explore the effect of atomic collisions on the clock frequency we varied the atomic density by a factor of 50 and did not find any shifts at the 3 x10^{-14} level. Dependence of the clock transition on magnetic fields has been examined as the hyperfine interaction (I = 9/2), which provides the small transition moment for the doubly forbidden clock transition, also results in a differential g factor of the $^3P_0$ and $^1S_0$ levels. We will report the latest results of this optical clock system. [1] A.D. Ludlow et al., *Phys Rev Lett* **96**, 033003 (2006).

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