Abstract Submitted for the DAMOP09 Meeting of The American Physical Society

Precision Measurements with an 87Sr Optical Lattice Clock TRAVIS NICHOLSON, GRETCHEN CAMPBELL, SEBASTIAN BLATT, MICHAEL MARTIN, MATT SWALLOWS, ANDREW LUDLOW, MARTIN BOYD, JAN THOMSEN, JUN YE, University of Colorado, JILA, and NIST, YE LABS TEAM — The uncertainty of our <sup>87</sup>Sr optical lattice clock operating on the ultranarrow  ${}^{1}S_{0}$  +  ${}^{3}P_{0}$  transition has recently reached  $1.5 \times 10^{-16}$ . We will report our latest work in further reducing this uncertainty. One of the largest frequency shiftsa density shift—has now been characterized at the  $5 \times 10^{-17}$  level. An understanding of the measurement-induced Fermionic interactions at ultracold temperatures has allowed us to zero the density shift altogether by operating the clock near a 50% excitation fraction. Furthermore, we report advancements in characterizing blackbody radiation-induced clock shifts. Recent progress toward high-fidelity manipulations of the long-lived nuclear- and electronic-spin states in alkaline earth atoms, a capability that will be useful for neutral-atom-based quantum information processing, will also be presented.

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Date submitted: 23 Jan 2009

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