Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Cavity enhanced non-linear spectroscopy of ultra-narrow optical transitions[1] DOMINIC MEISER, MICHAEL J. MARTIN, JUN YE, MURRAY J. HOLLAND, JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA — Optical atomic clocks are continuing to make rapid progress and are penetrating the 1 part in 10^{17} decade of fractional stability. A major bottleneck to further improvements of their stability is the linewidth of the clock lasers with which the atomic transitions are interrogated. The linewidth of these clock lasers is typically limited by thermal noise of the reference cavities which is technically challenging to overcome. Here we discuss an alternative laser stabilization scheme that is based on highly non-linear spectroscopy of ultra-narrow optical transitions in a cavity. We discuss the essential non-linear physics underlying this system and we show that laser linewidths in the 10 mHz range could be achieved with such a system using current experimental technology, an improvement of over an order of magnitude over the state-of-the-art. The fundamental limits of this approach are orders of magnitude below 1 mHz.

[1]This work is supported in part by NSF, DOE, and ARO.

Dominic Meiser
JILA, University of Colorado

Date submitted: 04 Feb 2011 Electronic form version 1.4