Abstract Submitted
for the TSF16 Meeting of
The American Physical Society

A high stability frequency standard using narrow linewidth atoms in an optical cavity[1] MATTHEW WINCHESTER, MATTHEW NORCIA, JAMES THOMPSON, JILA, University of Colorado Boulder — In this work we study a spectroscopic feature suitable for use as a frequency reference for laser stabilization that could offer an appealing compromise between frequency stability and experimental complexity. A cold ensemble of ^{88}Sr atoms interacts with a single mode of a high-finesse optical cavity via the 7.5kHz linewidth, dipole forbidden $^1S_0$ to $^3P_1$ transition. The strong collective coupling between the atoms and cavity places the system in the vacuum Rabi splitting regime. By applying a magnetic field to split out the Zeeman sublevels of the $^3P_1$ state, we observe a small additional feature as a result of interference between the two dressed states. We demonstrate that this spectroscopic feature approaches the atomic transition linewidth and is highly immune to the type of reference cavity length fluctuations that limit current state-of-the-art lasers.

[1]All authors acknowledge financial support from DARPA QuASAR, ARO, NSF PFC, and NIST.

Matthew Winchester
JILA, University of Colorado Boulder

Date submitted: 23 Sep 2016 Electronic form version 1.4