Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Toward a Portable Optical Atomic Clock in Neutral Silver (Ag)[1]
CAROL TANNER, University of Notre Dame — The Ag metastable state $4d^9 5s^2\ ^2D_{5/2}$ has an estimated[2] linewidth of 0.8 Hz. Proposed by Bender *etal.*,[3] the two-photon transition $4d^{10}5s\ ^2S_{1/2} \rightarrow 4d^9 5s^2\ ^2D_{5/2}$ (661.2 nm=2x330.6 nm) has an oscillation frequency near 10^{15} Hz and a quantum-noise instability limit of $1/10^{18}$ with the potential to achieve femtosecond-timing resolution in one second. The velocity-dependent Doppler shift cancels out to first order, an advantage over one-photon optical clocks. No one optical clock can address all the goals of clock science, and comparisons between types operating at their expected limits can provide stringent tests of the fundamental constants. Ag is an excellent candidate for a portable optical clock and may make it possible to improve upon various real- time applications such as Global Positioning, distance ranging, and communications, as well as mapping gravity, testing general relativity, and measuring the time variation of fundamental constants.

[1]Supported by a NIST Precision Measurements Grant.
[2]R. H. Garstang, J. Res. Natl. Bur. Stand. Sect. A **68A**, 61 (1964).
[3]P. L. Bender, J. L. Hall, R. H. Garstang, F. M. J. Pichanick, W. W. Smith, R. L. Barger, and J. B. West, Bull. Am. Phys. Soc. **21**, 599 (1976).

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Date submitted: 04 Feb 2011 Electronic form version 1.4