Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

A state-insensitive nanofiber trap[1] A. GOBAN, K.S. CHOI[2], D. DING, M. POTOTSCHNIG, J.A.M. SILVA, CHEN-LUNG HUNG, D.J. ALTON, C. LACROUTE, P. FORN-DIAZ, N.P. STERN[3], H. JEFF KIMBLE, Norman Bridge Laboratory of Physics 12-33 California Institute of Technology, Pasadena, CA 91125, USA — The development of quantum interface using cold atoms and optical fibers has been an active field of research. Following the pioneering work of Balykin et al [1] and Vetsch et al. [2], we realize trapping cesium atoms using a state-insensitive evanescent wave around a nanofiber [3]. By using the magic wavelengths, we remove the differential scalar light shift between the ground and excited states. The vector light shift induced by a forward-propagating wave is canceled by a backward-propagating wave. We measure the transmission spectrum of 200 trapped atoms, and obtain a resonant optical depth of 15 at a storage time of 1.5 ms, decaying to an optical depth of 1.0 after 300ms. The state-insensitivity is demonstrated by the measured linewidth of 5.6 MHz, similar to the natural linewidth of 5.2 MHz in free space. Our scheme provides a promising approach to trap and probe neutral atoms in a nanofiber trap with long coherence lifetimes using realistic parameters. [1] V. I. Balykin et al. Phys. Rev. Lett., 60, 2137 (1988). [2] E. Vetsch et al., Phys. Rev. Lett., 104, 203603 (2010). [3] C. Lacroute et al., arXiv:1110.5372.

[1]This work is supported by the DoD NSSEFF program, by NSF Grant PHY-0652914, and by the Institute for Quantum Information and Matter.
[2]Spin Device Research Center, Korea Institute of Science and Technology 39-1 Hawolgok-dong, Seongbuk-gu, Seoul, 136-791, Korea
[3]Department of Physics and Astronomy, Northwestern University, 2145 Sheridan Rd., Evanston, IL 60208

A. Goban
Norman Bridge Laboratory of Physics 12-33
California Institute of Technology, Pasadena, CA 91125, USA

Date submitted: 30 Jan 2012 Electronic form version 1.4