Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Hong-Ou-Mandel atom interferometry in tunnel-coupled optical tweezers BRIAN LESTER, ADAM KAUFMAN, COLLIN REYNOLDS, MICHAEL WALL, JILA, National Institute of Standards and Technology and University of Colorado, MICHAEL FOSS-FEIG, Joint Quantum Institute and the National Institute of Standards and Technology, KADEN HAZZARD, ANA MARIA REY, CINDY REGAL, JILA, National Institute of Standards and Technology and University of Colorado — We present recent work in which we demonstrate near-complete control over all the internal and external degrees of freedom of laser-cooled ^{87}Rb atoms trapped in sub-micron optical tweezers. Utilizing this control for two atoms in two optical tweezers, we implement a massive-particle analog of the Hong-Ou-Mandel interferometer where atom tunneling plays the role of the photon beam-splitter. The interferometer is used to probe the effect of atomic indistinguishability on the two-atom dynamics for a variety of initial conditions. These experiments demonstrate the viability of the optical tweezer platform for bottom-up generation of low-entropy quantum systems and pave the way toward the direct observation of quantum dynamics in more complex finite-sized systems.

Brian Lester
JILA, National Institute of Standards and
Technology and University of Colorado

Date submitted: 28 Jan 2014 Electronic form version 1.4