Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Confinement effects in guided-wave atom interferometer with mm-scale arm separation J.H.T. BURKE, University of Virginia, B. DEISSLER, K.J. HUGHES, C.A. SACKETT, University of Virginia — Guided-wave atom interferometers measure interference effects using atoms held in a confining potential. In one common implementation, the confinement is primarily two-dimensional, and the atoms move along the nearly free dimension after being manipulated by an off-resonant standing wave laser beam. In this configuration, residual confinement along the nominally free axis can introduce a phase gradient to the atoms that limits the arm separation of the interferometer. We experimentally investigate this effect in detail, and show that it can be alleviated by having the atoms undergo a more symmetric motion in the guide. This can be achieved by either using additional laser pulses or by allowing the atoms to freely oscillate in the potential. With these techniques, we demonstrate interferometer measurement times up to 72 ms and arm separations up to 0.42 mm with a well controlled phase, or times of 0.91 s and separations of 1.7 mm with an uncontrolled phase.

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Date submitted: 31 Jan 2008 Electronic form version 1.4