Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Discrete interferometer with individual trapped atoms ANDREAS STEFFEN, ANDREA ALBERTI, WOLFGANG ALT, NOOMEN BELMECHRI, SEBASTIAN HILD, MICHAL KARSKI, ARTUR WIDERA, DIETER MESCHEDE, University of Bonn, Institute of applied physics, QUANTUM TECHNOLOGY TEAM — Coherent control and delocalization of individual atoms is a pivotal challenge in quantum technologies. As a new step on this road, we present an individual atom interferometer that is capable of splitting a trapped Cs atom by up to 10 μm, allowing us to measure potential gradients on the microscale. The atom is confined in a 1D optical lattice, which is capable of performing discrete state-dependent shifts to split the atom by the desired number of sites. We establish a high degree of control, as the initial atom position, vibrational state and spin state can all be prepared with above 95% fidelity. To unravel decoherence effects and phase influences, we have explored several basic interferometer geometries, among other things demonstrating a positional spin echo to cancel background effects. As a test case, an inertial force has been applied and successfully measured using the atomic phase. This will offer us a new tool to investigate the interaction between two atoms in a controlled model system.

Andreas Steffen
University of Bonn

Date submitted: 04 Feb 2011 Electronic form version 1.4