Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

In-Situ Lattice Polarization Measurement by Atomic Wave Scattering FELIX SCHMIDT, Dept of Physics and Research Center OPTIMAS, University of Kaiserslautern; Graduate School Materials Science in Mainz, Kaiserslautern, MICHAEL BAUER, FARINA KINDERMANN, TOBIAS LAUSCH, Dept of Physics and Research Center OPTIMAS, University of Kaiserslautern, DANIEL MAYER, ARTUR WIDERA, Dept of Physics and Research Center OPTIMAS, University of Kaiserslautern; Graduate School Materials Science in Mainz, Kaiserslautern — Optical dipole traps and lattices have become indispensable tools in atomic physics and atom optics. Especially the accurate alignment of the beam polarization is crucial, because a deviation from purely linear polarization will result in state dependent AC-stark vector light shifts, which are proportional to the atoms' magnetic m_F substates. Such shifts can be either utilized as a tool for state dependent atomic transport and the creation of artificial gauge fields, or, in contrast, could cause unwanted dephasing in quantum information processing and spectroscopic experiments. Here, we present an in-situ measurement method of an optical lattice's polarization purity by employing the Kapitza-Dirac effect - the scattering of atoms by a standing light wave: We create a Rubidium-87 (Rb) BEC and shine in an optical lattice at 790 nm that is tuned in between the D_1 and D_2 lines of Rb. At this wavelength, the scalar dipole potentials of both lines counteract and ideally cancel out, yielding a high sensitivity to vector light shifts for different m_F states. By analysing the scattering of Rb atoms in the residual potential for different m_F states, we can extract the lattice polarization with high accuracy below 10^{-3}.

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Date submitted: 11 Mar 2015 Electronic form version 1.4