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1-D Mott insulator transition of a Bose-Einstein condensate[1]
RACHEL SAPIRO, RUI ZHANG, GEORG RAITHEL, FOCUS Center and Department of Physics, University of Michigan — We experimentally demonstrate the superfluid to one-dimensional Mott-insulator transition of a ^{87}Rb Bose-Einstein condensate. In the experiment, we apply a one-dimensional optical lattice, formed by two laser beams with a wavelength of 852 nm, to a three dimensional BEC in a shallow trap. We use Kapitza-Dirac scattering to precisely determine the depth of the optical lattice without knowledge of its exact geometry. It is found that the one-dimensional Mott insulator state is reached at a lattice depth of 30 recoil energies. We further study behavior specific to the one-dimensional case, including interference between pancake BECs in separate wells and dephasing behavior at the transition between the superfluid and Mott insulator states.

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