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Laser cooling and localization measurements in a Raman optical lattice RACHEL SAPIRO, RUI ZHANG, NATALYA MORROW, PAUL BERMAN, GEORG RAITHEL, FOCUS Center, University of Michigan — Recently, a new type of optical lattice, referred to as a Raman optical lattice, has been demonstrated. In one-dimensional implementations, the Raman optical lattice is formed by four laser beams and has a basic periodicity of $\lambda/4$, which is a factor of two less than in conventional optical lattices. Since the Raman lattice supports a novel sub-Doppler cooling mechanism, atoms can be cooled and localized in the wells of the lattice. In this work, we use time-of-flight temperature measurements to study the dependence of the cooling efficiency on the detuning parameters of the system. Furthermore, an optical-mask technique is employed to measure the atomic-density distribution in the lattice. The technique is first tested in a two-beam lattice configuration that yields an atomic-density distribution with $\lambda/2$ periodicity (in this test lattice, magnetic-field-induced laser cooling is effective). We then use the mask technique to obtain preliminary evidence of the $\lambda/4$ periodicity of the atomic-density distribution in the Raman lattice.

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