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Cold atoms in time dependent optical lattices I. B. SPIELMAN, B. BROWN, P. LEE, N. LUNDBLAD, J. V. PORTO, W. D. PHILLIPS, National Institute of Standards and Technology — Cold atoms in optical lattices provide new avenues for studying iconic condensed matter problems. Using an initially Bose condensed sample of $^{8}7$Rb atoms, we first implement the Bose-Hubbard model (the intensity of the static lattice potential determine the constants in the Bose-Hubbard model). This "native" Hamiltonian, with only on-site interactions, exhibits just two phases of matter: insulator and superfluid. Additional phases, such as a supersolid and density wave, are expected when nearest-neighbor interactions are added. Here we show preliminary results where we extend the "native" Bose-Hubbard Hamiltonian by rapidly varying the lattice potential.

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