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Dynamical Effects of Disorder in Optical Lattices[1] M. BEELER, E.E. EDWARDS, TAO HONG, S.L. ROLSTON, Joint Quantum Institute and Department of Physics, University of Maryland, National Institute of Standards and Technology — The precise control available in systems of neutral atoms confined in optical lattices makes them an ideal place to investigate the effects of disorder on crystal structure. We experimentally investigate how disorder affects the dynamical properties of these systems. Using a 1D optical lattice with the addition of one or two weak incommensurate lattices, we investigate the adiabaticity criteria for loading the ground state of the disordered lattice. We find that even a very small amount of disorder greatly increases the timescale needed for adiabatic loading. We attribute this change to the large change in the ground state of the wavefunction with the addition of disorder, as the wavefunction becomes localized. In addition, we will report on experimental efforts to study the effects of disorder in two-dimensional systems and on the timescales of thermalization in one dimension.

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