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Experiments on the 3D Disordered Bose-Hubbard Model MATTHEW WHITE, University of Illinois, MATTHEW PASIENSKI, DAVID MCKAY, BRIAN DEMARCO — Despite application of the disordered Bose-Hubbard (BH) model to many physical systems, the nature of the ground state phase diagram for this model has remained unsettled for nearly two decades. In order to experimentally test the properties of the disordered BH model, we have added fine-grained disorder to a three-dimensional optical lattice using an optical speckle field. The speckle field is fine-grained in that the correlation in disorder between neighboring sites is small along every lattice direction. We have measured the change in condensate fraction as a function of disorder strength for several different values of lattice depths above and below the onset of the $n = 1$ Mott-insulator lobe. These measurements, in conjunction with theoretical and computational work in progress, are expected to place constraints on the disordered Bose-Hubbard phase diagram.

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