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Quantum Quenches in a Strongly Correlated Optical Lattice

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University of Illinois at Urbana-Champaign — We study the excitations generated upon quenching a Mott-insulator into the superfluid regime for ^{87}Rb atoms confined in a 3D optical lattice. The lattice is ramped-down slowly compared to U/h , such that a condensate is always reformed after the quench. Using time-of-flight imaging, we observe that the degree of excitation is proportional to the fraction of atoms crossing the phase boundary, suggesting that defect generation occurs in a quantum analog to the Kibble-Zurek mechanism. We find that the degree of excitation and the heat produced by the quench both scale universally with the quenching time τ_Q as $\tau_Q^{-1/3}$.

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