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Dynamics of Hubbard-Band Quasiparticles in Disordered Optical Lattices[1] VITO SCAROLA, Virginia Tech, BRIAN DEMARCO, University of Illinois, Urbana-Champaign — Recent experiments use transport of degenerate Fermi gases in optical lattices (Kondov et al. Phys. Rev. Lett. 114, 083002 (2015)) to probe the interplay of disorder and strong interactions. These experiments find evidence for an intriguing insulating phase where quantum diffusion is completely suppressed by strong disorder. Quantitative interpretation of these experiments remains an open problem that requires inclusion of non-zero entropy, strong interaction, and trapping in an Anderson-Hubbard model. We construct a theory of dynamics of Hubbard-band quasiparticles tailored to trapped optical lattice experiments. We compare the theory directly with center-of-mass transport experiments of Kondov et al. with no fitting parameters. The close agreement between theory and experiments shows that the suppression of transport is only partly due to finite entropy effects. We argue that the complete suppression of transport is consistent with short-time, finite size precursors of Anderson localization of Hubbard-band quasiparticles. The combination of our theoretical framework and optical lattice experiments offers an important platform for studying localization in isolated many-body quantum systems.

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