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Seeing Superfluids through Bose Glasses: Effects of Disorder on Condensates[1] SCOTT E. POLLACK, D. DRIES, R. G. HULET, Rice Quantum Institute and Department of Physics and Astronomy, Rice University — We probe the ground state of a disordered optical potential with a quasi-1D ^{7}Li Bose-Einstein condensate (BEC). Competition between the tunable interatomic interactions and the effects of disorder result in a smooth transition from a superfluid at weak disorder to an insulating Bose glass state at strong disorder, characterized by density fragmentation and loss of global phase coherence. The location of this crossover in disorder strength varies with interatomic interactions, which are tuned from strongly repulsive, through zero, to weakly attractive interactions where the gas is predicted to populate single-atom states forming a Lifshits glass. We also report our investigations of expanding weakly interacting condensates in the presence of disorder and discuss the implications of these quantum glass states in the context of Anderson localization.

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