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Anderson Localization in a Bose-Einstein Condensate with Tunable Interactions D. DRIES, S.E. POLLACK, E.J. OLSON, R.G. HULET[1], Department of Physics and Astronomy and Rice Quantum Institute, Rice University, Houston, TX 77005 — The wave nature of matter can often lead to spectacular and counterintuitive phenomena. In a disordered system, it can lead to the surprising result that interference from multiply scattered matter waves can lead to a localized, insulating state, even for very weak disorder. This so-called Anderson localization is a general wave phenomena, and has been observed in wave systems as varied as ultrasonic, light, microwave, and ultra-cold atoms. One of the most interesting modifications of the Anderson model is the inclusion of an interparticle interaction. Questions as to whether the addition of this interaction leads to the break-down of localization at long times is still unanswered. We perform expansion experiments of an ultra-cold gas of ^{7}Li with tunable interactions in a one-dimensional guide with superimposed optical speckle for disorder. We have investigated the nature of the localization versus atomic momentum and in addition, will report on the progress of expansion measurements designed to investigate the role interactions play in localization.

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