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Effect of Disorder on a Bose-Einstein Condensate with Tunable Interactions[1] D. DRIES, YONG P. CHEN[2], J. HITCHCOCK, M. JUNKER, T. A. CORCOVILOS, C. WELFORD, R. G. HULET, Rice University Physics and Astronomy and Rice Quantum Institute — We have investigated the effect of a disordered optical potential on the transport and phase coherence of a Bose-Einstein condensate (BEC) of ^{7}Li. We observe damping of BEC dipole oscillations even when the disorder strength, V_D, is small, while for large V_D, transport is completely inhibited. Time-of-flight images show that the BEC gradually loses phase coherence for $V_D > \mu/2$, with coherence completely lost when $V_D = \mu$, where μ is the chemical potential of the BEC. We interpret this loss of coherence as resulting from fragmentation of the BEC as seen from *in-situ* measurements of the density distribution. While these experiments were performed with a BEC healing length, ξ, that is small in comparison to the disorder length scale, we are currently attempting to observe the Anderson localization predicted to occur for large ξ. Using a magnetically-tuned Feshbach resonance, the s-wave scattering length, a_s, is reduced to near zero where ξ becomes very large. Results of applying the disorder potential to this nearly non-interacting condensate, with a_s much less than the Bohr radius, will be reported.

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