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Three-Dimensional Anderson Localization of Ultracold Matter[1]

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Anderson localization (AL) is a ubiquitous interference phenomenon in which waves fail to propagate in a disordered medium. We observe three-dimensional AL of noninteracting ultracold matter by allowing a spin-polarized atomic Fermi gas to expand into a disordered potential. A two-component density distribution emerges consisting of an expanding mobile component and a nondiffusing localized component. We extract a mobility edge that increases with the disorder strength, whereas the thermally averaged localization length is shown to decrease with disorder strength and increase with particle energy. Progress toward combining disordered fermions with an optical lattice in order to realize the disordered (Fermi-)Hubbard model will be discussed.

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