

Abstract Submitted
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Universal Impurity-Induced Bound State in Topological Superfluids¹ LEI JIANG, Joint Quantum Institute, University of Maryland and National Institute of Standards and Technology, HUI HU, XIA-JI LIU, Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, HAN PU, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, YAN CHEN, Department of Physics, State Key Laboratory of Surface Physics and Laboratory of Advanced Materials, Fudan University — We predict a universal midgap bound state in topological superfluids, induced by either nonmagnetic or magnetic impurities in the strong scattering limit. This universal state is similar to the lowest-energy Caroli-de Gennes-Martricon bound state in a vortex core, but is bound to localized impurities. We argue that the observation of such a universal bound state can be a clear signature for identifying topological superfluids. We theoretically examine our argument for a spin-orbit coupled ultracold atomic Fermi gas trapped in a two-dimensional harmonic potential by performing extensive self-consistent calculations within the mean-field Bogoliubov-de Gennes theory. A realistic scenario for observing a universal bound state in ultracold ⁴⁰K atoms is proposed.

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