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Solitonic Vortex in a Strongly-Interacting Fermi Gas MARK KU, WENJIE JI, BISWAROOP MUKHERJEE, LAWRENCE CHEUK, ELMER SANCHEZ, TARIK YEFSAH, MARTIN ZWIERLEIN, Department of Physics, MIT-Harvard Center for Ultracold Atoms, and Research Laboratory of Electronics, MIT, Cambridge, Massachusetts 02139, USA — We investigate the solitonic excitation observed in our previous experiments [Yefsah *et al.*, Nature **499**, 426 (2013)] for a unitary Fermi gas with tomographic imaging. In this work, we directly access the local density of our 3D clouds by imaging a thin layer of atoms, which we achieve with a masked pumping beam that transfers atoms outside of the selected layer into an undetected state. Using the tomographic imaging, which circumvents the density integration along the probing axis, we identify unambiguously this excitation as a solitonic vortex. In particular, we rule out the vortex ring scenario predicted by several theory groups. Our measurements provide a quantitative benchmark for the theories of non-equilibrium dynamics of strongly-interacting superfluids.

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