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Probing and studying homogeneous atomic Fermi gases ZHENJIE YAN, BISWAROOP MUKHERJEE, PARTH PATEL, AIRLIA SHAFFER-MOAG, CEDRIC WILSON, RICHARD FLETCHER, Massachusetts Institute of Technology, ZORAN HADZIBABIC, Cavendish Laboratory, University of Cambridge, TARIK YEFSAH, LKB, CNRS, ENS-PSL Research University, UPMC-Sorbonne Universits and Collge de France, JULIAN STRUCK, MARTIN ZWIERLEIN, Massachusetts Institute of Technology — We create and study homogeneous Fermi gases of ultracold atoms in uniform trapping potentials. The homogeneity of the gas enables the measurement of momentum distributions without density averaging. For the non-interacting Fermi gas, we observe the emergence of the Fermi surface and the saturated occupation of one particle per momentum state. For thermodynamic measurements, we convert the uniform trap into a hybrid potential that is harmonic in one dimension and uniform in the other two. The spatially resolved compressibility reveals the superfluid transition in a spin-balanced Fermi gas, saturation in a fully polarized Fermi gas, and strong attraction in the polaronic regime of a partially polarized Fermi gas. In addition, we present results on the temperature dependence of the contact of the unitary Fermi gas measured with radio-frequency spectroscopy.

Zhenjie Yan
Massachusetts Institute of Technology

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