

Abstract Submitted
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Revealing the superfluid phase transition in strongly interacting Fermi gases in a precision measurement of the equation of state¹
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Laboratory of Electronics, MIT, Cambridge, Massachusetts 02139, USA — We per-
form a high-precision measurement of the equation of state (EOS) of a Fermi gas at
unitarity by in-situ imaging of ultracold ⁶Li at a Feshbach resonance. The recon-
structed local density distribution directly probes the EOS under the local density
approximation. We extract the chemical potential and the temperature from low
density regions via the virial expansion, and validate our method using the non-
interacting Fermi gas. The experimental results are compared to recent Monte-Carlo
calculations. We observe the superfluid transition in the chemical potential, entropy,
compressibility and heat capacity, which display characteristic lambda-like features.
We provide a new value of the Bertsch parameter ξ_S and directly obtain the critical
temperature from the EOS, validated via a condensate fraction measurement.

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