Abstract Submitted
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Unitary thermodynamics calculated from thermodynamic geometry GEORGE RUPPEINER, New College of Florida — Degenerate atomic Fermi gases of atoms near a Feshbach resonance show universal thermodynamic properties, which are here calculated with the geometry of thermodynamics, and the thermodynamic curvature R. Unitary thermodynamics is expressed as the solution to a pair of ordinary differential equations, a "superfluid" one valid for small entropy per particle $z \equiv S/Nk_B$, and a "normal" one valid for large z. These two solutions are joined at a second-order phase transition at $z = z_c$. Define the internal energy per particle in units of the Fermi energy as $Y = Y(z)$. For small z, $Y(z) = y_0 + y_1 z^\alpha + y_2 z^{2\alpha} + \cdots$, where α is a constant exponent, y_0 and y_1 are scaling factors, and the series coefficients y_i $(i \geq 2)$ are determined uniquely in terms of (α, y_0, y_1). For large z the solution follows uniquely if, in addition, we specify z_c, with $Y(z)$ diverging as $z^{5/3}$. The four undetermined parameters (α, y_0, y_1, z_c) were determined by fitting the theory to experimental data taken by a Duke University group on ^{6}Li in an optical trap with a Gaussian potential. The best fit of this theory to the data has $\chi^2 \sim 1$.

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