Complete Mapping of Magnetization in Solid ^{3}He

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Cyclic exchange processes, fundamental in magnetism of solid ^{3}He, may be important in high-temperature superconductors, which promise to provide new technologies. Magnetization versus magnetic field, a key quantity needed to characterize a magnetic material, has been available for solid ^{3}He only at low fields because of the extremely low temperatures required. Here we present the first result that completely maps the magnetization to the saturation field. We have discovered a novel scaling in pressure as a function of magnetic field (top fig.), which via a judicious use of a thermodynamic equality relates pressure to magnetization (bottom fig.). The unexpected, sharp rise in magnetization just below the saturation field indicates the importance of quantum fluctuations in the magnetism of solid ^{3}He.

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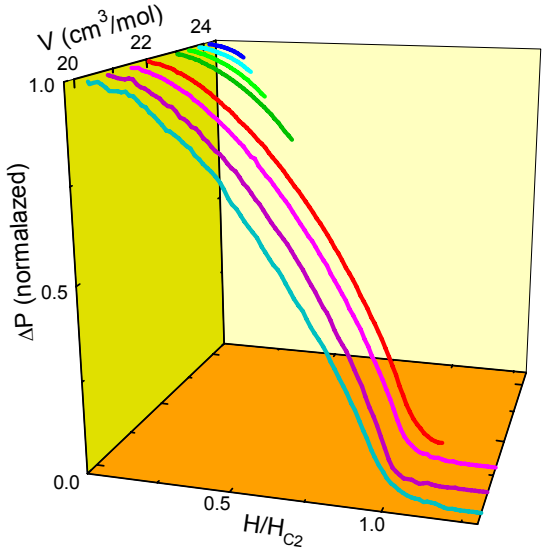

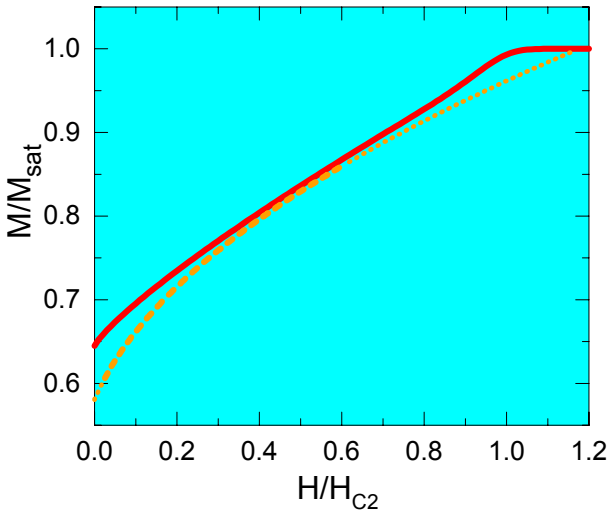

Red: new result; orange: previous result and extrapolation, by Osheroff et al.