

Test of Yang-Yang Anomaly in ^3He near its Liquid-Vapor Critical Point

Fang Zhong, Martin Barmatz, and Inseob Hahn

Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, 91109 USA

The Yang-Yang thermodynamic relation established a direct connection between the singularity in the heat capacity at constant volume, C_V , and the temperature dependence of the second derivatives in the chemical potential $(d^2\mu/dT^2)_\sigma$ and the pressure $(d^2P/dT^2)_\sigma$ in the two-phase region of a liquid-vapor critical point. The lattice gas model and all currently-in-use equations-of-state assume that the entire singularity in C_V is taken up in $(d^2P/dT^2)_\sigma$. A recent analysis by M. E. Fisher *et al.* suggests that $(d^2\mu/dT^2)_\sigma$ and $(d^2P/dT^2)_\sigma$ contribute almost equally to the C_V singularity. Kostrowicka Wyczalkowska *et al.* demonstrated that impurities can complicate the analysis of these measurements. We have performed high precision C_V measurements in the two-phase region with 1ppm pure ^3He to determine the bounds on the size of these singularities. The results of these measurements will be presented.

Section: Quantum gases, fluids and solids

Keywords: Equation-of-State, Critical Phenomena, Liquid-Vapor Critical Point, Helium3