Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Precise equation of state measurements of ^{4}He near the λ-point, using dual-mode Superconducting Cavity Stabilized Oscillators T.A. COR-COVILOS, California Institute of Technology, Pasadena, CA 91125 USA, D.M. STRAYER, Jet Propulsion Laboratory, Pasadena, CA 91109 USA, N.N. ASPLUND, N.-C. YEH, California Institute of Technology, Pasadena, CA 91125 USA — We report on progress towards precise equation of state measurements of ^{4}He saturated vapor near the λ-point using a Superconducting Cavity Stabilized Oscillator (SCSO) system. By operating the SCSO in a dual-mode phase-locked loop configuration we will be able to measure the dielectric constant of ^{4}He to parts in 10^{15} precision and comparable accuracy. The dielectric constant in turn implies a value of the density to parts in 10^{10}. Other measured parameters include the temperature to sub-nK precision using paramagnetic salt high-resolution thermometry (HRT) and pressure to parts in 10^9 using a Straty-Adams type diaphragm gauge. These substantially improved resolutions relative to existing data are expected to provide new insights into the interactions of helium atoms near Bose-Einstein condensation. Numerous error reduction techniques will be discussed, along with other applications of SCSO to precision metrology.

T.A. Corcovilos
California Institute of Technology, Pasadena, CA 91125 USA

Date submitted: 30 Nov 2004 Electronic form version 1.4