

Helium-4 Experiments near T_λ in a Low-gravity Simulator

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We report our studies of gravity cancellation in a liquid helium sample cell along the λ -line using a low-gravity simulator facility. The simulator consists of a superconducting magnet capable of producing $B(\partial B/\partial z) = 22T^2/cm$. We have verified experimentally that the simulator can cancel gravity to about 0.01g in a cylindrical sample volume of 0.5 cm in diameter and 0.5 cm in height. This allows us to approach more closely the superfluid transition without entering the normal-superfluid two phase region induced by gravity. We also present the measurements of $T_c(Q,P)$: depression of the superfluid transition temperature by a heat current(Q) along the λ -line (P). The results are consistent with the Renormalization-group theory calculation. Measurements of thermal expansion coefficient in a heat current will also be discussed. The work has been carried out by JPL, California Institute of Technology under contract to NASA.

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