Measurements of the thermal conductivity of Helium-4 near T_lambda in a two-dimensional confinement.

Yuanming Liu(1), Fengchuan Liu(1), Paul Finley(2), Da-Ming Zhu(3), Edgar Genio(4), Daniel Murphy(4), and Guenter Ahlers(4)

(1) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA
(2) Ball Aerospace and Technologies Corp, Boulder, CO, USA
(3) University of Missouri at Kansas City, Mo, USA
(4) University of California at Santa Barbara, CA, USA

We report our recent preliminary experimental measurements of the thermal conductivity of Helium-4 near the superfluid transition in a two-dimensional confinement under saturated vapor pressure. The two-dimensional confinement is provided by a 2mm-thick glass capillary plate, consisting of densely-populated parallel micro-channels, which has a cross-section of 5 x 50 micrometers. The heat current ($2 < Q < 400$ nW/cm^2) was applied along the channel direction. The high-resolution measurements were provided by DC-SQUID-based high-resolution paramagnetic salt thermometers with about nano-Kelvin resolution (HRTs). We have found that the thermal conductivity of the confined helium is finite at the bulk superfluid transition temperature. We will compare our two-dimensional results with those in bulk and one-dimensional confinement.

This experiment is part of the NASA-funded Microgravity Fundamental Physics experiment BEST (Boundary Effects on the Superfluid Transition), which will be carried out in the Low-Temperature Microgravity Physics Experiment Facility (LTMPEF) on board the International Space Station (ISS).

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