Measurements of $T_c(Q,P)$: Depression of the Superfluid Transition Temperature by a Heat Current Along the Lambda Line, Yuanming Liu, Melora Larson, and Ulf Israelsson, Jet Propulsion Laboratory, California Institute of Technology.

We report experimental measurements of $T_c(Q,P)$ for heat currents ($Q$) between 1 and 100 $\mu$W/cm$^2$ and pressure ($P$) between SVP and 15 bar. The measurements were performed in a normal gravity environment, using the low-gravity simulator facility at JPL without the magnet being energized. The sample pressure was controlled to 0.1 $\mu$bar using a hot volume, and a Straty-Adams capacitive pressure gauge. The total volume of helium in the sample cell and the hot volume was held constant using a pneumatic low-temperature valve. A melting curve thermometer (MCT) measured the transition temperature ($T_c$) with a resolution of about 10 nK through a sidewall probe of the thermal conductivity sample cell. We employed the same measurement technique and procedure described by DAS. Preliminary results indicate that $T_c(Q,P)$ depends very little on the pressure in the pressure range between SVP and 15 bar with a variation in the amplitude of $T_c(Q,P)$ of less than about 5% observable in this pressure range. According to the Renormalization-group theory calculation by Haussmann and Dohm, the amplitude of $T_c(Q,P)$ has a leading pressure-dependence term proportional to $\xi_0^\eta(1/\nu)$, where $\xi_0$ is the correlation-length amplitude and $\nu$ is the correlation-length exponent. Thus, a small pressure dependence of the amplitude of $T_c(Q,P)$ is expected since $\xi_0$ is very weakly dependent on pressure between SVP and 15 bar, consistent with our measurements.