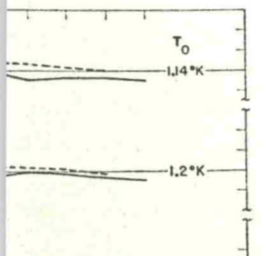

ow and fountain pressure with respect to uced temperature parameter $(T_1 - T_0)/$ rature T_0 ; $d = 3.36\ \mu$; solid curves: x = ure, P_f .

etermined in the experiments under

of P_f and that of $\dot{Q}$ is to examine the rimental points for P_f and $\dot{Q}$ deviate $T_c = T_1 - T_0$). Figure 7 shows the rements it is quite clear from Fig. 4 e made by visual inspection of the > 1.5°K (see Fig. 7 of I); for T_0 <

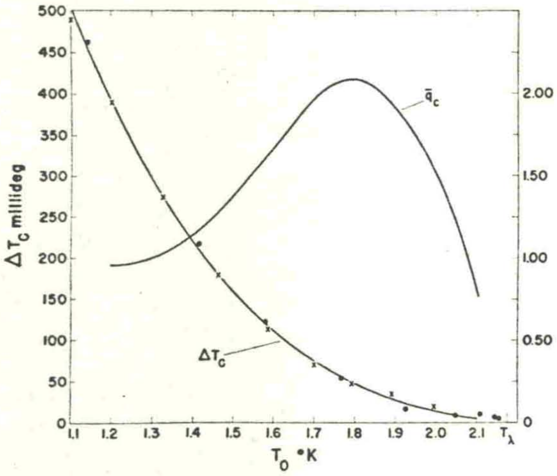

FIG. 7. Critical temperature difference $\Delta T_c = T_1 - T_0$ and corresponding critical heat current density $\bar{q}_c$ as a function of initial temperature T_0 ; $d = 3.36\ \mu$. Solid circles: ΔT_c as obtained from heat flow measurements; crosses: ΔT_c as obtained from fountain pressure measurements; curve for $\bar{q}_c$ obtained from smoothed ΔT_c vs. T_0 curve.

1.5°K ΔT_c has been taken as the inflection point in the curve of $\dot{Q}$ vs. T_1 . From Fig. 7 it is seen that values of ΔT_c as obtained from P_f and $\dot{Q}$ observations determine a single smooth curve as a function of T_0 .

Since it appears that at ΔT_c the character of the flow is modified, we tentatively designate this as the "critical" ΔT, and calculate the corresponding critical heat current density $\bar{q}_c$. The latter is also plotted in Fig. 7 for the 3.36 μ slit. From the smooth curve of $\bar{q}_c$ vs. T_0 we may calculate the average velocities of the two fluids at both the cold end (T_0) and hot end (T_1) of the slit from the relations (3) and (5). The same analysis has been made for the 2.12 μ slit and the results for both channels are given in Table III. Here the subscript c indicates a critical velocity and the superscripts 1 and 0 refer to the hot and cold ends of the slit respectively. A discussion of critical velocities will be given in Section V; but it is interesting to point out here that $\bar{v}^1_{s,c}$ is generally only slightly greater than $\bar{v}^0_{s,c}$, indicating that if $\bar{v}_{s,c}$ is the appropriate critical velocity, the conditions of criticality are achieved along the entire slit length at very nearly a single value of the superfluid velocity. This uniformity of the superfluid velocity along the slit provides some additional justification for the type of critical velocity used in the calculations. It is plausible that should criticality occur at one point of the slit turbulence would be created which would propagate along the entire slit, rather than the condition we have considered of local equilibrium at each point. Since $\bar{v}_s$ varies but slightly along the slit these two approaches are almost equivalent.

It may at first seem contradictory to derive a critical velocity from the meas-