

R&D at CERN

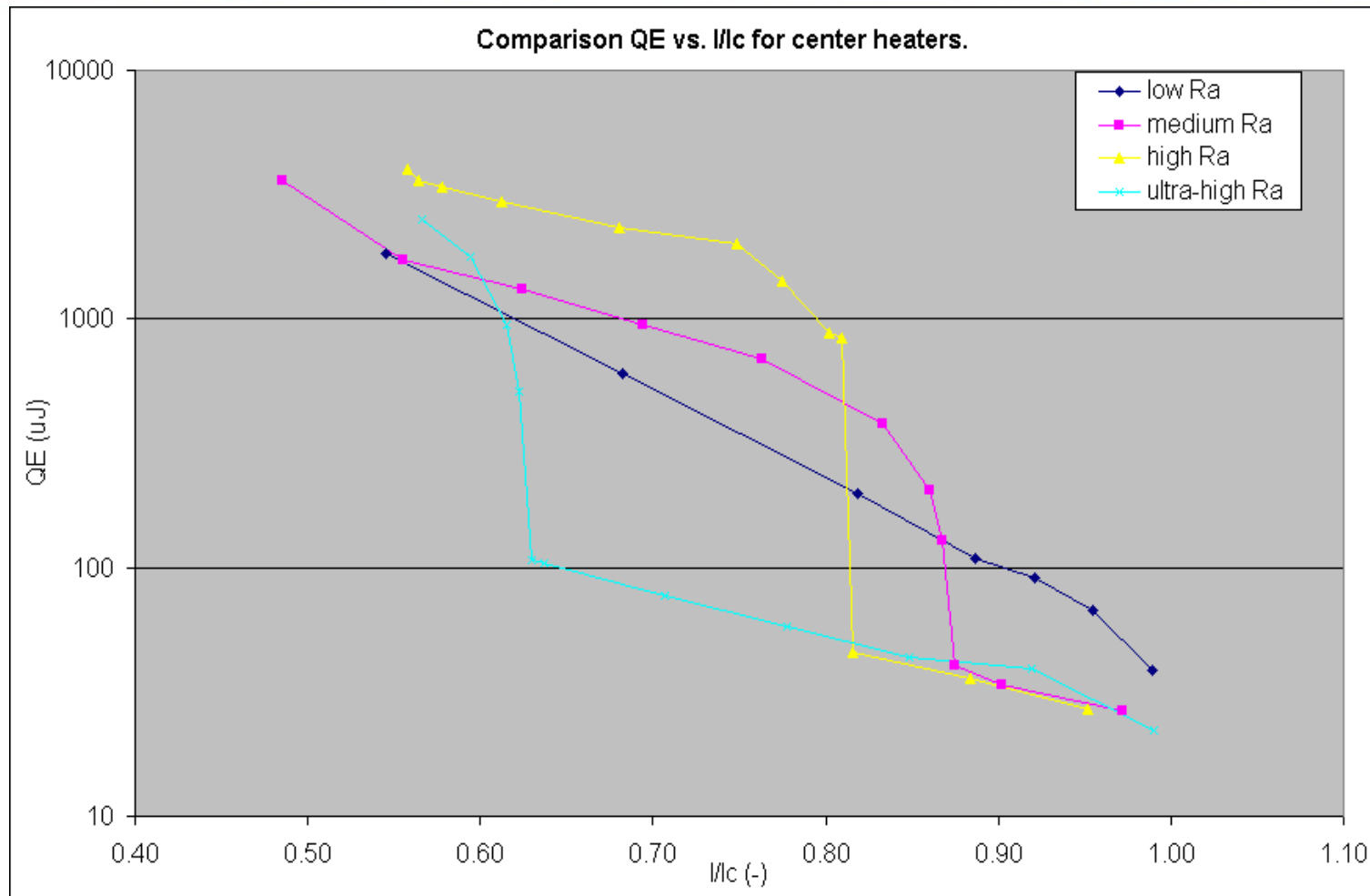
(MQE Measurements)

GSI-INFN Meeting

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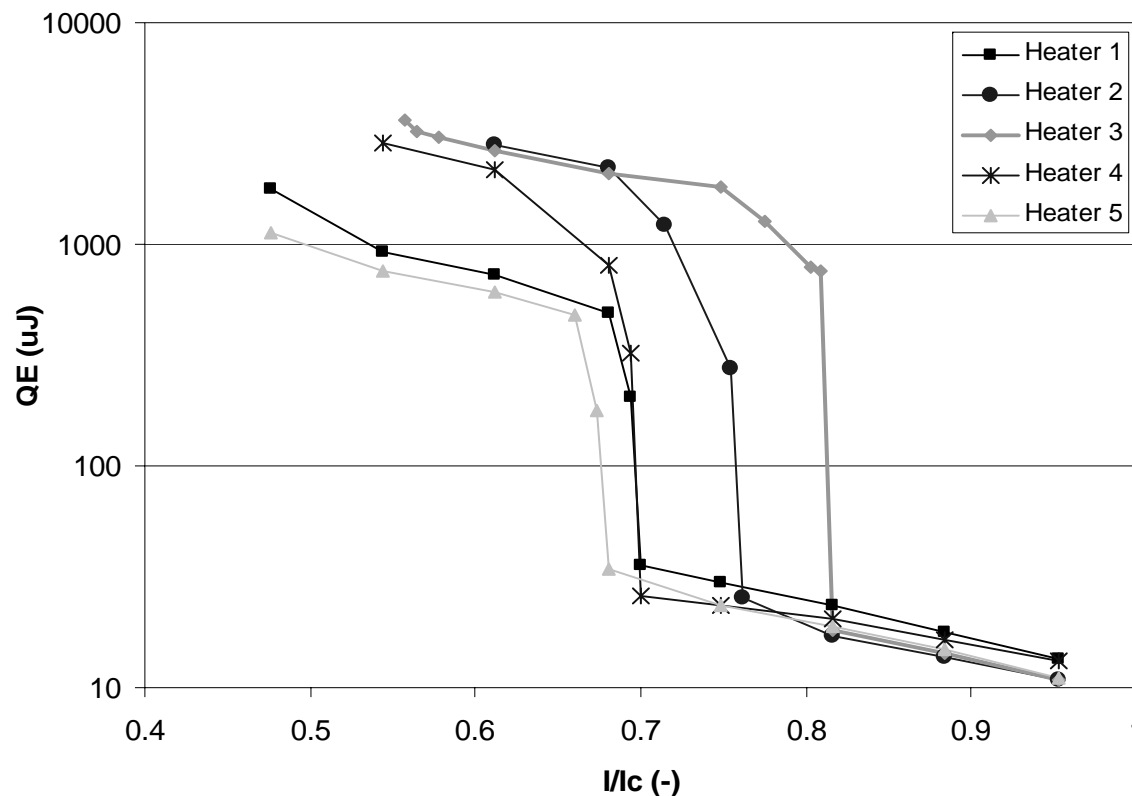
MQE versus I/I_c for cored LHC dipole outer layer cable at 6 T in liquid helium, cable center heaters



High Ra $\sim 600\text{-}700 \mu\Omega$

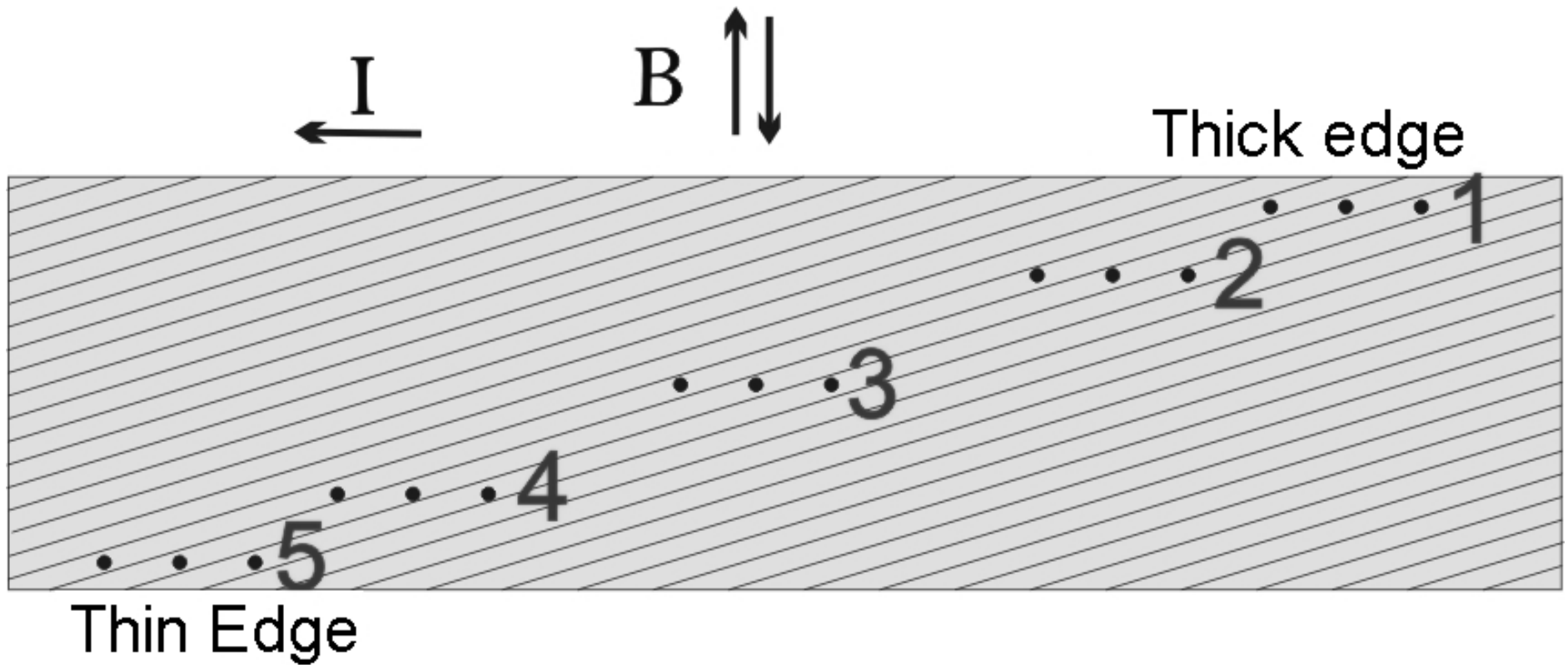
Medium Ra $\sim 60\text{-}70 \mu\Omega$

MQE versus I/I_c for cored LHC dipole outer layer cable at 6 T in liquid helium, cable heaters spread across cable width



The figure shows a gradual change in the kink position from $I/I_c = 0.68$ to $I/I_c = 0.82$, with in general the highest QE for the center heater (heater 3) and the lowest QE for the thin edge heater (heater 5). Besides there is a factor of 4 difference in quench level at $I/I_c = 0.61$. It is important to note that the thin (heater 5) and thick edges (heater 1) of the cable have very similar stability behavior.

Heater locations across the cable



Liquid versus supercritical helium heat transfer

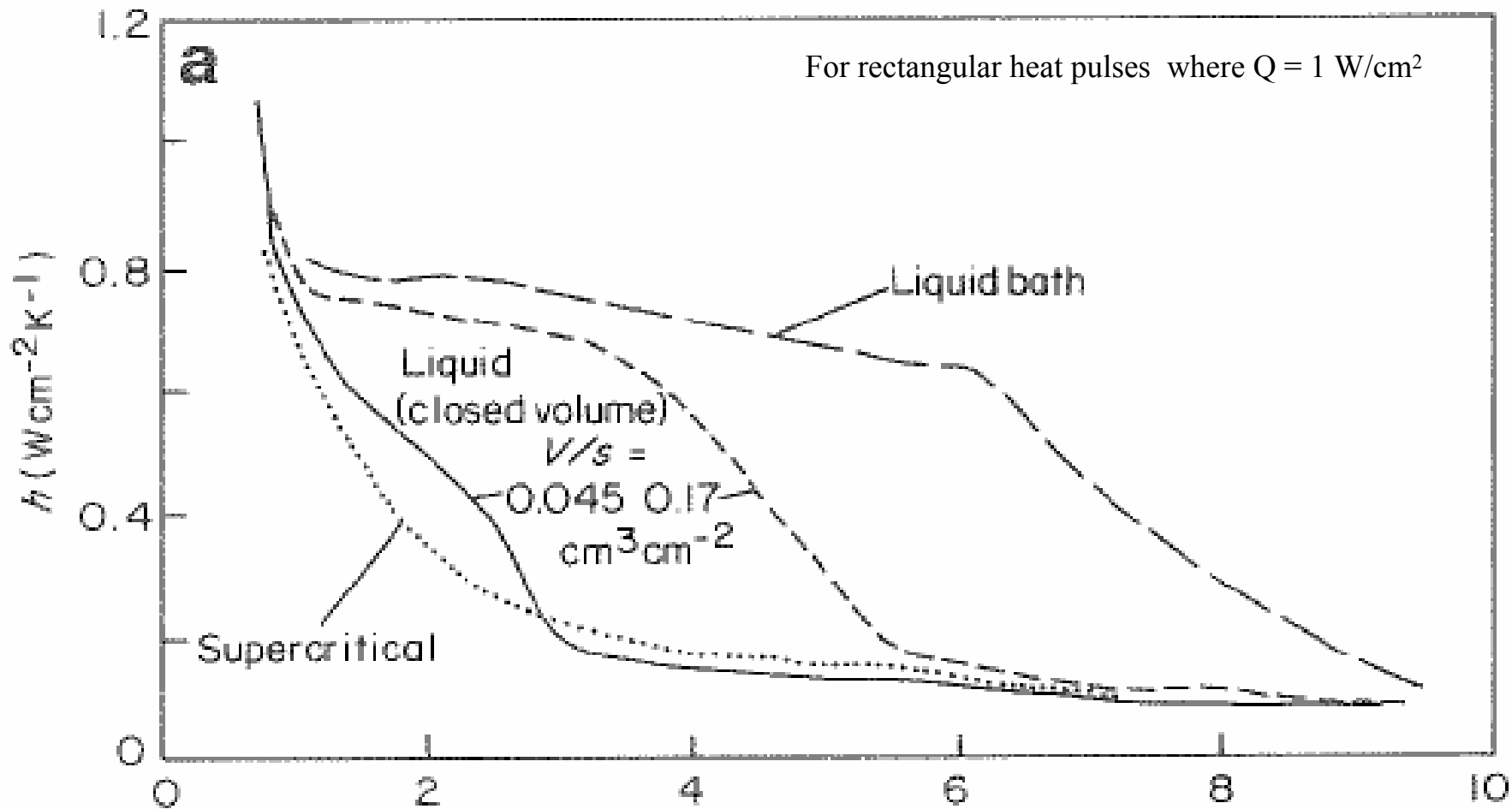


Figure 2 (a) Heat transfer coefficient after beginning of a heat pulse for liquid helium bath, for helium in a closed volume initially at liquid state and for supercritical helium; (b) pressure rise for

Transient Heat Transfer Experimental Setup

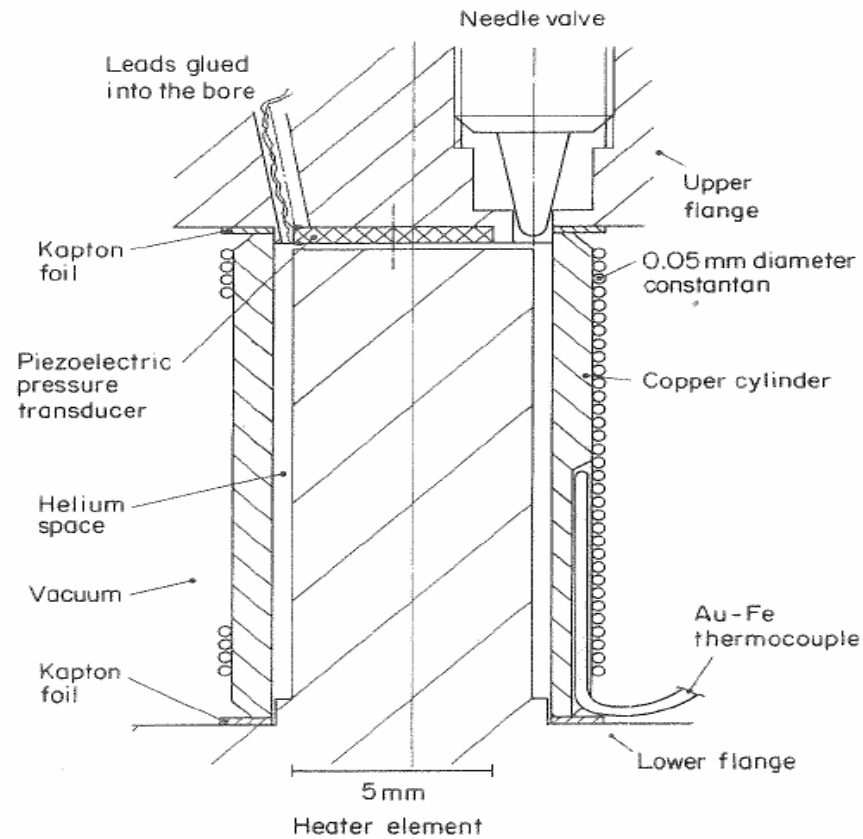


Figure 1 Experimental arrangement for measuring transient heat transfer in a closed small volume⁵

Conclusion



- Transient Heat transfer to supercritical helium is smaller than to liquid helium, after about 1 ms.
- CERN should analyze what effect this has on their measurements of MQE versus R_a , for the conditions of their experiment. This may require more measurements of the thermal conductivity to supercritical and liquid helium for different heat production rates Q (W/cm^2)