

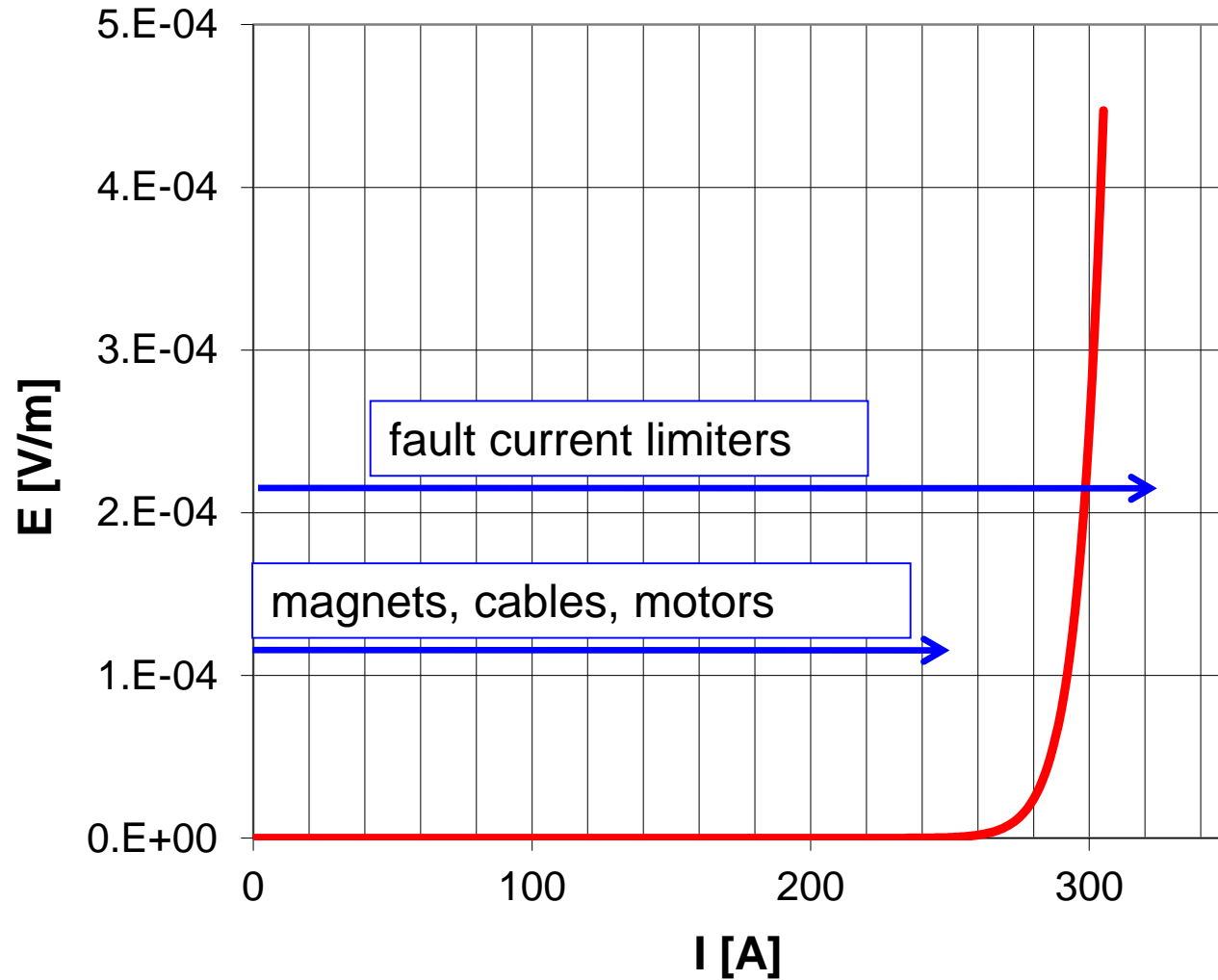


Coated conductor for fault current limiter application in cryogen free conditions

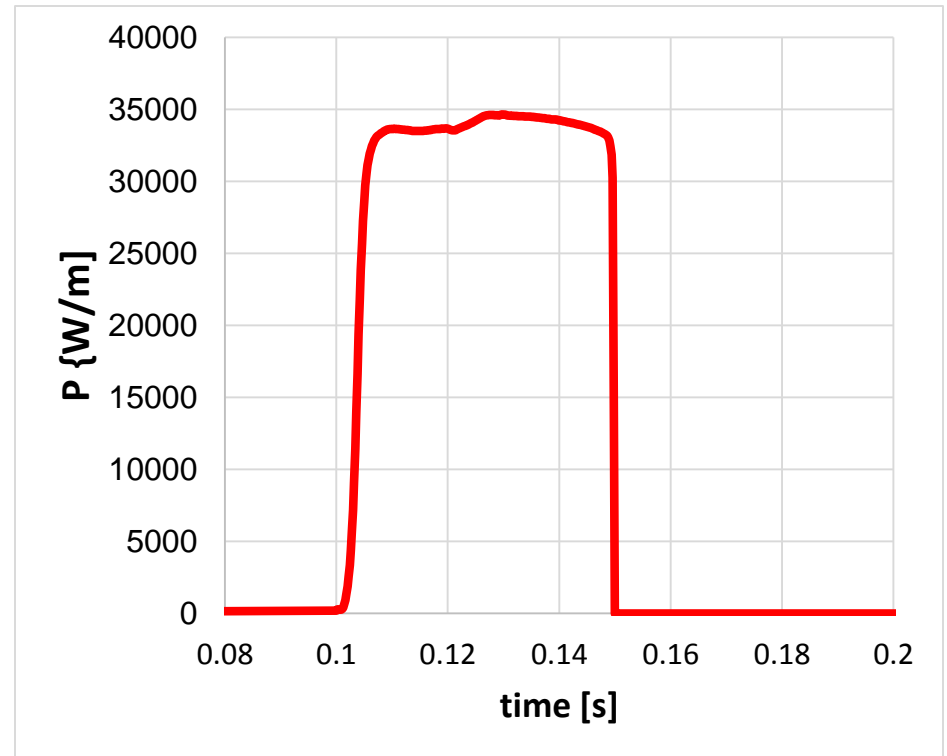
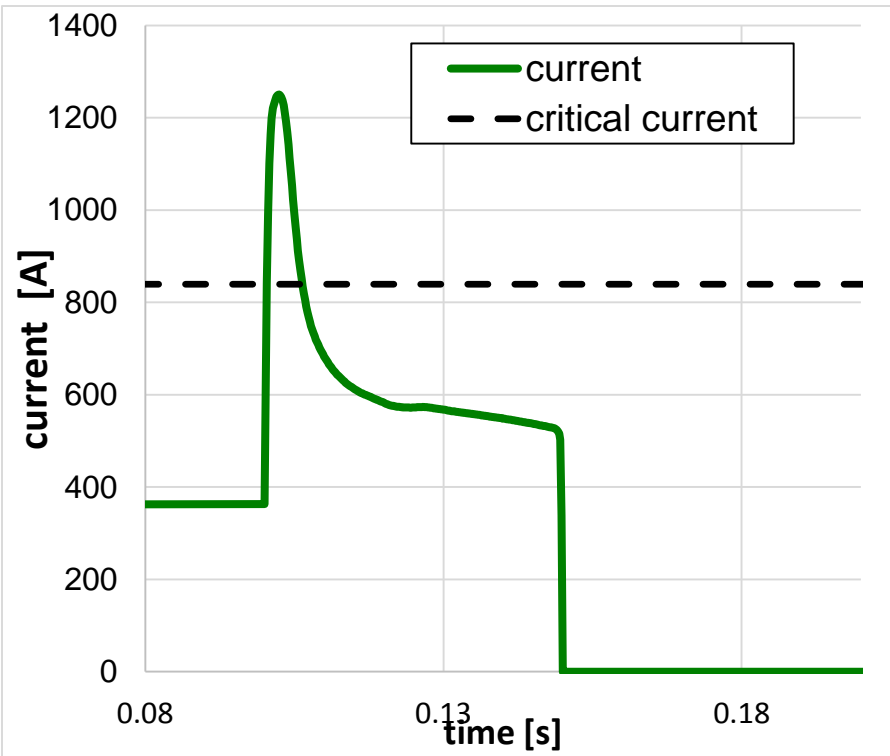
Michal Vojenčiak
Marek Mošať
Marek Buran
Fedor Gömöry

Fault current limiter

Operating range



Example of current limiting



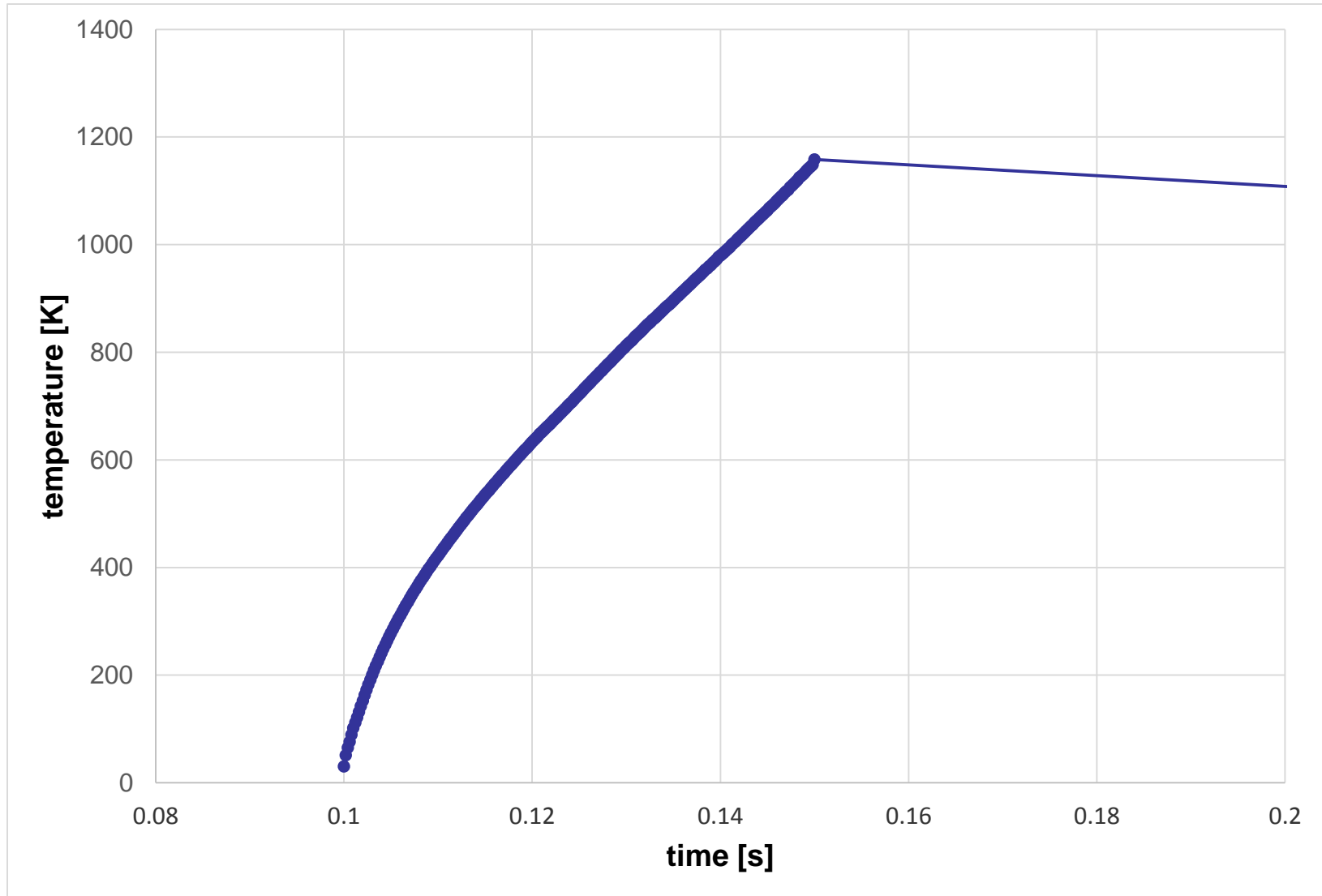
Example of current limiting



Heating system – 30 kW

Example of current limiting

Temperature calculated from sample resistance

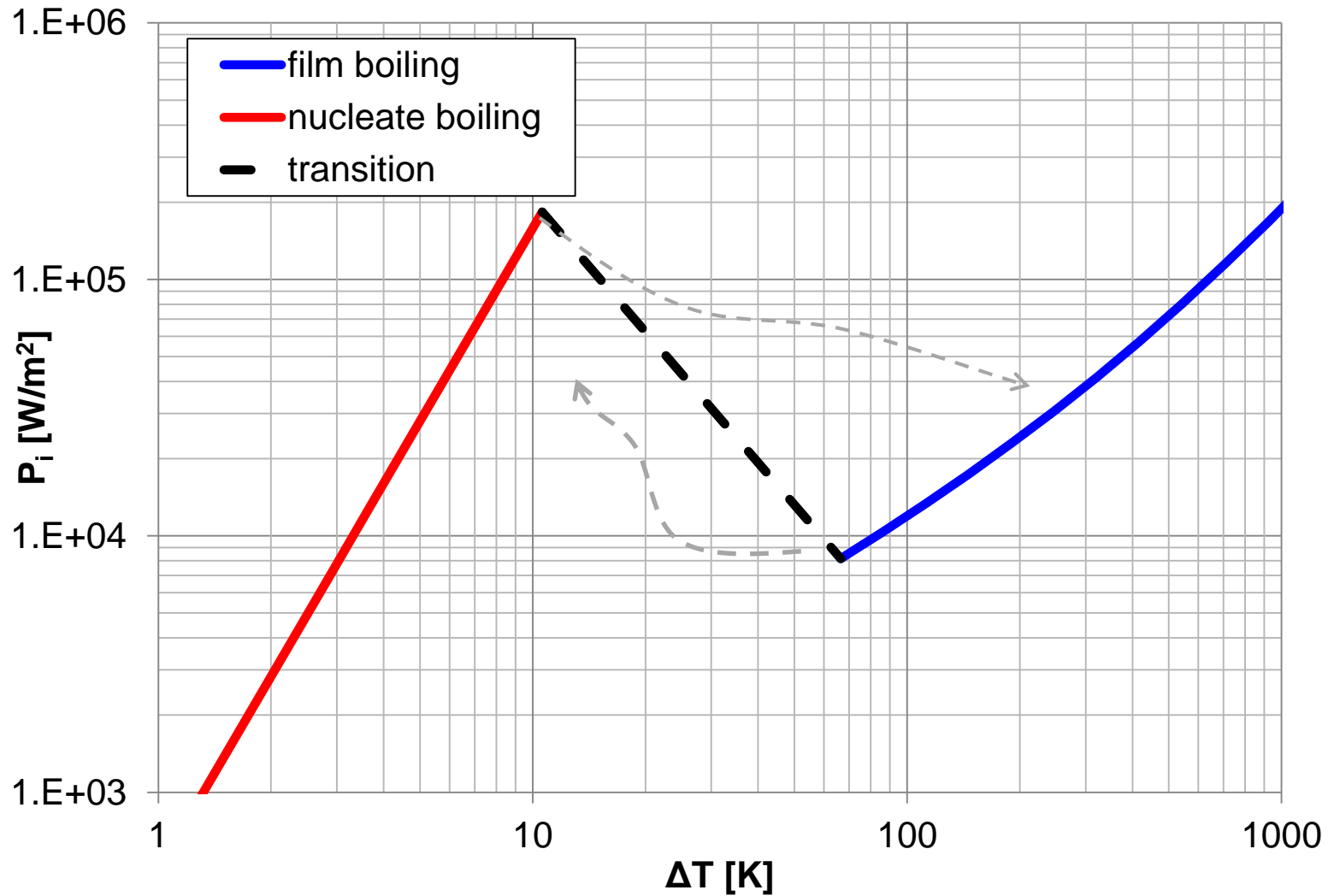


Conclusion

**Heat management is crucial for coated conductor in
Fault Current Limiter**

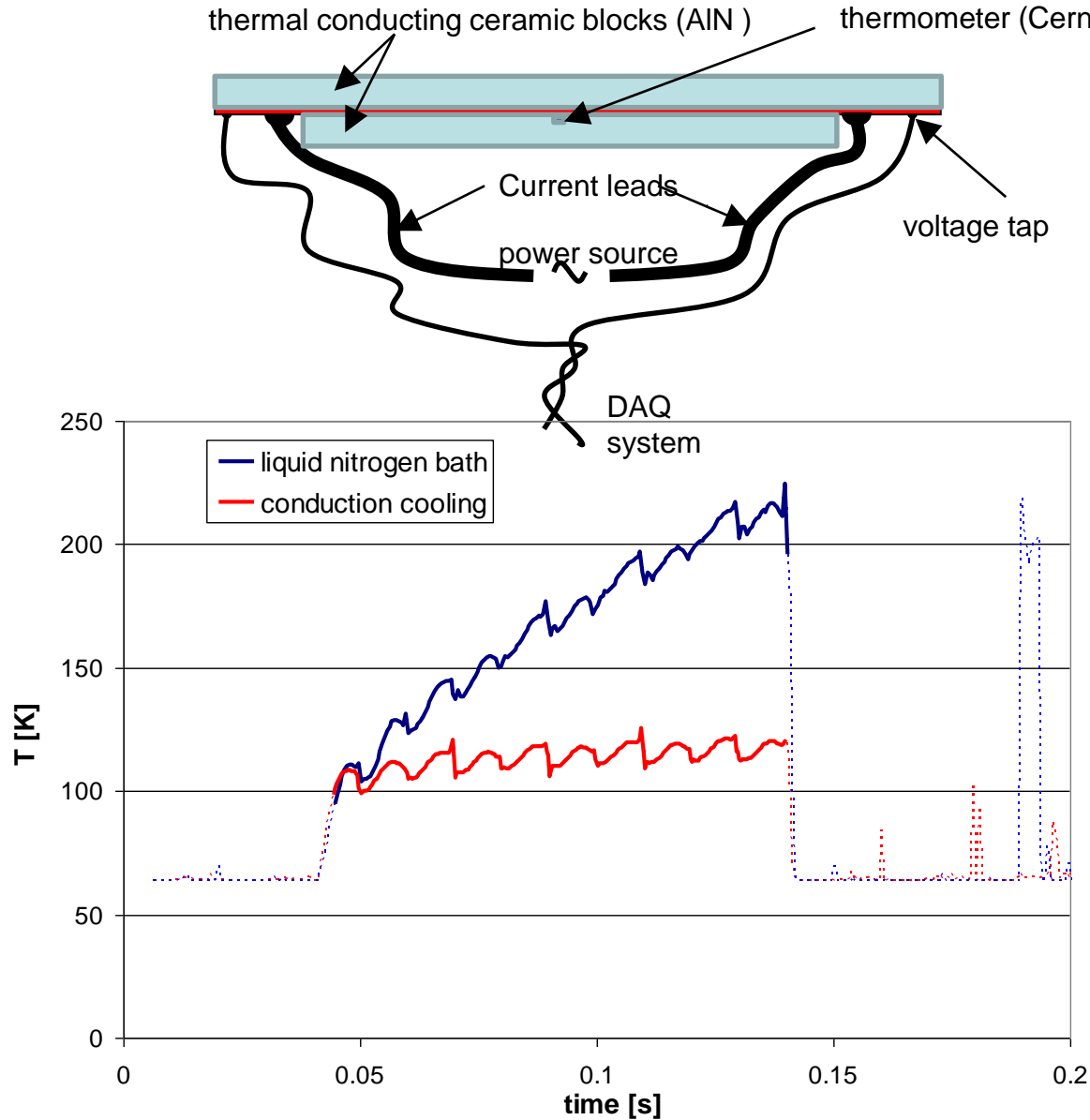
Cryogen-free fault current limiter

Motivation



Poor cooling capability of liquid nitrogen in film boiling regime

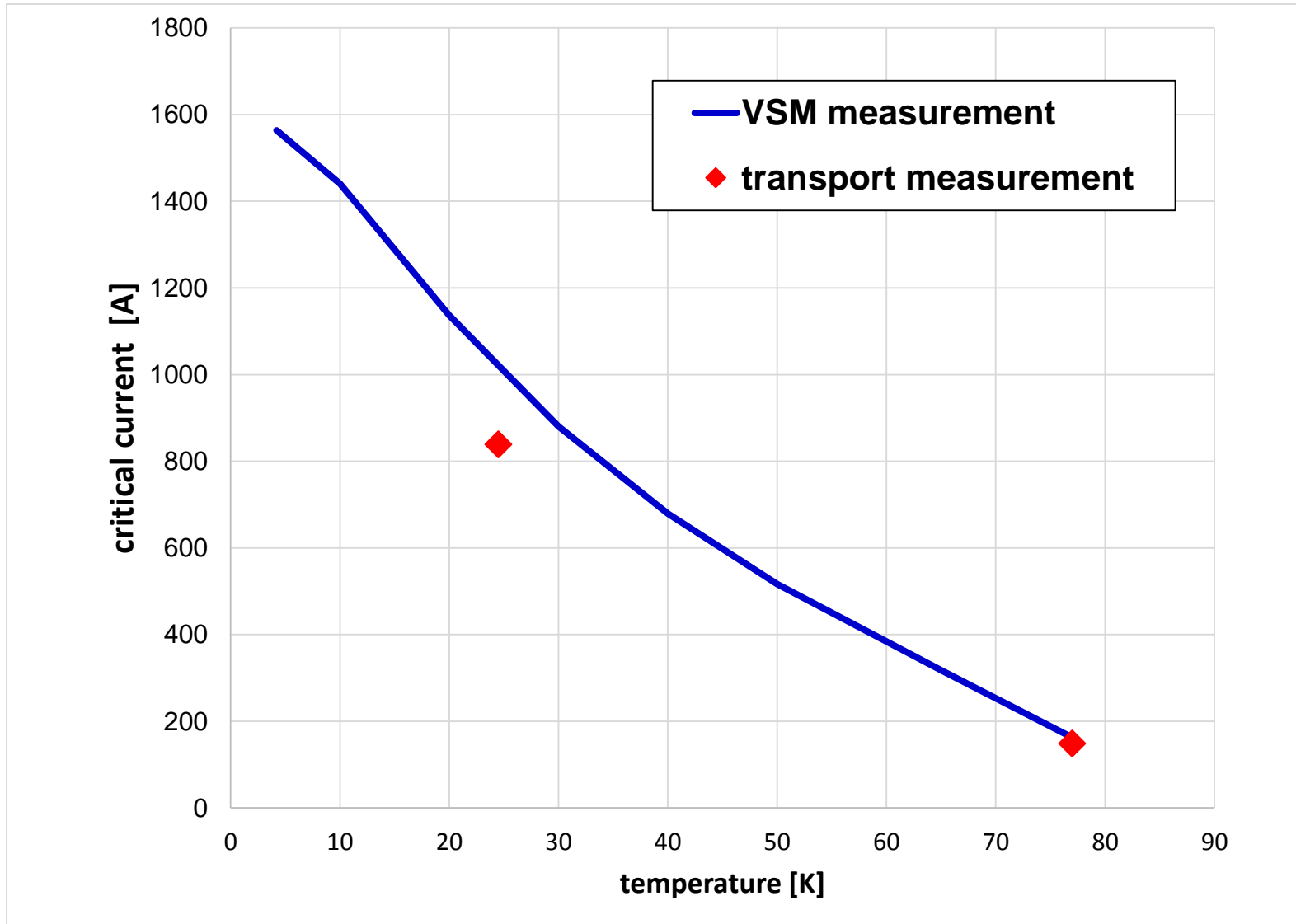
Thermal reinforcement – Aluminum nitride blocks



Vojenčiak et al.
EUCAS 2015

Concept of high-Cp thermal stabilization successfully tested @ 77 K

Motivation



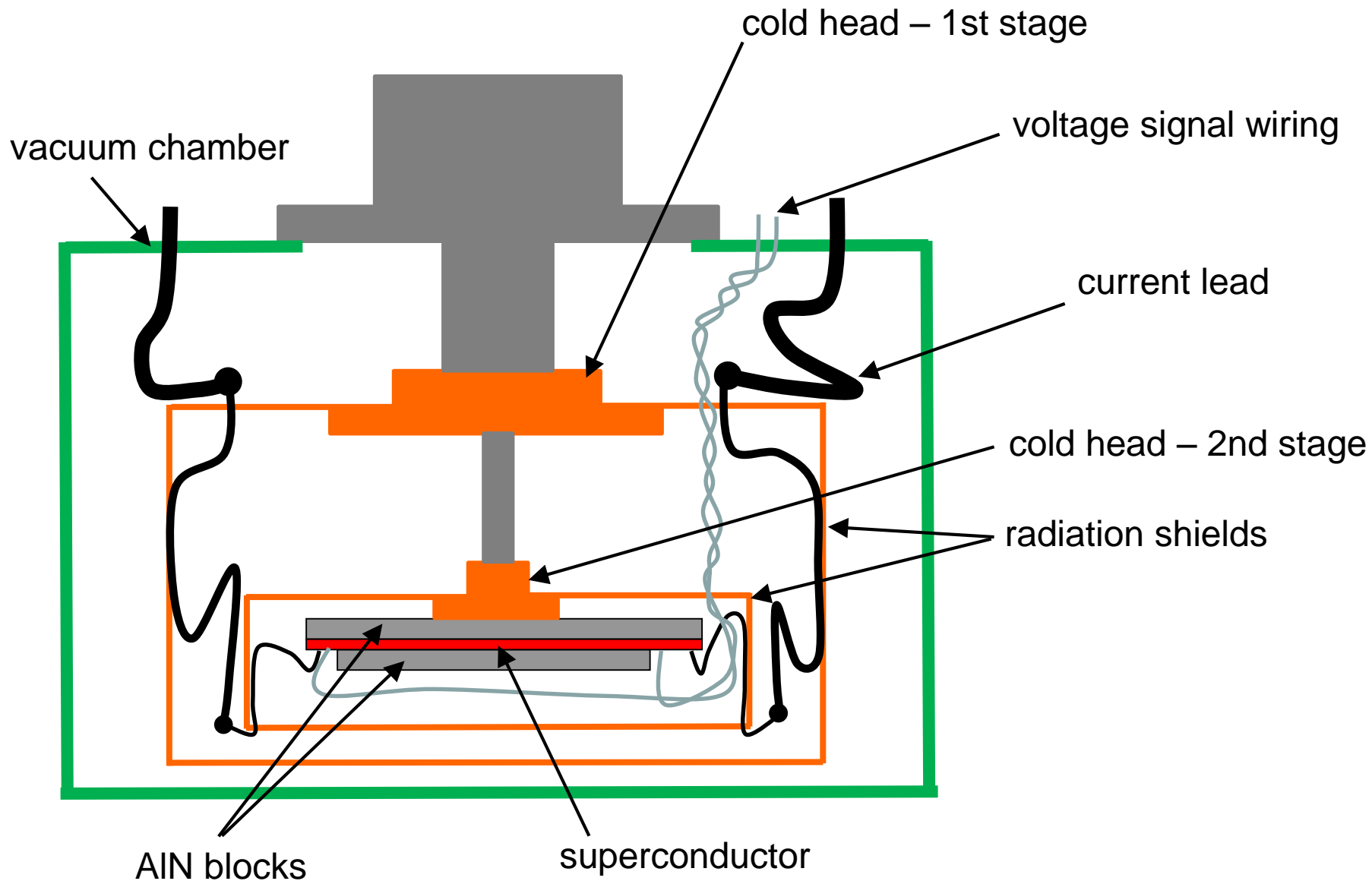
Critical current increased 6 times (77 K vs. 25 K)

Use of 2 mm wide tape instead of 12 mm ?

Cryogen-free demonstrator

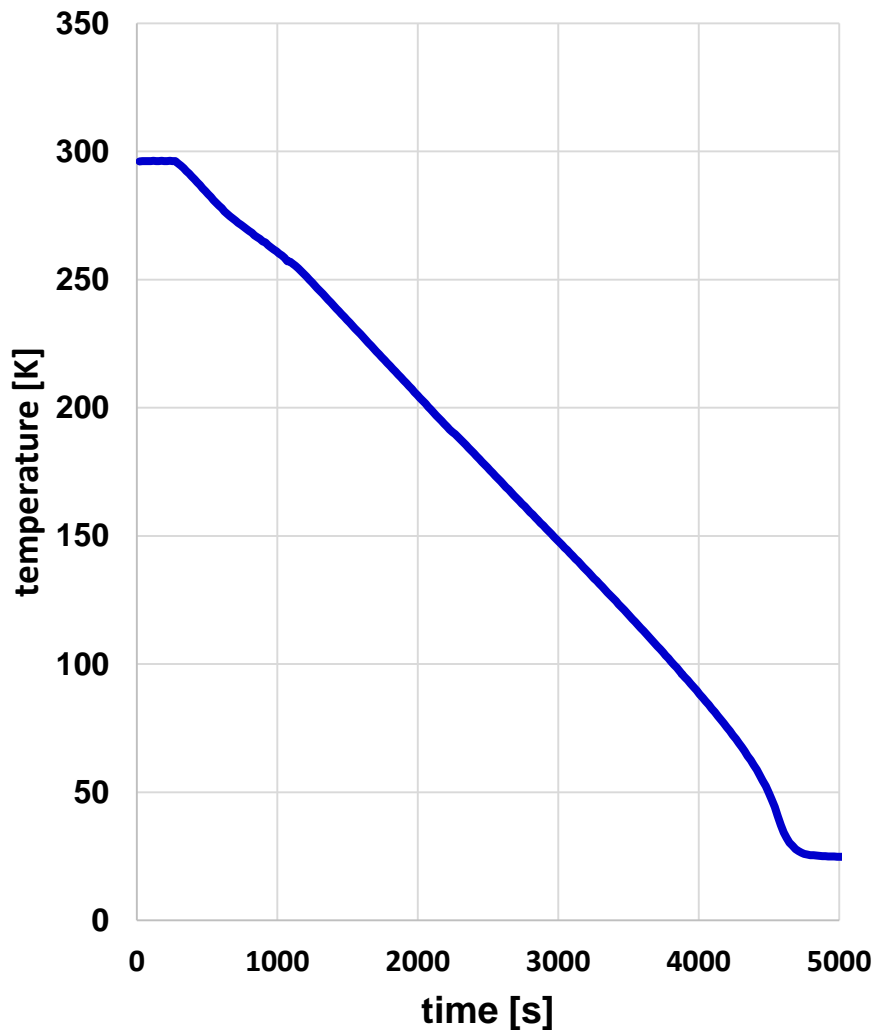


Cryogen-free demonstrator

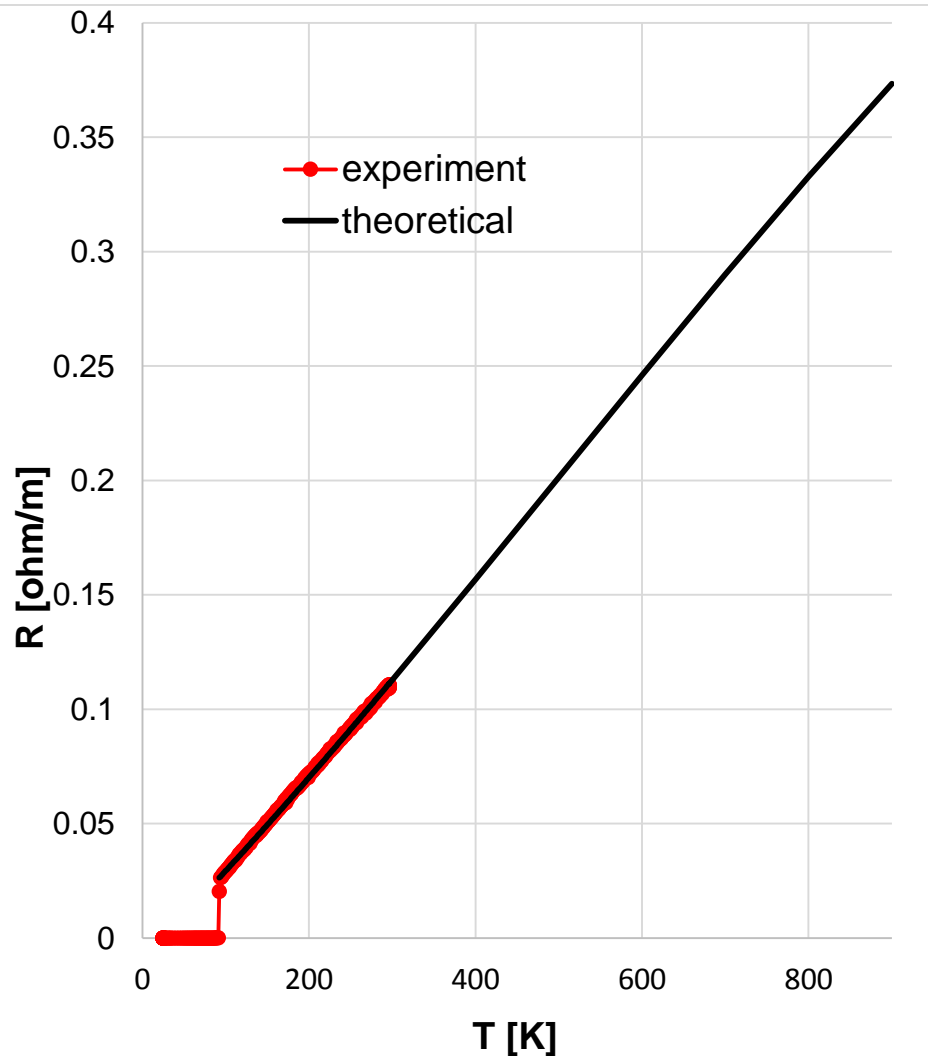


Cryogen-free demonstrator

Cooling-down process

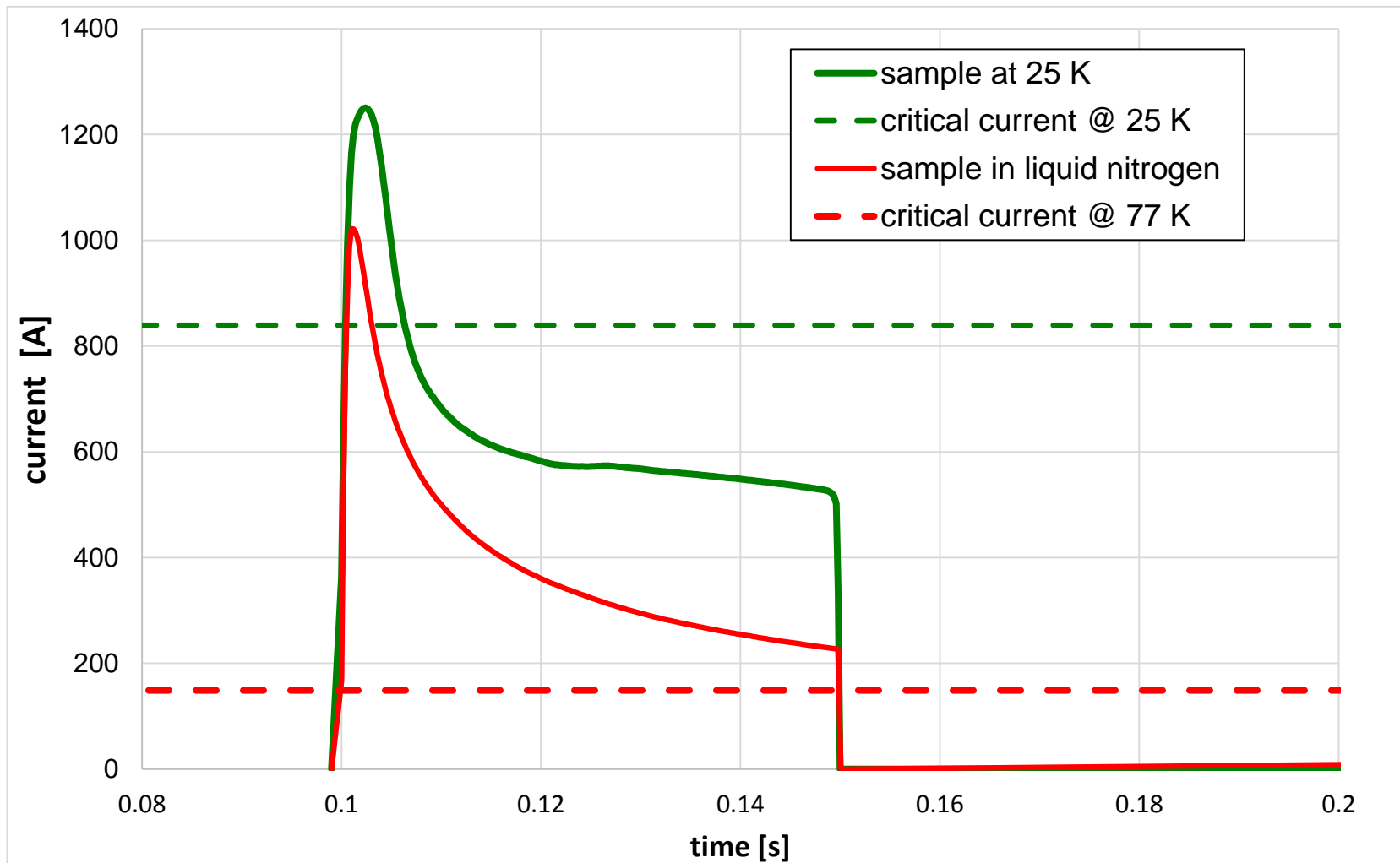


Resistance measurement



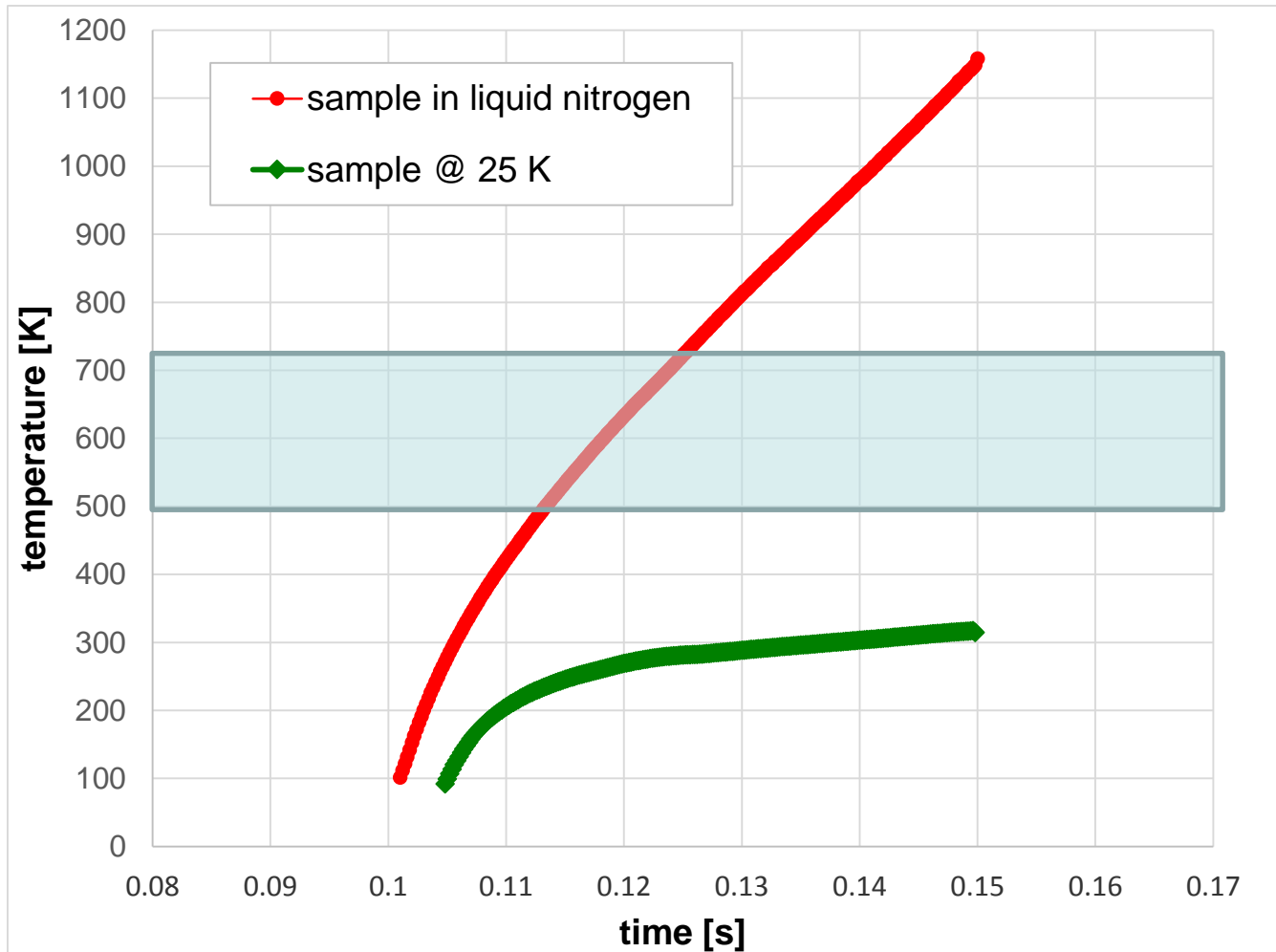
Theoretical curve – thickness of layers tuned to fit experiment (hastelloy - 60 μm , Ag – 2 μm , Cu - 11 μm)

Current limitation experiment – Electric field 100 V/m



Peak current ratio to critical current - ~ 6 for sample in LN
~ 1.5 for sample @ 25 K

Temperature during current limitation



?

What is maximum T for superconductor

Heating up processed slowed down by high Cp elements (AlN blocks)

Conclusions

Cryogen-free FCL has advantage of:

- higher I_c at low temperatures
- improved heat management

Future work

- Optimization of heat conducting elements
- Definition of boundary conditions (max. T for superconductor)
- Definition of requirements from application (electric field, time, etc.)

Acknowledgement



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FastGrid