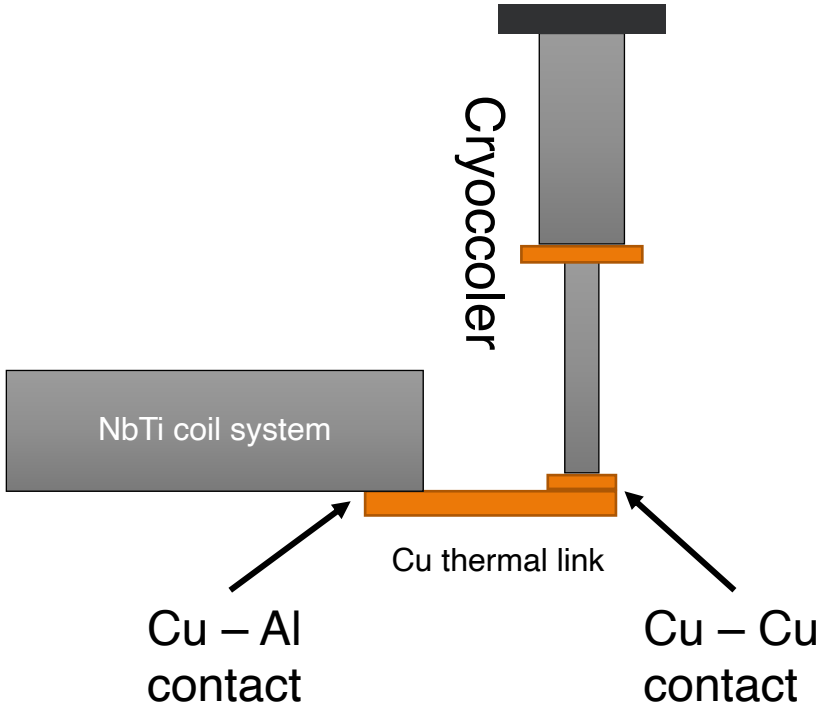
Experimental characterization of Al – Cu thermal contact resistance below 50 K

Gonçalo Tomás, Erik Krooshoop, Jaap Kosse, Marc Dhallé, Martin van den broek, Sander Wessel, Sohrab Kamyar, Herman ten Kate, Marcel ter Brake

- Measurements done in the framework of the project “IMDS”
  - 3 conduction-cooled NbTi superconducting coils
  - For every 100 mK increase → 23% decrease in current
  - **Thermal contact resistance (TCR) plays a big role!**
- TCR absolute values in literature are not consistent
  - Uncontrolled variables and size / force scaling



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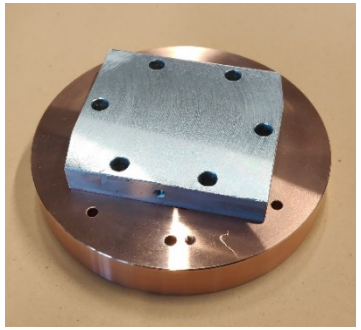
Measurement campaign

- Practical approach
  - Typical cold finger size area ≈ 35 cm^2 (≈ Ø68 mm cold finger)
  - 6 X M5 bolts – 5 N/m ≈ 2.7 tons force (calibrated at RT)

Cu-Al samples

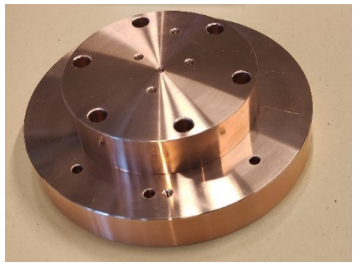


Contact	Medium	
1. Al RRR 1600 – ETP Cu	a) Dry	c) Indium foil
2. ETP Cu – ETP Cu	b) Apiezon-N	d) Apiezon-N loaded with Ag powder

To ensure reproducibility:

- For every measurement, a new set of materials is used
- Every measurement is repeated twice (with new materials)
- The Cu and Al pieces are machined < 1 µm average roughness
  - Verified by a surface profiler
- Cu is washed in acetic acid (99.7% purity) to remove oxide layer

Cu-Cu samples



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