Contribution ID: **12** Type: **Poster**

M2Po3B-01: Development of a thermal conductivity test bench at cryogenic temperatures

Tuesday 20 May 2025 14:00 (2 hours)

Thermal conductivity is a critical parameter in cryogenics and plays a fundamental role in the design of components operating in cryogenic environments. As cryogenics gain increasing relevance in fields like energy, understanding the low-temperature thermal conductivity of novel materials becomes ever more essential. Meanwhile, the depletion of helium reserves requires the high-energy accelerator community, including CERN and its Large Hadron Collider (LHC), to explore alternatives to liquid helium for cooling accelerator facilities. Although a complete replacement is nowadays not feasible, cryocoolers represent a promising option for replacing cryogens in a multitude of components. However, the widespread use of cryocoolers on large structures with the current constraints in cooling power requires an advanced thermal design and consideration of thermal transport properties, particularly for their successful integration into particle accelerators.
This study presents a thermal conductivity test bench operating from 4 K up to 300 K using a dry cryostat. The setup accommodates sufficiently large samples to practically measure composite materials such as low-temperature superconducting (LTS) cables and high-temperature superconducting (HTS) tape stacks. Simultaneously, to maximize the sample throughput, the test bench features aside the steady-state potentiometric measurement technique also a dynamic testing based on the pulse power method. Additionally, it is equipped to measure electrical resistivity, providing a comprehensive platform for thermal and electrical transport characterization.

Author: HOELL, Stefan (CERN)

Co-authors: GUINCHARD, Michael (CERN); SACRISTAN DE FRUTOS, Oscar (CERN)

Presenter: HOELL, Stefan (CERN)

Session Classification: M2Po3B - Cryogenic Testing, Standards, Procedures, and Measurements