



Contribution ID: 11

Type: **not specified**

Transient Heat Transfer Through the LHC Polyimide Cable Insulation

Monday 11 December 2017 09:00 (30 minutes)

During the operation of the LHC, the superconducting magnets are exposed to steady-state and transient heat loads. Knowledge of the thermal link between the superconductor and the He bath is essential to evaluate the stability of the superconductor. This work reports experimental data on the transient heat transfer between a stack of MB Rutherford superconducting cables and a He bath in saturated and pressurized conditions. The sample is prepared from machine insulated superconducting cable, instrumented with a Cernox temperature probe. The heat transfer is studied in the temperature range 1.7 K to 2.1 K and a deposited power range in 0.5 mW/cm^3 to 5 mW/cm^3 .

From the experimental data, two parameters are extracted and are discussed. The first parameter is the steady-state temperature difference and the second parameter is the characteristic time for the temperature difference to reach steady-state. From the two parameters conclusions are drawn on the void volume in the sample and on the dominant cooling paths through the polyimide insulation.

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Session Classification: Session III