

Thermal analysis of He II cooled Nb₃Sn superconducting coil samples

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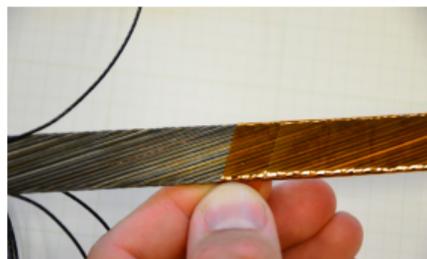
Overview

High Luminosity upgrade of LHC (HL-LHC)

- Higher Beam luminosity : Intensive heat loads
- Nb₃Sn magnet tech. : Heat transfer mechanisms
- Safe operating margins : Quench limits?

Test Program at Cryolab, CERN

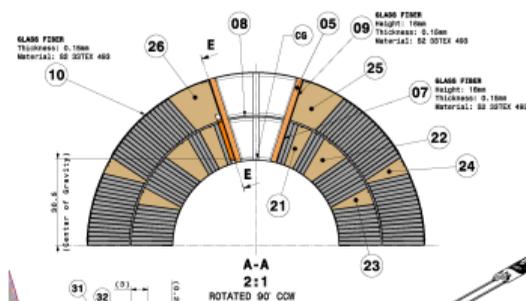
- 1 Experiments with prototype magnet coil samples
- 2 Developing a numerical toolkit



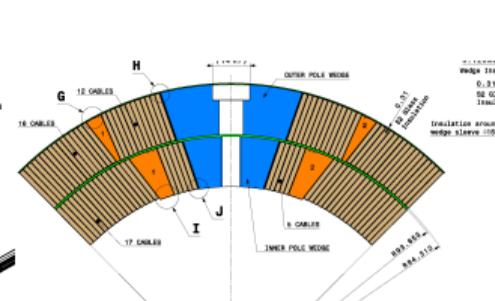
NbTi - polyimide



Nb₃Sn - Epoxy glass fiber



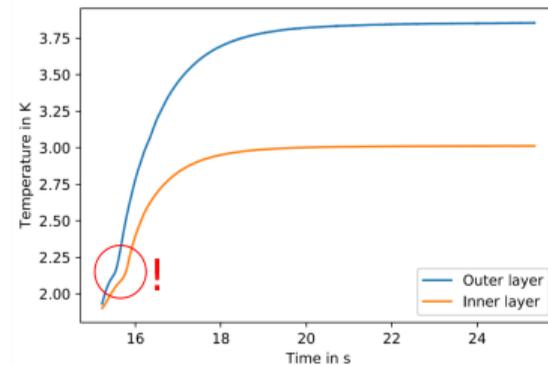
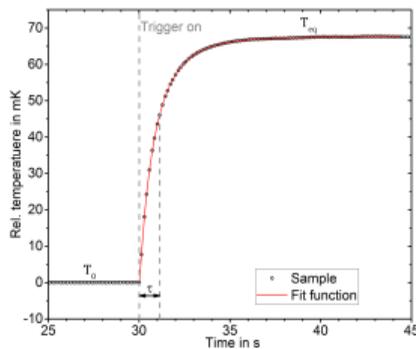
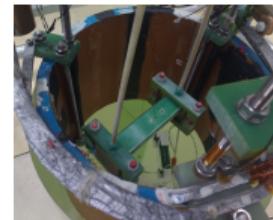
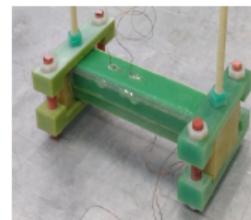
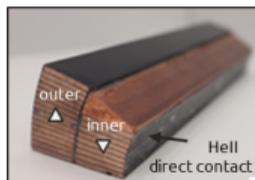
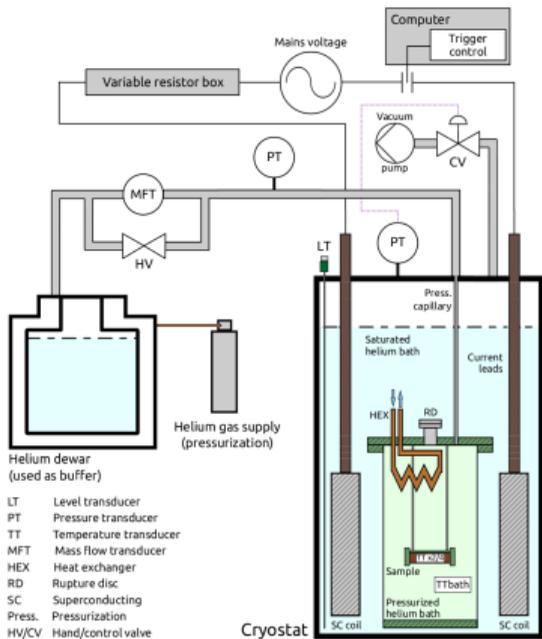
D11T



MQXF

Experiments

Unexpected observations



Hypothesis

Validation with numerical analysis and sample inspection

Coil samples are porous to helium.

How can this porosity be efficiently investigated, quantified and modeled?

- Phenomenological model : proof of hypothesis.
- Complex conjugate heat transfer model ultimately needed (being validated).



Cut D11T sample

Look out for my poster to see how and what we found out!