The analogy between electrical and thermal circuit can be expressed as:

\[ \text{MQY magnet coil} \]

- Measured and calculated quench values ranges from 0.6 to 15% for all measured types of superconducting magnets.
- The network model was validated with measurements performed in the CERN magnet test facility. The value of quench heater DC current and corresponding coil current were calculated from the network model of heat transport in the superconducting magnets. At the occurrence of the quench the measured parameters were compared with the model values. The relative difference between measured and calculated quench values ranges from 6 to 15% for all measured types of superconducting magnets.

- Quench heaters are installed to prevent the superconducting material from overheating and subsequent destruction. They are made of standard steel strips which are carefully placed inside the coil. They are heated by the DC current which is discontinued after the quench detection. The heat is transferred to the superconducting material in order to reduce their resistance. The strips are positioned along the coil.

- The power dissipation in the superconducting magnet component leads to a considerable increase of temperature which can be described by the heat transfer equation:

\[ \frac{\partial \Theta}{\partial t} = \nabla \cdot \left( \kappa \nabla \Theta \right) \]

where \( \Theta \) is the temperature, \( t \) is time, \( \kappa \) is the thermal conductivity of the material, and \( \nabla \) is the gradient operator.

- The modeling of the equivalent thermal circuit is based on the knowledge of the energy deposited in the coil, a quench will occur. The knowledge of the quench level will allow the optimization of the collimation system design and setting appropriate initial threshold values for beam loss monitoring and the reduction of luminosity from the beam.

\[ \text{MQY at 4.5 K} \]

- The LHC operates with 3.2·10^14 protons in one beam. Already if a small fraction of the beam, of the order of 10^7 protons per second, is lost locally and resulting charged particles are deposited for the coil, a quench will occur. The knowledge of the quench threshold values is essential. The model can be used for the quench limit calculation of other LHC magnets working at 4.5 K.

- The studied objects in the model are divided into different sub-regions.

\[ \text{MQY at 4.5 K} \]

- The results show very good agreement of the measurements with simulations. The relative difference between measured and calculated quench values are ranging from 6 to 15% for all measured types of superconducting magnets at 4.5 K.

\[ \text{MQY at 4.5 K} \]

- Proposed model can be used for the quench limit calculation of other LHC magnets working at 4.5 K.

\[ \text{MQY at 4.5 K} \]

- From the performed measurements and simulations it could be concluded that:

\[ \text{MQY at 4.5 K} \]

- The developed heat transport network model is working correctly at 4.5 K.

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