Contribution ID: **85** Type: **Poster**

Preliminary quench protection analysis for the FCC 16 T dipole magnets

Wednesday, 13 April 2016 17:30 (2 hours)

High-field, high-current superconducting dipole magnets are currently under study for the FCC project. Within the EuroCirCol collaboration, many efforts are dedicated to the optimization of the design of the 16 T dipole magnets. In general terms, cost-efficiency and, hence, compactness, are key criteria in the design optimization. This means that an optimal design is characterized by a low copper-to-superconductor ratio of the cables and a high energy density in the coils. Both these aspects represent potential criticalities from a magnet protection point of view, since they always imply higher hot-spot temperatures in case of quenches. In order to keep the hot spot temperatures lower than a safe limit, detection times and current decay times have to be minimized. This requires that a large fraction of the coil volume must be made to quench within milliseconds after the detection of the resistive transition.

In this paper, we present the hot spot temperatures and thermal gradients during a quench event for two different available quench protection technologies. The first technology is based on traditional quench heaters and the second one on the Coupling-Loss Induced Quench (CLIQ) system, a new technology developed at CERN that relies on inter-filament and inter-strand coupling currents to quickly spread the normal zone after a quench. Finally, also a hybrid scenario is discussed in which a combination of heaters and CLIQ is used to protect the magnet. A recently developed multiphysics simulation setting is used to accurately simulate the different physical phenomena involved in a quench event.

Primary author: PRIOLI, Marco (CERN)

Co-authors: STENVALL, Antti Aleksis; VERWEIJ, Arjan (CERN); AUCHMANN, Bernhard (CERN); BORTOT, Lorenzo (CERN); MACIEJEWSKI, Michal (Technical University of Lodz(PL)); SALMI, Tiina (Tampere University of Technology, Finland)

Presenter: PRIOLI, Marco (CERN)

Session Classification: Poster session

Track Classification: Superconducting Magnets