Contribution ID: **394** Contribution code: **THU-PO3-707-11** Type: **Poster**

Transient behavior of a REBCO No-Insulation or Metal-as-Insulation multi-pancakes-or racetracks-coil using a Partial Element Equivalent Circuit model.

Thursday, 18 November 2021 10:00 (20 minutes)

Implementing an efficient quench protection system in a classical insulated High Temperature Superconductor coil remains complicated and risky. Since about ten years, many groups have been working on novel windings consisting on removing the classical insulation between turns. This solution improves the thermal stability, and it avoids local degradations in case of a quench. One named them as "self-protected"coils as they do not need a dedicated safety system to ensure the quench protection. If such coils are much less sensitive to local burnings, the drawback is the loss of the control of the current path and all linked magnet aspects. It also induces new stresses distribution, which have to be mastered for designing a reliable magnet from a mechanical point of view. By setting appropriate value of the contact resistance, we can meet the different requirements.
This is why we have been developing since several years a multi-physics model dedicated to such coils. The model is built from a Partial Element Equivalent Circuit model coupled with a 2D finite difference thermal model and with a 3D magnetic model. This model makes possible to investigate the influence of the turn-to-turn resistance.
In this article, we present the thermo-electric behavior of a pancake with different values of the radial contact resistance. We consider different transient cases from the simple driven charge-discharge to the local quench inside a pancake. We then extend the model to a magnet made of several pancakes supplied in series; allowing to observe the temperature distributions, the radial and azimuthal current of each turn of the pancakes due to a source term generated on a sector of one of the pancakes. Finally, we present the results for the quench of a simple racetrack.

Primary authors: GENOT, Clément (CEA Saclay); LECREVISSE, Thibault (CEA-Université Paris-Saclay (FR)); FAZILLEAU, philippe (cea)

Presenter: GENOT, Clément (CEA Saclay)

Session Classification: THU-PO3-707 Quench Analysis I