Contribution ID: **916** Contribution code: **WED-PO2-718-02** Type: **Poster**

Analyses of Transient Electrical Behavior and Thermal Stability in No-Insulation REBCO Pancake Coils Using Electromagnetic-thermal Model

Wednesday, 17 November 2021 10:30 (20 minutes)

The No-insulation (NI) REBCO as an insert magnet has been applied to overcome the field limitation of LTS NMRs. So far, NI REBCO pancake coils have shown a "self-protecting"characteristic in experiments and, consequently, basic mechanism of self-protecting from thermal runaway has been widely studied by analyses under a low magnetic field or cooled by liquid nitrogen. However, several HTS insert magnets are designed with <20 K operating temperature or >10 T background field assumption. The transient variations of magnetic field and temperature affects the local critical current in the magnet, and they determine different electrical behaviors in equivalent No-insulation REBCO circuit. Thus, the thermal stability during charging process or after quench should be considered in the preliminary ultra-high field magnet design. In this study, an electromagnetic-thermal model is introduced consisting of electric and thermal contact resistances between turns and inductance matrix for the numerical simulation, and then the transient influences are further discussed by different operating temperatures, coil sizes, and background fields during charging/discharging and after quench to propose appropriate electrical and thermal contact resistances of the magnet.

Primary author: Mr LIU, Quanyue (Regional Leading Research Center, Changwon National University)

Co-authors: Prof. LEE, Sangjin (Uiduk University); Mr LEE, Jaehwan (Department of Smart Manufacturing Engineering, Changwon National University); Mr LEE, Jeongmin (Department Mechanical Engineering, Changwon National University); Mr KIM, Junil (Korea Electrotechnology Research Institute); Prof. KIM, Seokho (Department Mechanical Engineering, Changwon National University)

Presenter: Mr LIU, Quanyue (Regional Leading Research Center, Changwon National University)

Session Classification: WED-PO2-718 Design and Analysis I