Contribution ID: **151** Contribution code: **WED-PO2-709-07** Type: **Poster**

Numerical evaluation of transient thermal stability of no-insulation pancake coil wound with REBCO coated conductor with some defects

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

We are developing large diameter (m-class) no-insulation (NI) REBCO coil systems for applications such as cyclotrons for cancer treatment and high-magnetic-field whole-body MRI. NI coil technology is expected achieving both high thermal stability and high current density, which are essentially tradeoff relationships. Conventionally, superconducting coils have been required to quickly dissipate stored energy in externally connected protection resistance in order to avoid hot spot formation when a normal transition occurs. In contrast, our previous studies suggested that the application of NI coil winding technology may allow the coil to continuously operate even if some parts in the coil windings are degraded. Accordingly, by applying the NI coil winding technology, it can be expected that the use of REBCO coated conductor with defects or degradation, i.e., coil production that allows for variations in conductor characteristics, will lead to lower costs. Therefore, in this study, we analyzed the transient thermal stability of NI pancake coils wound with REBCO coated conductor has some defects using a numerical analysis program that combines the current distribution analysis based on the PEEC (Partial Element Equivalent Circuit) model and the temperature distribution analysis based on the finite element method. In this presentation, we will report the results of analysis assuming the magnetic field of 10 T and operating temperature of 30 K (conduction cooling) for the application to high field MRI and medical cyclotron. And the conditions for stable operation in a coil with defects are clarified using the number of defects, turn-to-turn contact electrical resistance and IOP/IC ratios as parameters.
This work was supported by JSPS Grant-in-Aid for Scientific Research (S) from the Ministry of Education, Science, Sports, and Culture (No. 18H05244).

Primary author: TSUYOSHI, Kyoka (Waseda University)

Co-authors: Ms NEMOTO, Ui; Ms KITAMURA, Mayu; Dr NOGUCHI, So; Prof. ISHIYAMA, Atsushi

Presenter: TSUYOSHI, Kyoka (Waseda University)

Session Classification: WED-PO2-709 No-Insulation Coils