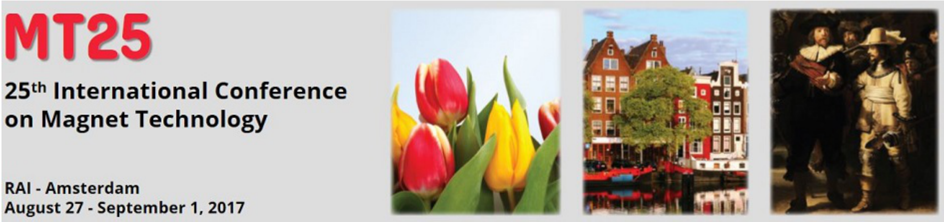

Contribution ID: **1004** Type: **Regular 15 minutes Oral Presentation**

Electromagnetic Quench Propagation and Self-Protecting Behavior of a Stack of No-Insulation REBCO Double-Pancake Coils

Tuesday 29 August 2017 10:00 (15 minutes)

No-insulation (NI) high temperature superconductor (HTS) winding approach has been progressing as a promising technique to produce compact, reliable and robust magnets, and has demonstrated electromagnetic quench propagation and self-protecting nature. Comprehensive distributed network simulation models have been used to understand the mechanism of the self-protecting behavior in a qualitative manner. However, the electromagnetic responses of actual NI magnets consisting of a stack of multiple coils have not been fully understood. Our approach uses previously described "lumped circuit model,"where each NI sub-coil in a magnet is modeled as an inductor and a resistor connected in parallel. Combined with an adiabatic lumped thermal analysis, the model reasonably well simulates the electromagnetic quench propagation among magnetically coupled sub-coils, much faster than the comprehensive distributed approach. Yet, some time-varying variables including transient responses of individual pancake voltages showed substantial discrepancy between measured and simulated results. The goal of this research is to investigate this discrepancy and improve our code for more precise simulation. An NI magnet comprising a stack of 3 double-pancake coils was constructed with REBCO tapes of which the lengthwise critical current over the entire length and the angular dependency of critical current of a short sample had been measured before construction of the coils. Fast ramping and over-current quench tests of the magnet were performed in a bath of liquid nitrogen and liquid helium, and the results were compared with simulated ones based on the inverse calculation approach. This allows us to investigate the validity of our code in a more controlled manner and better understand the electromagnetic behavior of an NI magnet more accurately.
Acknowledgement: This work was supported by the National High Magnetic Field Laboratory (which is supported by the National Science Foundation under NSF/DMR-1157490), the State of Florida, and the KBSI grant (D37611) to S.-G.L.

Submitters Country

United States

Primary author: Mr BHATTARAI, Kabindra (Applied Superconductivity Center-NHMFL)

Co-authors: KIM, Kwangmin (National High Magnetic Field Laboratory); Dr KIM, Kwanglok (National High Magnetic Field Laboratory); Mr PAINTER, Thomas (Magnet Science & Technology-NHMFL); Dr LEE, SangGap (Korea Basic Science Institute); Prof. HAHN, Seungyong (Seoul National University / National High Magnetic Field Laboratory)

Presenter: Mr BHATTARAI, Kabindra (Applied Superconductivity Center-NHMFL)

Session Classification: Tue-Mo-Or12

Track Classification: G2 - Quench and Normal-Zone Bahavior