



Contribution ID: 27

Type: **not specified**

Numerical simulation on current distribution in multifilamentary HTS tape

Sunday, 10 December 2017 14:30 (30 minutes)

The research and development on the applications of REBCO superconducting coil to the high field magnets for NMR, MRI, accelerator and so on are in progress. In these application, the magnets need to create highly homogeneous and temporally stable field. However, the screening currents lead to the serious problem in REBCO magnets for the applications required very high field quality. Then, multifilamentary REBCO tapes are expected to reduce the screening current induced magnetic field in the REBCO coil. The multifilamentary REBCO tape is plated the copper for mechanical strength and thermal stability. And, the coupling currents are induced between filaments in REBCO tape during excitation. In REBCO coil using copper-plated multifilamentary REBCO tape, the transverse resistivity between filaments in REBCO tape is important factor for thinking about the behavior of magnetic field and current distribution. In previous study, we developed three-dimensional numerical simulation code using finite element method (FEM) and fast multipole method (FMM) to calculate the spatial and temporal behavior of screening current distribution in REBCO coil. In this study, we focused on the transverse resistivity between filaments in REBCO tape and investigated the current distribution in the multifilamentary REBCO tape by using our developed simulation code. We discuss on the effects of transverse resistivity of multifilamentary REBCO tape on the diffusion process of screening current and the spatial and temporal behavior of the magnetic field.

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Session Classification: Session II