

Numerical Analysis of Transport Current Losses in Stacked HTS Conductors

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When the HTS tapes are used for the application such as transformer, magnet and cable, they need to be assembled to carry large current. In these devices the superconducting tapes are exposed to both transport current and magnetic field generated by itself and/or adjacent apparatus. Besides, it is well known that magnetic interactions between the neighboring tapes have significant effects on their critical current and AC transport current losses. Therefore, it is valuable to predict the critical current and quantity of the loss, which can suggest the useful information in the design process of electrical devices based on HTS.

In this paper, we computed and estimated AC transport current loss of stacked conductor. The assembled conductor consists of a couple of vertically stacked Bi-2223 superconducting tapes. We calculated current distribution in HTS tapes using 2-D FEM, introducing a A-V formulation. Dissipated ac losses are integrated with current distribution and electric field in the HTS. To observe the stacking effects on the stacked conductor, we measured the voltage-current characteristics of single tape at various external magnetic fields and it is used in the estimation of stacked conductor to reflect the nonlinearity of superconductor. Finally, estimated results of stacked conductor are presented and discussed.

keywords : AC loss, Transport current loss, current distribution, stacked conductor

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