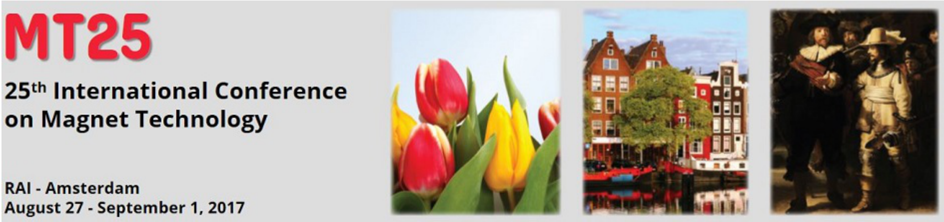

Contribution ID: **854** Type: **Poster Presentation of 1h45m**

The angular and Field Dependence of the Critical Current of commercial YBCO coated conductors

Thursday 31 August 2017 13:45 (1h 45m)

Many applications of YBCO tapes operate under external magnetic fields, hence it is necessary to investigate the in-field angular dependence of the critical current density of the coated conductors. In this paper, five commercial YBCO tapes with different microstructure that produced by three different manufacturers are chosen, which have width of 2mm, 4mm, 6 mm or 12mm. The in-field critical current density characteristics Jc (B, θ) of the selected commercial YBCO tapes are comprehensively measured under various magnetic fields and orientations. Afterwards, the obtained five experimental data sets are successfully fitted using an extended Kim model which considers the material anisotropy. In certain cases, a rational function is integrated into the fitting equations, which can effectively reduce the average errors of the fitting results to 2% or even lower. Based on the derived fitting functions of the YBCO tapes, a FEM model is built in COMSOL for calculating AC losses of the superconducting wires. The validity of the model is proved through comparison with the Norris analytical solution. Moreover, we consider the accuracy of this model is higher than the Norris equation since the influence of self-field is taken into account. Our results can be helpful for prediction of critical current and AC losses of devices that composed of electromagnetically interacting YBCO tapes.

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Session Classification: Thu-Af-Po4.08

Track Classification: F4 - ReBCO Wires and Cables