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Contact Resistance Dependent Transient Loss of REBCO No-insulation Magnet using T-A formula during Ramping Process

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For commercial large-scale magnet systems, the transient loss during the ramping process is an important evaluation metrics for refrigeration requirements, that is greatly influenced by contact resistance between winding turns. Due to intrinsic bypass current of no-insulation magnets, two part of the transient loss were considered: turn-to-turn loss generated by radial direction current, and magnetization loss produced by azimuthal direction current. In this study, the turn-distributed model is used to calculate the non-uniform current distribution, where the pancake coil is radially subdivided to each turn. The radial current was employed to calculate the turn-to-turn loss. The turn azimuthal current was applied to the boundary condition of the T-A formula to calculate magnetization loss in the cylindrical coordinate system. In the simulation, the superconductor index value model was used, in which the critical current density was conductor engineering current density estimated by a neural network fitting model. The contact resistivity dependent turn-to-turn loss and magnetization loss were presented. We conclude this study with reasonable advice for industrial applications

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