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A frequency domain finite element model for simulating high temperature superconductors using the J-A and T-A formulations

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AC losses, current density and the magnetic field are important variables for designing high-temperature superconducting (HTS) devices. The preferred method to compute those parameters is the finite element method. In this framework, most of the computational effort has been carried out in the time domain even though the interest may lay in the steady-state regime. For the latter, it is sensible to use a frequency model. This is the proposal here with the implementation of phasors in the modern T-A and J-A formulations. To validate the models, current density distribution and AC losses for the two formulations are compared against time-domain solutions and ultimately against experimental data for single BSCCO and a CORC® cable cooled at 77.3 K in liquid nitrogen.

Topic

Innovative methods and tools for modelling large-scale HTS systems

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