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H-phi Simulations for Pre-Quench and Minimum Quench Energy in HTS Tapes

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We introduce a H-phi magneto-thermal model to predict the dynamics of quench nucleation in HTS tapes by finite-element simulations. This superconductor model uses an original interpolation regime between the usual power-law model and the normal state resistivity, based using Bezier curves to allow a smooth transition between these two regimes. It is shown that this explicit modeling of the flux flow regime delays the quench nucleation when compared to the extrapolation of the power law model up the normal state. This helps reduce the non-physical overshoot of the voltage at the terminals of a quenched tape. We also compare the H-phi magneto-thermal simulations with some well-established electro thermal simulations, highlighting the key differences between both models.

Topic

Innovative methods and tools for modelling large-scale HTS systems

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