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Modelling the behavior of HTS coils under overcurrent conditions

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To improve the understanding of High-Temperature Superconducting (HTS) devices in electrical systems, it's important to couple Finite Element Models (FEM) with Electrical Circuits (EC). This coupling should consider superconducting behavior and how HTS devices affect electrical systems. Some HTS devices shift from the superconducting state to the normal resistive state, like fault current limiters, which requires modelling dynamic state changes. This transition leads to modelling challenges due to the current redistribution among the superconductor and the surrounding conductive materials. In this study, a Multiphysics FEM coupled with an EC was developed to address specific challenges of 2G HTS coil overcurrent operations. In addition, this study presents methods for reducing the Electrical Circuit Model (ECM), significantly reducing computational costs by a factor of 6 while maintaining a remarkable agreement with experimental results and full models.

Topic

Coupled and uncoupled multiphysics problems

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