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# Self-protecting behavior of Metal-as-Insulation windings made of High Temperature Superconductor tapes

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In the framework of the 40 T all superconducting SuperEMFL magnet, we investigated the metal-as-insulation (MI) winding technique for use in the insert part. This winding technique enhances the thermal stability of High Temperature Superconductor (HTS) coils without the drawback of long charging times, providing a self-protecting behavior.
We have then developed a unique numerical model to study the behavior of MI coils made of HTS tapes. The multi-physics model comprises an electric network model, taking into account the contact resistance between turns, coupled to a two-dimensional thermal coil model and a three-dimensional magnetic field coil model. The novelty is the integration of the non-uniform distribution of the current density within each conductor (i.e screening currents) assuming the well-known power law for the E(J) relation.
We present the behavior of a small MI solenoid made of several pancakes in two situations, the discharge of an external outsert and the case of a quench occurring in one of its pancakes. Finally, we compare the results against our PEEC model assuming a uniform current distribution.

**Primary author:** FAZILLEAU, philippe (cea)

**Co-authors:** Dr CHAUD, xavier (CNRS-LNCMI); Dr LÉCREVISSE, Thibault (CEA Paris Saclay); Mr GENOT, Clément (CEA Paris Saclay)

**Presenter:** FAZILLEAU, philippe (cea)

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