Modelling of Transient State Phenomena of Composite Superconducting Conductors During Pulse $I_c(B)$ Measurements

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Abstract - Computational modeling of pulsed current characterisation in composite superconducting conductors has been performed as the first step towards understanding the electromagnetic processes occurring during pulse Ic(B) measurements in the Cryo-BI-Pulse System. A simplified 2D model was created using the Finite Element Method (FEM) software ANSYS to investigate the current transfer process in a multifilamentary conductor, resulting in time dependent 2D distributions of electrical potential and current density along the wire axis. Experimental measurements were performed for two dissimilar NbTi wires and MgB2 tape: excellent agreement between pulse and DC results were found for one NbTi wire and the MgB2 tape, but the critical current for the other NbTi wire (Luvata OK3900) was significantly lower in pulsed current than DC characterisation. This behaviour has been interpreted in relation to current transfer phenomena using results from the FEM modelling.

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