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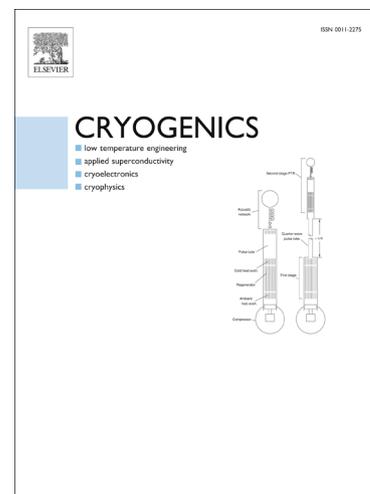
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Electromagnetic Analysis of a Superconducting Transformer for high current characterization of cable in conduit conductors in background magnetic field

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Abstract

A large cable-in-conduit-conductor (CICC) test facility has been designed and fabricated at the High Magnetic Field Laboratory of the Chinese Academy of Sciences (CHMFL) in order to meet the test requirement of the conductors which are applied to the future fusion reactor. The critical component of the test facility is an 80 kA superconducting transformer which consists of a multi-turn primary coil and a minor-turn secondary coil. As the current source of the conductor samples, the electromagnetic performance of the superconducting transformer determines the stability and safety of the test facility. In this paper, the key factors and parameters, which have much impact on the performance of the transformer, are analyzed in detail. The conceptual design and optimizing principles of the transformer are discussed. An Electromagnetic-Circuit coupled model built in ANSYS Multiphysics is successfully used to investigate the electromagnetic characterization of the transformer under the dynamic operation condition.

Keywords: design; optimizing; electromagnetic analysis; superconducting transformer

1. Introduction

In order to satisfy the test requirements of the superconducting cables, a large CICC test facility has been developed at the High Magnetic Field Laboratory of the Chinese Academy of Sciences, depending on the superconducting magnet of a 40 T hybrid magnet [1]. The main specifications of the test facility are shown in table 1 and the schematic of the test facility is shown in figure 1[2]. A superconducting transformer generating currents up to 80 kA is applied

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