

STUDY ON THE DYNAMIC BEHAVIOR OF A CURRENT IN CABLE-IN-CONDUIT CONDUCTORS BY USING SELF MAGNETIC FIELD MEASUREMENTS

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Cable-in-conduit conductors (CICCs), which are superior in terms of electrical insulation and machine stiffness, have been widely utilized for superconducting fusion magnets. However, there is concern that non-uniform current distribution occurs inside the CICCs, consisting of a large number of superconducting strands, under the operation of the fusion magnets. The non-uniform current distribution of the CICCs has a great influence on the performance of the superconducting fusion magnets. In this study, self magnetic field measurements on the CICC have been conducted in order to understand the behavior of a current inside the CICC under an external magnetic field and transient heating, which are assumed in the magnet operation. To measure the self magnetic field of the short sample CICC for JT-60 SA EF coil [1], Hall sensors were arranged around it. By using the Hall sensors, it was successful to measure dynamic variations of the self magnetic field under the condition that superconducting state changed into normal state in the CICC. Based on the measurement results, the behavior of a current inside the CICC was analyzed using the analysis model consisting of line currents. As a consequence, the analysis model enabled the dynamic behavior inside the CICC to be evaluated. In this paper, the results of the self field measurement and the analysis of the current inside the CICC are presented, and the dynamic behavior of the current inside the CICC is discussed.

[1] K. Kizu et al., Fusion Engineering and Design, vol. 84, 2009, pp. 1058-1062