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Performance of a HTS Persistent Current System for REBCO pancake coil

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HTS superconducting magnets for MRI or NMR should be operated in persistent current mode to achieve high homogeneity and stability. A persistent current switch and a superconducting joint are the key technologies for persistent current operation. Recently, a superconducting joint has been fabricated successfully in Furukawa Electric Co., Ltd. We made a persistent current system including the superconducting joints, a persistent current switch and a REBCO double pancake coil. In this paper, we report detail results of persistent operation test of the system in self-field and applied magnetic field of 1 T. The double-pancake coil of 160 turns with the inner radius of 44 mm and the persistent current system were fabricated with SuperPower REBCO tapes (6 mm width). The persistent current system was cooled by the second stage of the GM cryocooler in a cryostat installed in a room temperature bore of a cryocooler-cooled superconducting magnet. The current decay behaviors in the persistent current mode up to 170 A at 20 K were measured using a Hall probe located at the center of the coil. The magnetic field generated by persistent current was 0.59 T at 170 A and the decay rate of the field after five days operation was estimated to be 1.5 ppm/h in self-field. The detailed results will be discussed with considering operating current and applied field dependences.

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