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A Prototype of a 500 A class Bi-2223/AgAu Current Lead for a Conduction Cooled Superconducting Magnet

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We have designed a 500 A class high temperature superconductor (HTS) current lead using Bi2223/AgAu tapes for a conduction cooled superconducting magnet. The HTS current lead consists of two terminal blocks, a support tube, and seven Bi2223/AgAu tapes with support tapes. An operating condition is 500 A at 70 K, 0.6 T by conduction cooling, and heat leakage through the current lead is 0.32 W from 50 K to 4 K. Based on the design, we fabricated a prototype of the HTS current lead (PHCL). Critical current value was 738 A at 77 K in self-fields. The initial critical current at 77 K was maintained after five thermal cycles. The PHCL could carry 500 A at 70 K, 0.6 T by conduction cooling even after 21,000 cycles of electromagnetic force (Lorentz force). These results showed that the HTS current lead had sufficient current capacity and strength against thermal stress and Lorentz force. In addition, the critical current value was measured under various magnetic field and temperature conditions. These results will be reported in this paper.

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