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Basic Study for an Air-core Hybrid Bi2223 High Temperature Superconducting Transformer for a Compact Current Source and its Protection System for Normal Transitions

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A compact current source for supplying large AC current is useful for measuring current transport characteristics of HTS sample tapes. We focus on small weight and volume of a high temperature superconducting (HTS) transformer and have studied and presented the source with an HTS transformer [1-3]. The source outputs large current from its secondary coil by supplying small current to the primary coil. In order to reduce the weight and volume much more, we have been trying to develop an air-core hybrid Bi2223 HTS transformer. The transformer has a primary copper coil, a secondary HTS coil and no iron core [2, 3]. In this presentation, we will firstly report the structure of the transformer and characteristics of the large output current. The hybrid transformer needs a protection system for normal transitions in the secondary HTS coil for safe operation. Secondly, we will propose an appropriate protection system for the hybrid and air-core transformer. This work was supported by JSPS KAKENHI Grant Number 18K04080.

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