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Tue-Af-Po2.23-08 [95]: Design and Fabrication of a Laboratory Electromagnet applying HTS Coils

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This paper deals with the design and fabrication of a laboratory electromagnet utilizing high temperature superconducting (HTS) coils which is applied to excitate high magnetic fields compared with the conventional laboratory electromagnet with copper coils. The proposed electromagnet was composed of iron-core, HTS coils, and cryostat for the HTS coils. The components are designed using numerical calculation and finite element analysis. The electromagnet is based around a compact iron-core with HTS double pancake coils, and the electromagnetic design was carried out to take into account magnetic properties of the iron-core material and the Ic-B performance of the HTS conductor. The compact cryostat having HTS current leads is designed to reduce the thermal load of the coils. Based on the design results, the laboratory HTS electromagnet was fabricated and the performance is evaluated. The HTS coils are immersed into the liquid nitrogen of 77 K and energized up to the designed current level with the background field generated by electromgnet. In addition, the performance test result is discussed with respect to the shape of magnetic flux from iron-core.

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