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Thu-Mo-Po4.10-03 [71]: Thermal Design and Test of 4kA Current Lead based on Stacked YBCO Conductor

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For the Beijing Spectrometer III (BESIII) superconducting magnet alternate upgrade project, two 4kA HTS current leads were designed, manufactured and tested. The baseline design of the current leads adopted a stacked YBCO conductor solution to achieve a lower thermal load at 4K, improve the stability of the magnet, and meet the requirements in the upgrade project that the unchanging of existing cryogenic system and of the internal space of valve box. This paper introduces optimized design of the fin resistive heat exchanger component using fluid dynamics simulation, and thermal analysis of the entire current lead. Owing to the adoption of YBCO conductor, the heat leakage was effectively controlled. The joint component connected the LTS cable adopted a conduction-cooled design, which avoided complicated liquid helium piping and made the entire current lead structure simpler. The development of a novel YBCO soldered stacked conductor is also described. Their thermal conductivity and electrical properties tests, and experimental results of the entire current lead are discussed.

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