Construction and Test of the 27.2 T All-Superconducting Magnet at IEE

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A 27.2 T/32 mm all-superconducting magnet, consisting of two REBCO high temperature superconducting (HTS) inserts and a 15 T/160 mm low temperature superconducting (LTS) magnet, has been successfully achieved at Institute of Electrical Engineering, Chinese Academy of Sciences. The YBCO tape from Superpower Inc. and the GdBCO tape from SuNAM Co., Ltd were both selected to wind the HTS inserts through the non-insulation winding technology. To increase the current-carry capacities and decrease the perpendicular magnetic field dependency of critical current at two ends of the inner HTS insert, the double pancake (DP) coils located at the top and bottom of inner HTS insert were wound by a double-winding technique. After soldering the DP-DP splice joints, the outer layer of the two HTS inserts were both reinforced by stainless steel tapes, which could help the HTS inserts survive from excess electromagnetic stress. The two HTS inserts are in series connected and operated in the driven model with an independent power supply. The results test at 4.2 K show that the two HTS inserts could generate a central field of 12.2 T at an operating current of 169.2 A in the 15 T background field generated by the LTS outsert. The design, construction and test results of the 27.2 T all-superconducting magnet will be introduced and discussed detailed in the paper.

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