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Fri-Af-Po.06-01: Progress report and future plans for a 20 T, 50 mm room temperature bore high-homogeneity all-HTS magnet with conduction-cooled system

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High-temperature superconductors (HTS) are indispensable for producing magnetic fields exceeding 20 T, a subject that has attracted substantial research efforts in recent years. This study aims to develop a conductioncooled all-HTS magnet capable of generating a 20 T magnetic field with a 50 mm room temperature bore. The magnet has been designed to operate at a maximum temperature of 20 K using hybrid HTS tapes. To address mechanical and electrical challenges, the design incorporates a stainless steel co-winding approach to mitigate high stress while maintaining optimal turn-to-turn contact resistance. Additionally, a solderless joint method has been employed for connecting double pancake coils (DPCs), effectively eliminating corrosion issues caused by flux. So far, 8 out of the 18 DPCs required for the full magnet have been partially fabricated and tested, achieving a magnetic field of approximately 5.4 T. Moving forward, the remaining components will be integrated to complete the 20 T magnet.

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