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Construction and Testing of Curved ReBCO Coils

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In many applications dipole magnets with coils having significant curvature are needed. This is particularly challenging for high temperature superconductors (HTS) as they are brittle. One application for curved HTS coils is the fragment separator dipole magnets for the Facility for Rare Isotope Beams (FRIB). These magnets operate in a high radiation environment and are subject to a high heat load. Removal of heat generated in magnets in this environment using conventional NiTi and Nb₃Sn superconductors, which must operate at ~4.5 K, is difficult. However, HTS conductor can be used to permit operation at 40 K where heat removal is significantly more efficient. As these coils are curved, one side of the coils has a reverse curvature requiring the development of special technology to wind the coils. As part of an SBIR/STTR grant to develop and demonstrate a super-ferric design for a 2.2 T magnet two curved coils were fabricated with 12 mm wide SuperPower ReBCO conductor and first tested in liquid nitrogen at 77 K. Afterwards they were installed in a cryostat and cooled to 40 K with cryo-coolers. This paper will present the construction details and test results of these coils.

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