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Magnetization of CORC, TWST, and Roebel Cables for HEP applications and Associated Error fields

Tuesday 29 August 2017 15:00 (15 minutes)

Magnetization and AC loss measurements were performed on cables made from HTS coated conductors. Coated conductor-based CORC, Twist stack, and Roebel Style cables were measured and were compared. In a first set of runs, magnetization was measured out to 1.4 T at 4 K, and was compared for the various cable options with reference to the field at injection for particle accelerators. Additionally, progress and initial measurements made with a new 3 T/4 K small dipole measurement system are presented. The M-H measurements were compared to values for the coated conductor tapes themselves, and to simple analytical models. CORC cables made with tapes with different levels of striation are presented. The penetration field and the saturation magnetization, as well as the magnetization at injection are compared for the various cable types. CORC cables are seen to shield and trap flux from the whole of the cable (including the central core) at lower fields, while flux penetration is enhanced in CORC cables with striated strands. The measured magnetization values were then used to compute error field harmonics for a 4-layer, canted-cosine dipole magnet using two different approaches: (1) a Biot Savart and doublet approach, and (2) FEM modelling using COMSOL.

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