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Mon-Mo-Po1.09-01 [97]: 3D modeling and analysis of superconducting tape stack conductors for uniform trapped field

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Abstract
High temperature superconducting (HTS) taped stacks have broad application in magnetic levitation because of uniform induced current distribution, good heat dissipation and preferable mechanical properties. Configuration of the stack has a great influence on the uniformity and strength of the trapped magnetic field. In this paper, 3D modeling and experiments of HTS taped stacks with different stacking configurations are carried out under field cooling conditions, and the influence of three different configuration samples on the profile and uniformity of trapped field was compared. The first sample consisted of the superconducting tapes is arranged in a straight line; the second sample is the knitted tape stack (KTS); the third is inclined stacks with an angle. 3D modeling simulation is promoted by using the E-J constitutive law together with a T-A formulation to calculate the electromagnetic properties of the taped stacks. Finally, the simulation result is roughly consistent with the experimental result. Result shows that the location of the trapped field of the stacks in the straight arrangement matches the location of the tape arrangement. In the cross-shaped sample, it has been found that the maximum trapped magnetic field values appear in the regions where the superconducting tapes overlap each other, and the minimum values appear in the overlapping edges of the tapes. Compared to the other two samples, the inclined stack sample has a greater attraction for capturing a uniform magnetic field over a larger area.

Keywords: HTS tape stacks, 3D modeling and analysis, T-A formulation

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