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M1Po2A-06 [30]: Magnetic field simulation and measurement of HTS magnetic suspension system

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The performance of a high temperature superconducting (HTS) magnetic bearing is directly related to the external magnetic field of the permanent magnet (PM) rotor and properties, such trapped magnetic flux, of the superconducting stator. In this paper, finite element models are built for square, tile and circular shape high temperature superconducting blocks of different sizes. A multi-functional system for measuring magnetic filed at temperature between 77 K and 300 K was built, and the external magnetic flux density and distribution of the permanent magnet and the PM rotor were obtained. A liquid nitrogen cooling and magnetic field excitation device for square, tile and circular shape HTS blocks was built, and the magnitude and distribution of the trapped flux of the superconductor under different excitation conditions were obtained. The simulation results and experimental results are compared and analyzed. The relationship between the trapped magnetic flux and the shape of HTS block are studied. The influence of machining on superconducting blocks is analyzed. Based on the above finite element simulation model and test platform, the structure of the HTS magnetic bearing was improved, and the uniformity and consistency of permanent magnets and superconductors can be studied.

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