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Influence of Soft Ferromagnetic Section on Trapped Field of High Temperature Superconducting Bulk Magnet used for linear motor application

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High temperature superconductor(HTS) bulk has significant potential in linear motor application due to relatively high trapped field compared with the permanent magnet. However, the trapped field in a HTS bulk would be attenuated or even erased when bulk is subjected to a time-varying external magnetic field.Therefore, it is important to develop a method to protect bulks from demagnetization. In this work, YBCO HTS bulk which was magnetized by field cooling was attached by ferromagnetic plate on the top surface or ferromagnetic ring round the periphery, then subjected to traveling magnetic field. The relationships between the trapped field attenuation,electromagnetic force of HTS bulk magnet with ferromagnetic section and the amplitude, frequency of traveling magnetic field would be investigated experimentally. The trapped magnetic field are measured by Hall probe mapping and electromagnetic force are obtained by a home-made measuring equipment. Meanwhile, numerical model was built with finite element software Comsol Multiphysics. Based on the verified simulation, further investigations were carried out to systematically examine the dependence of the trapped field attenuation of bulk on the different geometrical parameter of ferromagnetic section. Conclusions would be beneficial to the design and applications analysis of the superconducting linear motor.

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