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Dynamic Responses of Stacked coated conductor tapes Levitated above a Permanent Magnet Guideway

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For the superconducting magnetic bearings (SMB) employed with stacked high-temperature superconducting (HTS) tapes, rotational or linear, its static and dynamic performance are essential for engineering application. Up to now, most works reported on the HTS tapes of SMB were focused on experimentally or numerically studies on levitation and guidance forces under quasi-static conditions. However, the dynamics of SMB has not been investigated primarily. In this work, a linear magnetic bearing composed of a stacked HTS tapes and a permanent magnetic guideway was built up for maglev application and its response on pulsed excitation was investigated. Three identical stacked HTS tapes with each 120 layers were used to form an assembly-sample which was exposed to the magnetic field produced by permanent magnet guideway of Halbach array. A force imposed on the sample was excited by a hammer with replaceable head. The laser displacement sensor (LK-G80) and uniaxial piezoelectric acceleration sensor (4507-B-004) were used to measure the response of sample at different field-cooling heights and amplitudes of impulse, the decay curves of displacement and velocity were obtained. Additionally, the resonant frequency of the levitation system was determined by spectrum analysis. Definitely, this work is of great value for better understanding the dynamics of SMB and promote its application.

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