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A propulsion-function-integrated HTS maglev system based on reversed excitation mode of electromagnetic guideway

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With the Meissner effect and flux pinning, high temperature superconducting (HTS) bulk can levitate with "self-stable"property above a magnetic guideway, integrating levitation and guidance functions in one. Generally, the propulsion function of an HTS maglev transportation is realized by another independent system, which has complicated the entire train system. Lately, according to the previous study of force between an HTS bulk and a reversed excitation electromagnetic guideway (EMG), it is found that the reversed excitation mode can introduce propulsion force in an HTS maglev system. However, the levitation and guidance performances of a single HTS bulk will also be affected synchronously. In this paper, the propulsion-function method is proposed with a multi HTS bulk arrangement and an exciting current regulation strategy in a straight EMG segment. Two HTS bulk arrangements are tested and the propulsion force is measured and analyzed firstly. Afterward, the levitation and guidance force variations during the propulsion stage are analyzed and optimized by using different excitation current switching methods. At the end, the advantages of the propulsion-function integrated HTS maglev system are summarized. This work will bring in new operation method in HTS maglev and provide basis for relative studies in the future.

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