



Contribution ID: 597 Contribution code: THU-OR5-501-07

Type: Oral

A High-Speed Maglev Test Rig Designed for HTS Pining Levitation and Electrodynamics Levitation

Thursday 18 November 2021 20:00 (15 minutes)

Our group has successfully developed SCML-03, which was used to study the dynamic behavior of high temperature superconducting (HTS) maglev. As the experimental speed of SCML-03 can only reach 300 km/h, it is no longer competent for research tasks in a higher speed range. At present, HTS maglev has entered the key stage of engineering application. In order to study its dynamic characteristics and stability under higher speed conditions, a high-speed maglev test rig is developed to undertake this research task. The test rig is mainly composed of a frequency conversion timing AC motor, the transmission mechanism, a brake, a guideway rotor, the control system, the HTS maglev measurement system and the permanent magnet electro-dynamics levitation (EDL) measurement system. In the test rig, the circular guideways are rotated vertically, and the Halbach-array PMG and aluminum guideway are fixed inside the stainless-steel rotor to solve the centrifugal effect of high-speed rotation. In order to ensure that the test rig can run stably at the speed of 600 km/h, the design is strictly in accordance with the standard of 700 km/h during the development process. This paper further verified the reliability of this important component through modeling and simulation of the guideway rotor. The ultra-high speed maglev test rig has abundant functions, which can be used to study the high-speed dynamic characteristics and stability of HTS maglev and permanent magnet EDL, which has great practical significance to promote the research and development of maglev.

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Session Classification: THU-OR5-501 Superconducting Rotating Machine, Levitation and Flywheel