Contribution ID: **597** Contribution code: **THU-OR5-501-07** Type: **Oral**

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