Contribution ID: **862** Contribution code: **THU-PO3-508-06** Type: **Poster**

Force Characteristic Analysis of Active EDS System Under Different Control Currents

Thursday 18 November 2021 10:00 (20 minutes)

Electrodynamic suspension (EDS) system is promised to be the ideal option for high speed magnetic levitation transportation. The electromagnetic forces for levitation and guidance of the EDS system are based on the relative motion of onboard superconducting magnets and the null-flux coils fixed on the ground. This unique working principle requires an auxiliary device to suspend the vehicle at low speed range as well as start process. Moreover, the operation safety of the train is difficult to guarantee with passive levitation coils on the ground under extreme conditions. Through an active control of the levitation coil currents, a quasi-static suspension state can be achieved independently of the running speed, and the stability is controllable at high speed. A numerical model of an active electrodynamic suspension system is carried out in this work to study the suspension characteristic of the system and the current in the levitation coils is controlled under different operation states of the vehicle. Square wave current and sinusoidal current are respectively input to the null-flux coils to investigate the electromagnetic forces of the system. The peak value and oscillation properties of the levitation and guidance forces are calculated and compared under different control currents corresponding to various speed range.

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Session Classification: THU-PO3-508 Superconducting Rotating Machines, Linear Machines, and Related Subjects III