Contribution ID: **807** Contribution code: **TUE-PO1-509-01** Type: **Poster**

Analysis of dynamic thermal and mechanical behaviors of HTS magnet for high-speed superconducting maglev

Tuesday, November 16, 2021 1:15 PM (20 minutes)

A prototype racetrack high temperature superconducting (HTS) magnet used for high-speed superconducting maglev has been in progress at Institute of Electrical Engineering, Chinese Academy of Sciences. The dynamic thermal and mechanical characteristics of the racetrack HTS coil is affected by multiple factors while it is accelerating, which has an effect on the operating margin inversely. To design a reliable HTS coil of superconducting maglev, it is essential to analyze the dynamic thermal and mechanical behaviors in HTS magnet accurately. In this paper, the AC losses induced by the rapidly changed magnetic field originated from levitation planes and guidance coils were analyzed, and the temperature fluctuation inside the HTS coil was calculated furthermore based on the cooling method and heating power. A refined finite element method was proposed to analyze the mechanical behaviors of HTS coil with considering the combined effects of winding, bands, cooling method, ac losses, and electromagnetic force. To increase the analyzing accuracy, the screening current induced by the coupling magnetic field from levitation planes and guidance coils is also taken into considerations to calculate the stress/strain in the HTS coil. The experimental data and simulation results will be compared and discussed detailed in the paper.

Index Terms—HTS magnet, racetrack coil, superconducting maglev, thermal behavior, mechanical behavior

Primary authors: WANG, Lei (Institute of Electrical Engineering, Chinese Academy of Sciences); SUN, Wanshuo (Institute of Electrical Engineering, Chinese Academy of Sciences); WANG, Luzhong (Institute of Electrical Engineering, Chinese Academy of Sciences); HU, Xinning (Institute of Electrical Engineering, Chinese Academy of Sciences); CHENG, Junsheng (Institute of Electrical Engineering, Chinese Academy of Sciences); LIU, Jianhua (Institute of Electrical Engineering, Chinese Academy of Sciences); ZHANG, Zili (Institute of Electrical Engineering, Chinese Academy of Sciences); Prof. WANG, Qiuliang (Institute of Electrical Engineering, Chinese Academy of Sciences)

Presenters: WANG, Lei (Institute of Electrical Engineering, Chinese Academy of Sciences); Prof. WANG, Qiuliang (Institute of Electrical Engineering, Chinese Academy of Sciences)

Session Classification: TUE-PO1-509 Maglev and Levitation I