Contribution ID: **155** Contribution code: **THU-PO3-508-11** Type: **Poster**

R&D of a No-insulation HTS Magnet for Small-Scale Bilateral HTS Linear Synchronous Motors

Thursday 18 November 2021 10:00 (20 minutes)

A Linear synchronous motor (LSM) is more electrically and mechanically efficient as compared to a linear induction motor (LIM) when it is running at high speed. Therefore, LSM is especially suitable for maglev which is usually operated over 400 km/h. To acquire stronger thrust force, high-temperature superconducting (HTS) magnets are proposed to replace traditional permanent magnets or electromagnets as the secondary excitation part in a LSM since HTS magnets can generate a much stronger field intensity. In this paper, research and development process of a HTS magnet is presented for a small-scale bilateral HTS LSM. The HTS magnet is designed with no-insulation winding technique for the enhanced thermal stability during unexpected quench. The optimization process is achieved by MATLAB circulative iterations combined with FEM software simulations, and its target is to find a magnet structure with minimum HTS tape consumed while generating a qualified magnetic field and running in a safe margin. The analysis of basic characteristics including turn-turn resistance, changing and discharging time constant are deduced and tested by experiments. Then performances like filed intensity, total harmonic distortion (THD) analysis and safety margin in operation, are investigated by comparison of simulations and experiments. Besides, accessory structures such as current leads and cooling system are also designed to further ensure the successful and safe operation of the HTS magnet.

Primary author: Dr DONG, Fangliang (Shanghai Jiao Tong University)

Co-author: HUANG, Zhen (Shanghai Jiao Tong University)

Presenter: Dr DONG, Fangliang (Shanghai Jiao Tong University)

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