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The Test Results of a YBCO Racetrack Coil at 30K Incorporate a Novel Cryostat Suitable for a Linear-Motor Type Flux Pump Used on an Synchronous Motor

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Based on the designed field current of an high temperature superconducting (HTS) synchronous motor and the cooling temperature at 30K in our laboratory, this article introduces the structure and fabrication of a novel cryostat suitable for a linear-motor type flux pump used on an synchronous motor, and reports the charging test of the HTS no-insulated (NI) double racetrack coil used in the rotor field winding of the 16.9 kW HTS synchronous motor at 30K in the cryostat. The machine technically employs an HTS contactless static excitation device (CSED), the so-called linear-motor type flux pump, to charge the HTS field winding through a non-contact and the thermal shielded wall in the cryostat excitation method. We show that the device can inject a large current into the HTS NI double racetrack coil at 30 K, and is capable of operating at flux gaps greater than the thickness of the thermal shield. The results of this work have practical guiding significance for the next step of the 16.9KW synchronous motor rotor field excitation and accommodating a cryostat wall within this flux gap will enable future flux pump designs, which is helpful to realize the application of linear-motor type flux pump for HTS motor rotor excitation.

Primary authors: LI, Hong (Sichuan University); Prof. WANG, Wei (Sichuan University); YANG, Chao (Sichuan University); XU, Hang (Sichuan University)

Presenter: LI, Hong (Sichuan University)

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