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## Study on the Through Duwar Wall Excitation of YBCO Coil Based on Linear-motor Type Flux Pump

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HTS flux pumps enable superconducting currents to be directly injected into a magnet coil without the requirement for thermally inefficient current leads. As exciter of high temperature superconducting synchronous motor, HTS flux pumps will reduce the cryogenic volume and improve the efficiency of the HTS machine. With the air gap between the flux pump and the HTS stator increases, the effective magnetic field acting on the superconducting stator becomes smaller. But too small an air gap will limit the application of flux pumps. Therefore, based on the stingy gap (1mm) linear flux pump previously used in the laboratory, the air gap of linear-motor type flux pump is optimized in this paper, so that it can charge the HTS racetrack coil at a larger air gap. Firstly, we simulate the air gap magnetic field when the air gap is changed between 1-12mm with the COMSOL Multiphysics. Secondly, we use the optimized linear-motor type flux pump to carry out charging experiments on the HTS racetrack coils under different air gaps. The results of this experiments are instructive for the further optimization of the HTS flux pump and the application of the flux pump to the 16.9kW HTS synchronous motor built in the laboratory. The linear flux pump can be used to charge the superconducting coil across the wall of the cryostat, which greatly simplifies the complex structure of the cryostat and is easy to install.

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