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## Influence of the Stator Substrate Magnetism on the Charging Performance of Dynamo-type HTS Flux Pump

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### **Abstract:**

Dynamo-type high-temperature superconducting (HTS) flux pump has been verified to be a practical method for the charge of HTS magnet, due to its simple structure and low cost. The nonlinear properties of HTS stator which is influenced by its substrate magnetism, play an important role on the charging performance of the dynamo-type HTS flux pump. Generally, there are three kinds of substrates being used in HTS coated conductors, e.g., non-magnetic substrates, weak-magnetic substrates and strong-magnetic substrates. In this study, we have compared the charging performance of dynamo-type HTS flux pump with different type of HTS stators numerically and experimentally. A finite-element model was established firstly, in which the nonlinear properties of the superconducting material are described by the E-J power law in conjunction with an H-formulation framework. Then, corresponding experiments were carried out to verify the simulated findings. According to the results of simulations and experiments, compared to the coated conductor without magnetic substrate, when the magnetic substrate was under the superconducting layer, the saturated current and the charging speed of the stator with magnetic substrate had been promoted obviously.

**Key words:** flux pump, finite-element simulation, magnetic substrate, charging performance

**Primary authors:** SUN, Chenzhen (Southwest Jiaotong University, Chengdu, China); LI, Jing (Southwest Jiaotong University); ZHOU, Pengbo (Southwest Jiaotong University); MA, Guangtong (Southwest Jiaotong University)

**Presenter:** SUN, Chenzhen (Southwest Jiaotong University, Chengdu, China)

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