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Wed-Mo-Or12-01: Investigation on the Ultra-high field Flux Pumped superconducting magnets

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Flux pump field magnets have the ability to generate high fields through avoiding utilizing current expensive high-current power supplies and warm-to-cold current leads. The resultant effect is that the purchase and running costs of high-field magnets will decrease substantially. Thus it is realistic to expect HTS flux pumped magnets to be available which could be installed widely enabling a radical sea change in the use of high field magnets to support research.
Flux pump technology and the latest dynamic bridge switching method will be the key to providing the required high currents cost-effectively. Most previous studies have focused on the circuit of the flux pump system under ideal circumstance. However, in a real flux pumping system for high field magnets, the electrical components in the flux pumping system can be affected by each other. Negative impacts, such as the quenching of the dynamic bridge and inefficient control strategies, slow down the charging speed, and result in the saturation of the transformer iron core and even the failure of the whole flux pump system. This paper will investigate how to optimize the whole flux pumping system and coordinate the electrical components in the circuit to achieve the best performance. An effective and interesting solution based on second harmonic analysis is proposed to eliminate the negative impacts. Experimental results from a flux pump system will be presented to validate the methods described in the paper.

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