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Wed-Mo-Po.12-05: Development of Inductive Wireless Charging Systems for HTS Magnet Applications

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High-temperature superconductor (HTS) magnets have demonstrated significant potential for generating high magnetic fields and transporting DC current with minimal power loss, making them essential components in advanced applications such as NMR, MRI, and superconducting motors. Despite the advantages, the high joint resistance of HTS magnets has limited the adoption of persistent current mode (PCM), necessitating the use of power-driven modes, which introduce thermal loads and reduce operational stability. To address these challenges, our previous study proposed an inductive coupling-based contactless current charging system designed for a HTS coil operating in cryogenic environments. This system effectively demonstrated feasibility through finite element analysis, electrical circuit simulations, and prototype experiments. In this study, we aim to extend the application of this technology to larger-scale HTS magnets. The research will focus on the design and fabrication of a system capable of charging HTS magnets efficiently while addressing challenges such as optimizing coupling coefficients and ensuring robust performance under cryogenic conditions. This result is expected to provide a practical and scalable approach to contactless current charging for HTS magnets, enabling broader adoption in advanced superconducting applications.

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