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Mon-Af-Po1.23-11 [120]: HTS Coil Structure Suitable for High-Power Transmission in a Short-Time in Wireless Power Transmission System for Railway Vehicle

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A Wireless Power Transmission (WPT) system for a railway vehicle has been investigated to reduce the greenhouse gas emissions in a diesel vehicle. However, the WPT system is required to transmit the electric power of several hundred kW in a short time while the railway vehicle is stopping at a station. Since there are power converters and control devices under the floor of the railway vehicle, the coil space for the WPT system is limited. Therefore, when high power is transmitted to the coils installed in a limited space, eddy current loss generates in the coils and rails, and a long time coil operation becomes difficult due to the coil heat generation. Therefore, it is required to reduce the losses in the coil and the rails and lower the operating frequency. Since a copper coil using Litz wire has low current density, it is difficult to increase the number of turns of the coil in the limited space. Since the quality factor of the copper coil decreases with decreasing the operating frequency, it is difficult to suppress the coil heat generation by decreasing the operating frequency. Therefore, we investigated an HTS coil structure suitable for high-power transmission in a short-time in a WPT system. A high-quality factor was obtained in the WPT system using the HTS coils even at the frequency region around 1 kHz. It was found that the reduction of the current load factor was particularly important for the high-power transmission in a short time because the AC loss in the HTS coil strongly depended on the current load factor. Considering this point, we were able to realize the high-power transmission in a short-time at the low-frequency region around 1 kHz in the WPT system with the HTS coils composed of parallel conductor with wide tapes.

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