Analysis and Optimisation of Inductive-Based Wireless Power Charger

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Abstract

Widespread use of wireless communication, the cables are taken away step by step from our electrical equipment. Nowadays, the power cable is the last wire based connection to the equipment. Therefore, the wireless power transfer (WPT) is desired technology. The advances make the WPT very desirable to the electric vehicle (EV) charging applications in both stationary and dynamic charging scenarios.

The inductive type WPT can be considered as a large gap transformer, where the primary winding is the transmitter coil, and the secondary winding is the receiver coil. The application of analytic methods for mutual inductance calculation to real life cases is almost impossible, so the computational electromagnetics can help to analyse this complex system. In addition, knowing the electromagnetic field and parameters of transmitter and receiver coils are not enough, the system level approach of wireless power transfer is required. Further, the operating frequency of resonance-based charger is high, so the transmitter and receiver coil acts as an antenna. Therefore, the analysis of the transmitted, reflected and total electromagnetic field also important in this application.

Our presentation focuses on the numerical analysis of a wireless power charger using finite element method and co-simulation of electric circuit and magnetic system of wireless power transfer for resonance in ANSYS Simplorer system simulation environment. The aim of optimization is to reduce material costs at a certain distance. The presentation covers the importance of eddy current shielding and losses in this application.

References

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