

Novel Automatic Switching Technology for Transmission Coil of Dynamic Wireless Power Transfer System

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In a dynamic wireless power transfer system, it is necessary to install a power supply and a sensor for detecting the position of the receiving coil for each transmitter coil as shown in Fig.1, and that will be the challenge to reduce infrastructure costs. In this report, we propose a system configuration in which a plurality of transmitter coils are connected to a single power supply (Fig.2) and a segmented coil topology having parallel elements as a resonance topology suitable for the proposed system, and an automatic switching technology using variation of the transmitter coil voltage and current according to position of a receiving coil.

In the proposed system, only a variable capacitor of the transmitter coil in which the receiving coil exists nearby is switched to a resonance condition, and a resonance state is established between the resonance capacitor and the transmitter coil (Fig.3). Thus, a voltage is effectively applied to the mutual inductance to transmit power to the receiving coil. The existence of the receiving coil is determined based on the change level of the transmitter coil voltage and current, and each transmitter coil autonomously switches the variable capacitor to engage/disengage the power transfer. Fig.4 shows operation waveforms when the transmitter coils are arranged in a row and the receiving coil are moved. The transmitter coil is automatically engage/disengage the power transfer.

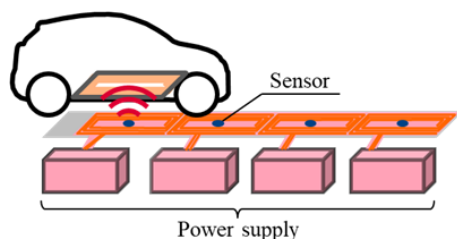


Fig.1 A conventional DWPT system

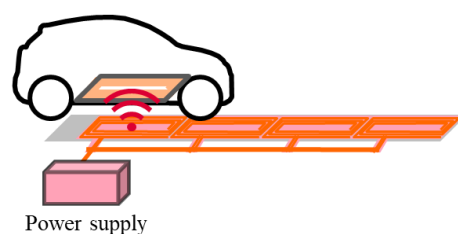


Fig.2 Proposed DWPT system

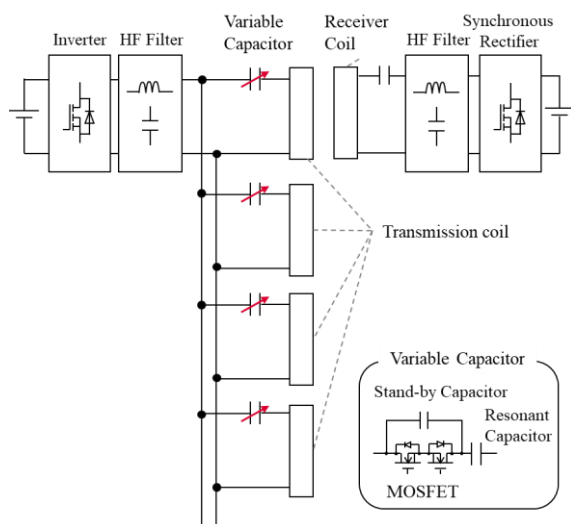


Fig.3 Proposed DWPT system configuration

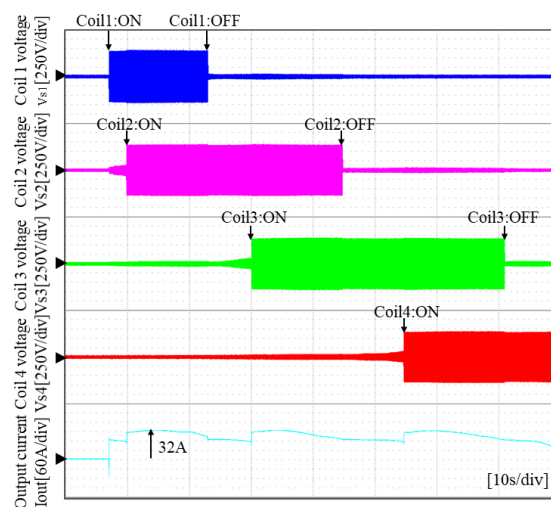


Fig.4 Experimental waveforms at automatic switching