



Wireless Charging System of Electric Bicycle via Microwave

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Wireless Power Transfer (WPT) via Microwave can be applied not only for wide-beam and weak powered battery-less sensors for IoT (Internet Of Things) but also narrow-beam and high power wireless charging system. We, Kyoto University, proposed and developed a wireless charging of an electric bicycle via microwave as shown in Fig.1. This system was developed by collaborative research with Kyoto University and Mitsubishi Heavy Industries, Ltd. 2.45GHz, 100W microwave power is transmitted to charge a parked electric bicycle.

Recently, there are a lot of inductive/resonance wireless charging systems of electric vehicle and electric bicycle in the world. The inductive/resonance wireless charging system is suitable for high power and high speed charging because its frequency is very low (<100kHz). But positing keeping of a transmitting coil and a receiving coil is required strictly to keep high efficiency because the transmitting coil and the receiving coil are electromagnetically coupled and circuit parameters, e.g. resonance frequency and impedance, is easy to be changed and its efficiency decreases when the position of the coils changes. The wireless charging system via microwave is an electromagnetically uncoupled system. There is no relationship between the transmitting/receiving antenna position and the circuit parameters. It is easy to keep high efficiency when the antenna position changes. To keep the high efficiency of the wireless charging system via microwave, target position detecting and beam forming of the microwave are important. In our system, we adopted the target position detecting and beam forming system and succeeded in keeping high efficiency. It is important for safety of the high power microwave. Additionally, we adopted human sensing system around the WPT system and the WPT system is very safety system.

Experiment of the WPT system is carried out in 'SandBox' (special permitted region for innovative technologies by Japanese government), in city hall in south of Kyoto prefecture from May 2017. In the SandBox, we measure not only system efficiency, error of wireless charging, and convenience of the system, but also coexistence of the other wireless communications and safety for human. We hope these ata will be used for future commercial WPT system via microwave.

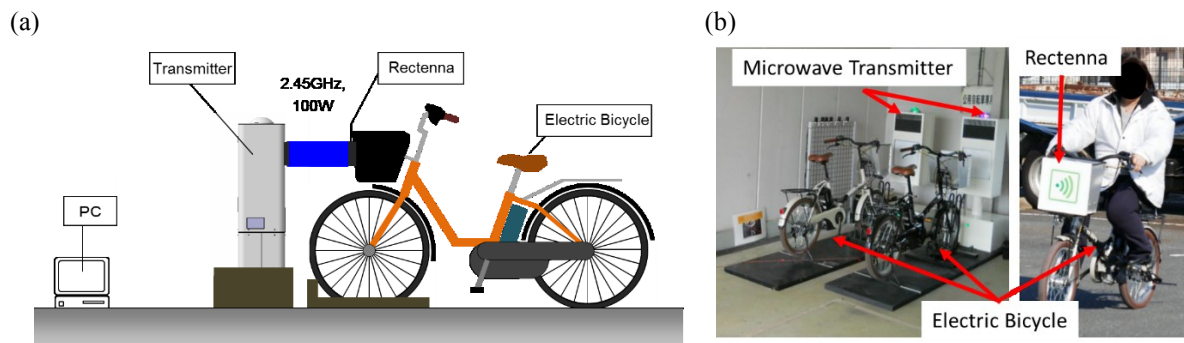


Figure 1. Wireless Charging System of Electric Bicycle via Microwave (a) System (b) Developed System

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