

High Efficiency 10kW Class Wireless Power Transfer by CPT -Increased Power Consumption of Electric Field Coupling Coupler-

Mitsuru Masuda Naoki Tsurutani Hiroyuki Yamazaki Hirokazu Takewaki

Furukawa Electric. Co., LTD.

5-1-9 Higashiyawata, Hiratsuka-shi, Kanagawa, 254-0016, Japan (E-mail: mitsuru.yhpe.masuda@furukawaelectric.com)

KEY WORDS: CPT , Capacitive Power Transfer, WPT, Wireless Power Transfer , Electric Field Coupling 10kW

Wireless power transmission, which can transmit and receive power energy without using electric wires, is expected to improve user convenience and create a new industry. The Qi standard using magnetic field coupling is installed in smartphones and wireless power transmission of about several watts. It is installed in many models in Japan. In addition, the task force of J2954 of US SAE has issued a standard of up to 11 kW for the North American automobile market. In this way, the development of wireless power transmission using magnetic field coupling has reached the commercialization stage and is approaching the popularization period. On the other hand, wireless power transmission using radiated electromagnetic fields such as radio waves and light is suitable for large power transmission. Although it is unsuitable, it is effective for power supply over long distances, so practical studies are underway to take advantage of this feature. However, the wireless power transmission method using an electric field is considered unsuitable for high-power transmission. In addition, research has not progressed because it has been thought that the transmission distance can only be transmitted over a short distance. In this report, it was demonstrated that 10kW class power transmission can be achieved by electric field coupling, and the efficiency between couplers can be as high as 95% or more. The coupler size is 480 mm x 480 mm x 70 mm.

Compared to magnetic field coupling, power transmission using electric field coupling is characterized in that the coupler section is lighter and can be configured with only inexpensive parts. However, frequencies that are three orders of magnitude higher than magnetic field coupling must be used. Therefore, at present, the disadvantage is that the efficiency of high-frequency power supplies is low. Currently, LD- MOSFETs that apply silicon semiconductor micromachining technology are used for high-frequency power supplies, but compound power semiconductors such as GaN and SiC have been put into practical use, and as their circuits are studied, lightweight and inexpensive systems will be developed. It is thought that it can be achieved.

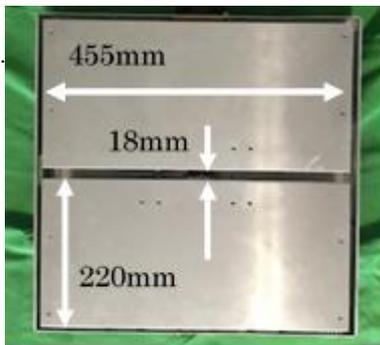


Fig1 Coupler Appearance Diagram

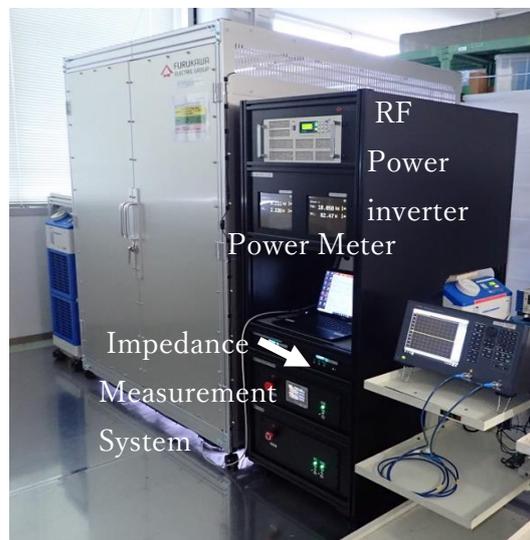


Fig 2 Mesurment System

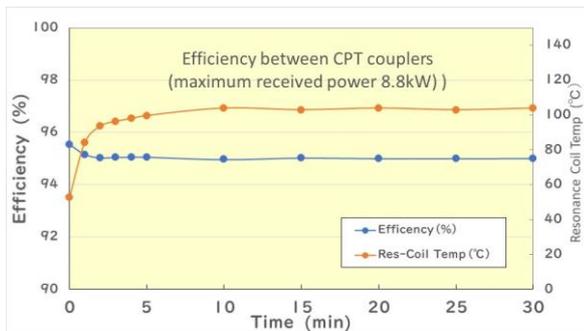


Fig 3 Efficiency CPT couplers and Resonant coil temperature.