Light-Weight and High-Efficiency Capacitive Coupling Wireless Power Transfer System for Drone Charging Stations

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Applications of drones are growing in a variety of scenes such as infrastructure inspection and parcel delivery. But the drone has a weak point i.e. the conventional drones are difficult to fly a long time and distance by the limitation of battery capacity. To extend their flight range, a drone highway concept was proposed [1]. Automatic battery charging stations using wireless power transfer (WPT) technique are emerging to realize this concept. As the WPT system to be borne onto the drone should keep weight light, it is not preferred to use heavy-weight circuit devices or electromagnetic shielding materials. Capacitive coupling WPT System is suitable for this application because the system does not need to have heavily weight ferrite cores or copper wire for coupling coils. Some experimental capacitive coupling WPT systems are already developed for a drone without battery onboard to show the reality of the WPT system [2, 3]. To bring it to the market, power efficiency and weight of circuit device on board are important. Therefore, we developed and optimized the system from the viewpoints of power efficiency and circuit device weight, and achieve 78% of power efficiency measured from DC input of class E inverter to DC load output, when the system transmits 380W DC power at 6.78MHz. The weight of the circuit devices on board, i.e. rectifiers and choke coils, is only 95g.

References


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