

Experiments of Microwave Power Transmission from an Airship

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Our research group successfully conducted the world's first experiments of microwave power transmission from an airship to the ground. The objectives of the experiments are simultaneous transmission of electricity and information, technical verification of miniaturizing a microwave transmitting system, remote control of the system, and demonstrations of wireless power supply to electronic devices. This microwave power transmission system will be available for emergency power supply to a disaster area, helping search and rescue operations by the simultaneous transmission of electricity and information, etc.

The experiment system consists of a microwave transmitting system, a microwave receiving system, a retro-directive system and a telemetry system. In the microwave transmitting system, a 2.46GHz microwave power of 220W is radiated from two elements of radial line slot antennas (RLSA) fed by phase-controlled magnetrons at a frequency of 2.46GHz and each output power of 110W. The microwave power is received by the microwave receiving system, which consists of a set of 7cm-square rectennas (rectenna = antenna + rectifier) to convert from the microwave power to dc power, a dc-dc converter, and electronic devices (electronic buzzers, LEDs and cell phones) which work by the dc power. The retro-directive system makes a microwave beam transmit to the direction of arrival of a 5.8GHz pilot signal sent from the ground. The telemetry system controls and monitors the microwave transmitting system which is commanded by a PC on the ground.

The experiments were conducted on the Uji ground, Kyoto University on March 5 and 10, 2009, as shown in Figure 1. An airship was launched at 33m altitude. The transmitting system was remotely operated from the ground. As soon as the transmitting system was turned on, electronic buzzers loudly sounded and LEDs brightly lit. We successfully demonstrated that an electronic buzzer and a LED worked by the wireless power supply from the airship with four rectenna elements, and that a cell phone charging system worked with twelve rectenna elements, the size of which is as large as A4 paper.

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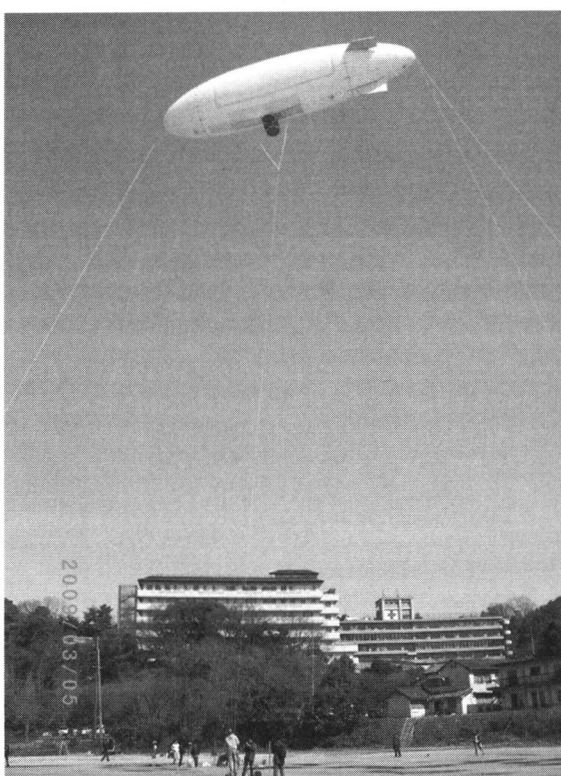


Figure 1. A photo of the experiment.