

DEVELOPMENT OF MICROWAVE POWER TRANSMISSION EQUIPMENT FOR SSPS RESEARCH FACILITY

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INTRODUCTION

Recently, the energy and environment are much interested in as the world wide problem. As one of the solution, SSPS is studied in order to obtain the ultimate clean energy. However, it is necessary to carry out the further study to launch SSPS into the real life. Kyoto University and Mitsubishi Heavy Industries, Ltd., contracting with Kyoto University, developed a test facility, called SPORTS5.8, in order to perform the basic research of wireless power transmission.

FEATURE OF TEST FACILITY

The Test facility consists of two microwave power transmission modules and rectennae for the receiving module. The pilot wireless equipment for retro-directive system is also provided. Both two transmission modules are operated in the band of 5.8GHz. However, the transmission power is different. One transmission module provides 9 magnetrons and 288 antennae, and they can generate the high-power microwave of 1.25kW. Moreover, all magnetrons are synchronized by the common standard microwave signal from the oscillator. Hence, the phase of radiated RF wave from the magnetrons can be controlled to be identical. Also, the phase can be varied by the digital phase shifter between oscillator and magnetron. So, this high power – phase variable transmitter is called PCM, Phase Controlled Magnetron (Fig.1).

The microwave of the other module is generated by the conventional semiconductor devices. Although the output power of the module is not so high, the phase of every 144 antenna can be separately varied. Hence, the radiated beam direction of the second module can be precisely controlled. Investing these two different modules could lead to the optimum power transmission system.

The receiving module consists of approximately 1500 rectenna components shown in Fig.2. Each rectenna provides the LED, and the operator can visually recognize the beam direction. Also, the A/D converter is provided in each rectenna, and this helps the numerical analysis of beam direction and its width. Furthermore, the microwave beam radiated from the transmission module can be controlled by the pilot signal. This signal is modulated by the unique spread-spectrum code and processed by the pilot wireless equipment. This pilot system is very useful in case of controlling the microwave beam from the Earth.

The basic research such as microwave beam control, power efficiency, and so on will be conducted by the above facility, SPORTS5.8.



Fig.1. Power Transmission Module with PCM



Fig.2. Power Receiving Module : Quasi-spherical shape

