

SPORTS : Space Power Radio Transmission System

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For SPS, many microwave power transmission (MPT) experiments were carried out in the world, especially in Japan. Some MPT experiments focused at high DC-RF-DC conversion efficiency. Some MPT experiments focused at electrically beam forming with active phased array. We need a MPT system both with high DC-RF-DC conversion efficiency and with electrically beam forming with active phased array for the SPS.

Our experimental group has developed and will develop MPT transmitters with Phase-Controlled Magnetrons (PCM). We call these MPT system "SPORTS (Space Power Radio Transmission System)". One is 2.45 GHz system developed in FY 2000 (SPORTS2.45) and the other is 5.8 GHz system developed in FY 2001 (SPORTS5.8). We designed these MPT system both with high DC-RF-DC conversion efficiency and with electrically beam forming with active phased array.

The SPORTS2.45 is composed of three sub-systems ; a solar cell - microwave transmitter sub-system, a near-field scanner, and a microwave receiver (rectenna array) (Fig). The solar cell - microwave transmitter sub-system is a active phased array with twelve PCM whose power source is solar cells. A Transmitting microwave power is 4 kW and a frequency is 2.45 GHz. The solar cell - microwave transmitter sub-system includes two antenna arrays. One is twelve horn antenna array with low power loss and narrow beam control area. The other is 96 antenna array with twelve 8-way power dividers and 96 phase shifters. We originally design the solar cell - microwave transmitter sub-system for a space MPT experiment.

The SPORTS5.8 is composed of several transmitting sub-system and rectenna array. We mainly use 9 PCM array with 8-way power dividers. It is easy to change a place of an antenna element to study random array. We also use parabolic array system with 3 parabolic antennas with 1-dimensional phased array. A revised PCM with PLL and low-loss power phase shifter system can be used for the SPORTS5.8. The SPORTS5.8 adopts a retro-directive system with a pilot signal modulated with Spread Spectrum. We also have a MPT system with 96 semi-conductor amplifiers and we can compare the both system, the PCM and the semi-conductor for the MPT.

We show the developed MPT systems and discuss targets for the MPT system for the SPS.

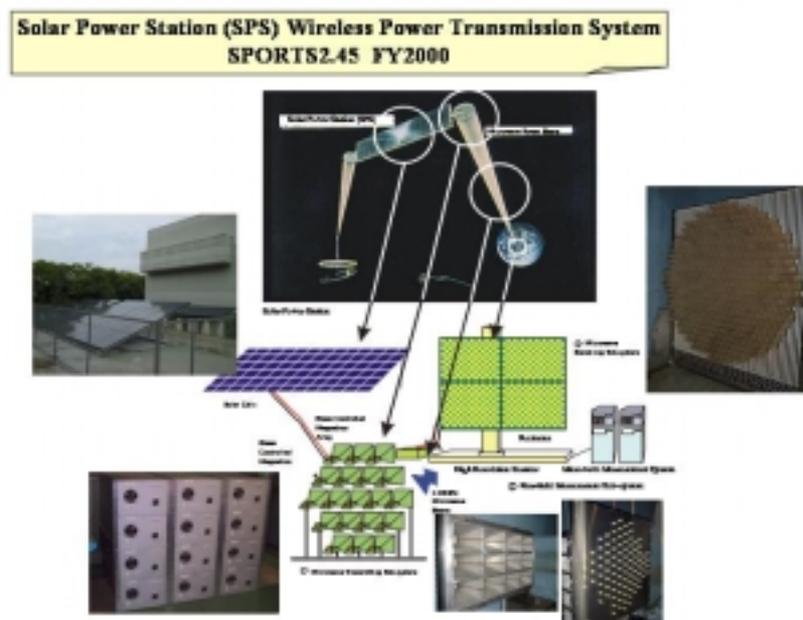


Fig. SPORTS2.45