Beam Steering in Active Integrated Antenna for Microwave Wireless Power Transmission

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Space Solar Power Satellite (SSPS) is very promising as one of the key technologies for creation of clean energy. In order to realize this project, some technical problems have to be solved such as precise beam control and high efficiency of power generation in the spacetenna. One of the technologies to solve these problems is to apply the active integrated antenna technique for small weight and multi-function. This paper reports a design method and experimental data from the active integrated antennas for SSPS as demonstration of a spatial power amplifier.

The active integrated antenna with the function of amplification demonstrated here consists of the input slot antenna, an FET amplifier and the output patch antenna. The slot-microstrip line transition for the incidental wave capture and the digged patch-microstrip line for the amplified and phase-controlled signal radiation was attained with 50 ? base. The gain of the FET amplifier was designed with 15 dB. The design was done with a commercial available CAD (Agilent-Eesof: ADS & Momentam). Figure 1 shows the configuration of the active integrated amplifier antenna.

The incident wave with the perpendicular polarization was radiated from the planar antenna operated at 5.8 GHz. The active integrated amplifier antenna received this signal and amplified with about 10 dB. After the signal was amplified, the polarization was changed and radiated from the patch antenna with vertical polarization. In order to obtain a stable operation condition, a chip capacitor was attached in one of stabs of the FET amplifier. Under this condition, the antenna pattern was measured with the change of bias voltages. Beam steering with 5 degrees was achieved which was shown in Fig. 2.

For microwave power transmission in the SSPS system, the application of the active integrated antenna technique was demonstrated. By changing the bias voltages, the beam was steered slightly. More steering angle was expected by adding the voltage control reactance device.

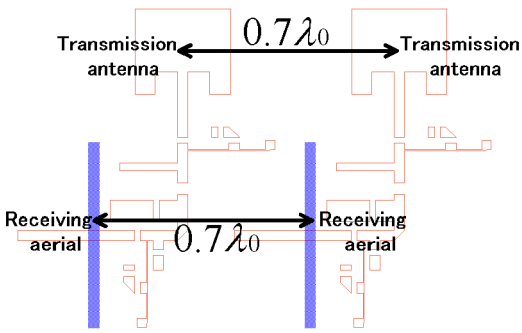

Fig.1:Configuration

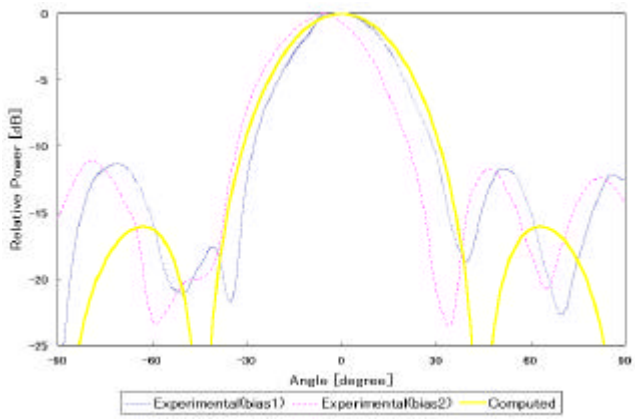

Fig.2:Measured Antenna patterns