ABSTRACTS (MASTER THESIS)

Study on Antennas Appropriate for Low-Power Rectennas in Microwave Power Transmission

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In recent years, microwave power transmission has drawn our attention, which can be used in low power driving devices aiming at battery free. However, the starting voltage of a diode leads to the RF-DC conversion inefficiency of a low input rectenna. Through prior research, some methods were used to improve the RF-DC conversion efficiency by enhancing the applied voltage to a diode. We proposed two methods; one was to improve the impedance of the rectenna and the other was to design the high Q value antenna. In the first place, we investigated the characteristics of various antennas. Then we chose patch antennas to do the following research because they were easy to be manufactured and had a high directional gain. After that, we discussed the efficiency of low-power rectennas with high impedance. To begin with, we used ADS simulator to do the simulations of the rectifying circuits with characteristic impedance between 50 ohm and 400 ohm. We proved that the efficiency of the rectifying circuit can be improved by raising characteristic impedance. Then, we fabricated the rectifying circuits whose characteristic impedance was 50 ohm, 70 ohm, 80 ohm, 90 ohm and 100 ohm, respectively, as shown in Figure 1. From measurement results, we obtained the highest efficiency at the impedance of 80 ohm, the efficiency of which was 13% higher than the conventional 50 ohm rectifying circuit. Then we designed the high impedance patch antennas. When the impedance improved, the characteristics of antennas were almost the same. Consequently, we will connect the high impedance antenna with a diode directly to improve the voltage of the diode moreover in the future. Next, we measured efficiency of low-power rectenna with high Q value. We used two measuring systems. In one measuring system, we obtained higher conversion efficiency with a low Q value antenna, but which had a small reflection loss. In the other measuring system, we obtained the same conversion efficiency of all species. Then we analyzed the reason to find out only the series resonance circuit can obtained a high voltage when the resistance was settled in the circuit. To design a series resonance circuit with high Q value will be a future problem.

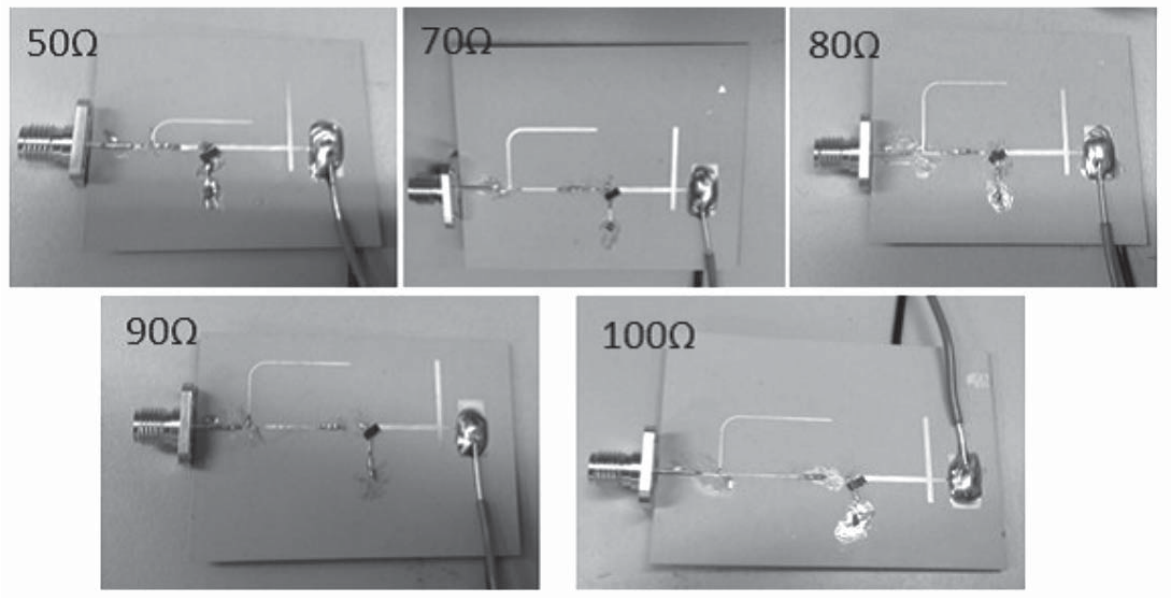

Figure 1. Rectifying circuits with various characteristic impedances.