

A Compact Transmitter and a Dual-Polarized Rectenna Array for Low-Power Microwave Wireless Power Transmission

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A compact rectenna for microwave wireless power transmission system with dual polarization at S band is presented. The microwave wireless power transmission system consists of a voltage-controlled oscillator, a power amplifier, and a dual-polarized rectenna array. The transmitter includes a voltage-controlled oscillator with a power amplifier, which has an output power of 1 watt at 2.45 GHz. Its dc power supply is 5 V from a universal type-C port, which enable the transmitter easily be used in our daily life. A conventional mono-pole antenna is applied to transmitting microwave power.

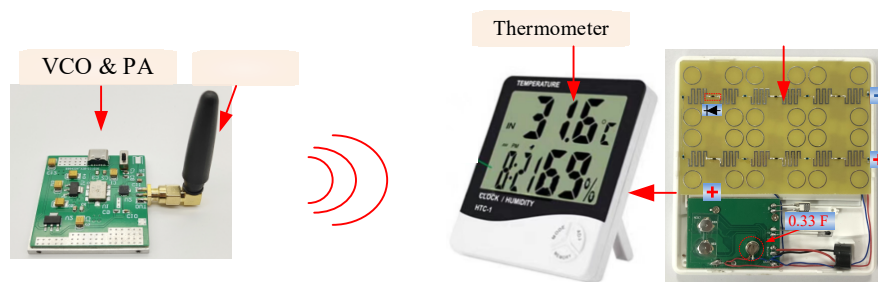


Figure 1. Compact transmitter with a voltage-controlled oscillator and a power amplifier, and rectenna array with dual-polarization.

Meander-line dipole antennas are applied to build a rectenna. The rectenna eliminating the impedance matching network between a dipole antenna and a Schottky diode to be compact. The meander-line structure design is a valid method to improve the antenna input impedance as well as reduce its size to build a compact rectenna. Some conductor circles are introduced to tune the impedance of a meander-line dipole antenna so as to realize conjugate impedance matching with the Schottky diode. The measured maximum efficiency of the rectenna is 60 % at -2.5 dBm microwave input power level.

The rectenna array is from rectennas with vertical polarizations, while rectennas are connected in series to form a dc power combining. Thus, it is realized a dual-polarized microwave energy harvesting rectenna. The proposed rectenna array has been integrated into a digital thermometer without damaging it. All rectennas are put into the spare space inside the thermometer. A demonstration system is shown in Figure 1. The commercial digital thermometer is successfully powered by the proposed compact microwave transmitter, showing a bright prospect for microwave wireless power transmission applications.

References

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