A Printed Rectenna with Data Communication Function

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Abstract: With the development of wireless communication, wireless sensors, radio frequency identification and portable electrical devices, microwave power transmission technology was supposed to be used as a "wireless battery" to supply power for these devices. The "wireless battery" is named as a rectenna, which receives microwave and convert it into dc power. The two major components of a rectenna are a rectifying circuit and a receiving antenna. A rectifying circuit is composed of a rectifying diode, an input and output matching networks, a bandpass or lowpass filter, and a dc-pass filter. A receiving antenna with harmonic suppression can omit the need for a filter and allows for miniaturizing the rectenna. The conversion efficiency can reach 80% when a Schottky diode receives a high input power of 100mW [1]. However, high power density may exceed security standards [2]. It is therefore necessary to investigate the high mw-dc conversion efficiency approach with a low input power condition for a Schottky diode. Such electrical devices are usually used in communication systems.

Considering the demands of safe standards for data communications, this work designs a printed microstrip rectenna under the condition of low input power for the rectifying circuits. An aperture-coupled dual polarization patch is utilized as the receiving antenna. The vertical feed port receives the microwave and transfers it to the rectifying circuit for dc power generation while the horizontal feed port is used for data communication with high isolation between the two ports. The double layer-structure of this patch antenna has harmonic suppression function. The input power for the rectifying circuit is limited to 10mW, such that the security standards of low power density are easily achievable. The simulated and measured conversion efficiency is 81% and 63%, respectively.

Keywords: rectennas, microwave power transmission (MPT), conversion efficiency, data communications

References:

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