Chapter 6
Efficient Rectenna Circuit for Wireless Power Transmission

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ABSTRACT

Wireless power transmission is the transmission of electrical energy without using any conductor or wire. It is useful to transfer electrical energy to those places where it is hard to transmit energy using conventional wires. In this chapter, the authors designed and implemented a wireless power transfer system using the basics of radio frequency energy harvesting. Numerical data are presented for power transfer efficiency of rectenna. From the simulated results, it is clear that the anticipated antenna has single band having resonant frequency 2.1 GHz. The anticipated antenna has impedance bandwidth of 62.29% for single band. The rectenna has maximum efficiency of 60% at 2.1 GHz. The maximum voltage obtained by DC-DC converter is 4V at resonant frequency.

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INTRODUCTION

For converting electromagnetic energy (AC) into direct current (DC) power or electricity a special type of antenna i.e. rectifying antenna is used for the task. Rectenna transmit the energy or power by radio waves in wireless power transmissions. A Rectenna element consists of an antenna with an RF diode connected across the elements (Tesla, 1905, pp. 21-24; Crawford, 2005; Naresh and Singh, 2017a). The diode works on forward bias to rectify the AC energy induced in the antenna by the microwaves, to generate DC power, in which power was delivered at the load. Schottky diodes are frequently used because they have the lowest voltage fall and maximum speed and therefore have the lowest energy losses due to transfer and switching (Naresh and Singh, 2017b; Dickson, 2013, pp. 36-47; Naresh, Singh, Bhargavi, n.d., --. 131-138; Parviz, 2009, pp. 36-41).

Recently energy harvesting was the main focus of the research community. There are various sources of power that energy harvesting can gain from. Micro strip patch antennas have been an vast topic for study due to its better configuration which comprises of fine structure, smaller size and lesser weight and more economical. Wireless power transmission holds reliable criteria for future work in generating the electricity for charging mobile wirelessly, as there is no such requirement in placing the cell phones at a very shorter distance to the sockets due to the shorter length of the cable as compared to those of area covered by the wireless field (Warneke, 2001, pp. 44-51; Glaser, 1968, pp. 857-861; Shinohara, 200; Dobkin and Weigand, 2007, pp. 170-190; Brown, 1964, pp. 8-17).

RECTENNA CIRCUIT

High density integration technologies have provided immigration from mobile to wearable in information communication system in recent times. In this paper, an anticipated antenna is simulated using slotting techniques on a PCB. They are mostly used at microwave frequencies. A microstrip patch antenna can be a type of metal foil of different design on the face of a PCB, with a ground plane on the other side of the PCB. Microstrip patch antennas have turn into well-liked in modern times by reason of their low weight low shape conformability, easy and cheap realization. The simulations were carried out