Chapter 11
Missile Structured Wearable Antenna for Power Harvesting Application

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ABSTRACT

In this chapter, a single element of wearable antenna is designed, and further, to enhance the gain, a wearable rectenna array is designed that can be utilized for the purpose of energy harvesting at 3.14 GHz. The theoretical analysis of received power has been studied. The anticipated antenna array shows the directivity of 8.048 dBi that was used to calculate received power by antenna array at the distance of 10 meters from transmitter. This rectenna array can be used to operate the micro-electronic gadgets and to operate small sensors.

DOI: 10.4018/978-1-5225-9683-7.ch011

INTRODUCTION

Many Industries create some impact on wearable devices. At present time it is the need to keep our self hands free and wireless so the wearable antenna as rectenna fulfills such type of requirement. Wearable rectenna can be the source of a small amount of power to operate some devices like sensors. It is easily wearable and flexible in nature that can be used to harvest the energy. Electromagnetic wave which have high frequency in Gigahertz associated with some amount of energy at the particular frequency so this energy can easily captured by the anticipated antenna and then it is used to operate the device which required the small amount of power (Electronic, 2008; ECC, 2007; Chaudhary, Kim, Jeong and Yoon, 2012).

Here specific transmission frequency is used. There is some standard level of frequency exist in our surrounding like mobile communication frequency range, Bluetooth frequency, radiolocation frequency and at this particular frequency, some amount of power density is available in the environment so we can design the wearable antenna that can operated at particular frequency which able to receive the power and used to operate some microelectronic equipment and gadgets. When the single antenna is to be used, it have some gain in dBm (Decibel milli) but to increase its gain, the combination of multiple antenna is used this arrangement called rectenna array (Naresh and Singh, 2017a; Naresh and Singh, 2017b; Hameed and Kambiz, 2017; Wang, Li, Xu, Bai, Liu, and Shi, 2013; Naresh, Singh, Bhargavi, Garg and Bhoi, 2018a). So here antenna array is designed which have larger gain as compared to single antenna which is operated at four resonant frequency. In this chapter the theoretical analysis is occurred only for 3.14 GHz frequency. According to Federal communication commission (FCC) the range of 3.1 GHz to 3.4 GHz is to be used for radiolocation purpose.

Background

Rectenna is the part of wireless power transmission. The demonstration of wireless power transmission was performed by NASA (National aeronautics and space administration) in 1975. In this demonstration 34000 watts of power was safely transmitted over the 1.5 Km range. In that transmission system, 26 meter long antenna with the 0.5 Megawatt transmitters was used. At that demonstration the large amount of energy was transmitted through antenna this cause the huge radiation so such type of system cannot be established