

## Chapter 4

# A Diamond Cut Leather Substrate Antenna for BAN (Body Area Network) Application

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### **ABSTRACT**

*In this chapter, a diamond cut shape antenna has been simulated under CST software using twisting material (i.e., leather). The dielectric constant of leather material is 1.655. For antenna to be twist, leather substrate is used. The return loss of this newly design diamond cut shaped antenna is -35 dB at 5.5467 GHz resonant frequency. This type of antenna can be useful in BAN (body area network) applications. In this chapter, simulated results like return loss graph, 3-D pattern, and polar plot are presented.*

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## **INTRODUCTION**

The simulation of leather antenna can be done in three steps. Firstly, we have to make a ground of copper material having dimensions on x-axis and y-axis. Secondly, after the ground, substrate is imposed on it having some dimensions and lastly patch is designed on leather substrate with copper material (Lemey et al., 2014; Saxena, 2019; Saxena & Khare, 2019; Saxena et al., 2019; Van Torre et al., 2010).

In the town, after a complicated multiple reflection or scattering effect, the polarization of the propagating radio wave may change significantly. These are used in high performance aircrafts, radar, missiles and other spacecraft (Lui et al., 2013; Saxena, Singh, Mohini et al, 2018; Saxena & Singh, 2018a; Saxena & Singh, 2018b; Singh et al., 2018; Singh & Saxena, 2018).

It has many advantages such as its light weight, simple structure, ease of addition and less cost. Microstrip antenna requires very less space for installation as these are simple and small in size. The only space these need is the gap for feed line which is placed at the back of the ground plane (Agilent, 2005; Roundy, 2003; Saxena, Singh, Kumar et al, 2018; Saxena & Singh, 2019a; Saxena & Singh, 2019b).

There are a variety of methods for enhancing the bandwidth of microstrip antenna by expands the material depth, utilizing low dielectric material, using numerous feeding techniques and impedance matching (Shukla et al., 2015).

Both the bandwidth and the thickness of the antenna is contradictory assets i.e. enhancement in bandwidth increases the size & thickness of presented antenna (Hall & Hao, 2006).

## **DESIGN CONFIGURATION OF PRESENTED ANTENNA**

The design of Diamond cut leather antenna and ground is shown in figure 1. The dimension ground made by copper is 60 x 60 mm having 0.0038 mm height. A patch square is designed on leather substrate with different diamond cut. The height of leather antenna is 2 mm. Table 1 shows the various parameters of presented antenna.

## **RESULTS AND DISCUSSION**

After simulating the diamond cut shape leather antenna various results are generated and shown in figure given below. Figure 2 shows the return loss Vs frequency graph in which 5.5467 GHz resonant frequency is generated. Figure 3 shows the radiation pattern in 3-D format of presented antenna in which around 6.382 directivity is generated on 5.567 GHz resonant frequency. Also Figure 4 shows the radiation

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