Chapter 6
Design of a Practical Miniaturized Antenna to Support IoT Applications

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ABSTRACT

The term "Internet of Things (IoT)" was coined at the start of this century when work was done on MIT Auto-ID Centre to make a smart identification technology, which would help to reduce the error rate, subsequently increasing efficiency. But since then, the concept of IoT has evolved rapidly in various ways, as now with the help of this huge number of small networks which can remain connected to one another and can directly communicate with the main network without any human interaction. In this chapter, the investigation has been carried out to design a printed monopole antenna, which is basically a printed microstrip rectangular patch to support such IoT devices. The proposed antenna was designed and simulated using CST MWS, which shows that the antenna is working effectively in the triple band of frequency. The proposed antenna has the capability to work in the range of 2.4 GHz to 6.9 GHz. The miniature size of the antenna makes it suitable for wireless IoT applications.

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INTRODUCTION

The FCC has now approved LTE-U just recently, which is the LTE specification for unlicensed frequency spectrum. Using this technology small-scale coverage could be deployed and connectivity improved in rural areas. The LTE-U base stations utilize the 5GHz band in which Wi-Fi also resides in. Only the biggest corporations are competing with one another for exclusive rights to the licensed spectrum. However, with the advent of latest technological advancements, Nowadays even smaller start-ups are competing in the unlicensed spectrum. The extensive usage of data every year poses problem to the providers makes it difficult for them to continue expanding their expensive licensed networks. On the other hand, the IoT devices does not need such expensive or long distance spectrum (Deshpande,2017),(Amin,2016) and they can simply work well with mesh networking technology utilizing the unlicensed spectrum effectively and cheaply. Antennas can be designed to radiate in these unlicensed spectrum. Of all the available structures, the micro strip patch antenna is promising because of its size and ease of fabrication in printed circuit boards, which can well along, go with IoT devices. (Deshpande,2017)(Amin,2016)

Microstrip antennas can be designed in variety of forms like as such dipole, slot, TWT structure or a simple patch designed based on the specific application demands. Microstrip antennas are more preferred and researched due to their following inherent advantages (GirishKumar,2002), (Swathy, 2015).

- Simple geometric profile.
- Less weight.
- Compatibility to design with different substrates.
- Low cost.
- Integration capability with other circuits.
- Versatility.

However, basic forms of Microstrip patch antennas also suffer from some drawbacks such as narrow bandwidth, poor polarization, low radiation efficiency, less power capability. Microstrip patch antennas are one of the most basic and important types of planar antenna. The most concepts and techniques used with microstrip patch antennas can be directly implied to design other planar antenna structures. In this chapter, the basic features of these antennas are reviewed. The design of a rectangular patch antenna is dealt and after which broadband improvement techniques are described briefly. These techniques could be implemented also to other planar antennas. Lastly, a practical design procedure for a broadband slotted antenna for IOT application(Amin,2016)is given as an example.