

# Chapter 12

## Antenna Design and Analysis for Narrow Band Internet of Things Applications

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### **ABSTRACT**

*One of the standards in wireless communication is Narrowband IoT. It deals with low power, small gain, and more life expectancy. The connectivity problem is reduced in narrowband design. This is achieved with microstrip antenna. Single patch is designed with the selected dielectric substrate. Several parameters are considered for the antenna design. The high value of dielectric constant reduces bandwidth in smaller patch for internet of things (IoT) design applications. These applications require gadgets for operating in licensed band of frequencies with less data rate and required antenna efficiency. When compared to dielectric, FR4 is a commonly available substrate and useful in smaller patches. In this chapter, two antennas are presented. The antennas were simulated in IE3D software and analyzed for Narrowband IoT (NB-IoT) with 100 MHz.*

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## **INTRODUCTION**

The 5G technology includes and makes growing the projects like internet of things, vehicular communication, smart city systems, e-health maintenance systems. The following devices use antenna for various applications. Wireless networking devices, such as wireless routers, smart phones, laptops, tablets, and hotspots, have receiving and transmitting antennas. The transmitting antenna radiates waves and receiving antennas pick up on the EM waves containing packets of information and convert them into electrical signals for the device to process.

Internet of Things is meant as an infinitude of connected devices and small sensors, integrated in a bigger network with a permanent access to the user. One of its major application is in the Smart home concept, allowing more convenience, efficiency (at various aspects) and safety. With more and more devices, it is nowadays mandatory for these devices to be small, low-power and at the same time more capable and efficient. In this chapter, antennas for narrowband applications is discussed and proposed two design for IoT devices, developed for GHz band and presenting bandwidth according to the growing needs of wireless IoT networks.

With this objectives, the antenna design for industry required, is presented in this chapter. The introduction to antenna designed for IoT applications of some researchers literature is reviewed and presented in the following section.

## **BACKGROUND**

From the earlier researchers, this short literature review is presented about the Narrowband antennas. Marcos V. T. Heckler et al (2009) in his paper presented a microstrip antenna array developed for a robust receiver in navigation applications to suppress out-of-band interference and the array has been designed to operate in a Narrowband. Y. Wang et al (2013) achieved ultra-wideband/Narrowband results in dielectric resonator antenna by integrating it. S. M. Abbas et al (2015) given antennas design with narrowband and ultra wideband of modes by using reconfigurability.

Tiago Varum et al (2018) proposed antenna for Internet of Things devices at 17 GHz frequency. This antenna has reduced dimensions, ideal to be integrated in most of IoT sensors.

Albert Sabban (2019) presented the SRR antennas characteristics such as length, resonant frequency, gain, directivity used for wearable antennas with SRR on human body may be shifted by 2–5%. Adewale Ayomikun Elijah et al (2020) proposed microstrip antenna for IoT application by miniaturization technique.

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