Chapter One

Introduction

1.1 Overview:

Now days, several devices is equipped with two or three radio interfaces i.e. WiFi, Bluetooth and 4G. In the future this number may increase dramatically due to the wide range of applications that users are needed with minimum cost and under optimum conditions i.e. data rate and energy efficiency [1]. WiFi has dramatically increased productivity and convenience. Today, there are nearly pervasive WiFi that delivers the high-speed Wireless Local Area Network (WLAN) connectivity to millions of offices, homes, and public locations, such as hotels, cafés, and airports. The integration of WiFi into notebooks, handhelds and Consumer Electronics (CE) devices has accelerated the adoption of WiFi to the point where it is nearly a default feature in these devices.

Together, the 4G (i.e. WiMAX and LTE) and the WiFi are ideal partners for service providers to deliver convenient and affordable mobile broadband Internet services in more places [2]. Both are open IEEE wireless standards built from the ground up for Internet Protocol (IP)-based applications and services. IEEE 802.11 has accelerated the network deployment for providing high transmission rate in limited geographical coverage, while IEEE 802.16 offers more flexibility while maintaining the technology data rate and transmission range [3].

However, both techniques have their own sets of advantages and disadvantages. On the one hand, WiFi may offer a high data rate (up to 500Mb/s is envisaged), but its power is limited due to the use of unlicensed band and are therefore much more confined in 4 coverage, while on the other hand, even though 4G (i.e. WiMAX and LTE) is data rate limited (up to 70Mb/s fixed), it can provide extensive coverage much like the cellular systems [4].

A multiband antenna may have lower than average gain or may be physically larger in compensation. Many types of antenna will be examined i.e. microstrip patch, dipole/monopole, fractical, array planar antennae, etc. The optimization of the positions of the slots and shorting strips for the microstrip antenna is one of the

challenges that should be optimized and evaluated carefully. Microstrip has been designed in many shapes i.e. H, F, T and many other shapes.

The reconfigurable multiband antenna design is base on the specifications of the wireless transceivers. The advantage of using a reconfigurable antenna is to operate in multiband where the total antenna volume can be reused and therefore the overall size can be reduced. Moreover, the future of cell phones and other personal mobile devices require compact multiband antennas and smart antennas with reconfigurable features[17].

1.2 Problem Statement

In heterogeneous transceivers where two or three radios are build the same chip; this proximity may cause a harmful interference which may lead to reduce the signal to noise ratio (SNR) in both radios [6]. This interference also reduces the efficiency of the transceiver dramatically when the numbers of users increase. As worst case one of the radios may totally stop working if the power of the other radio is quite high i.e. WiMAX-fixed with WiFi. Proposed solution by using dual band reconfigurable antenna improves the heterogeneous interference problem considerably as the RF radios will be fit through the same antenna, where one of the radios (band) will give very high input impedance ($Z_{in} \sim \infty$) while the input impedance for the other port will be zero ($Z_{in} \sim 0$).

1.3 Aim and Objectives:

The main aim of this project is design high gain and evaluates the performance of reconfigurable dual band antenna for broadband applications.

The main objectives of this project are:

1- To investigate the problem of dual band antenna using microstrip chip.
2- To design a multi dimensional antenna for dual band for WiMax /and WiFi respectively.
3- To develop dual band antenna to reconfigurable dual band antenna using switching technology.

4- To analysis through simulation the performance of the proposed antenna.
5- To manufacture the reconfigurable dual band antenna using PCB.

1.4 Thesis Outline:

The thesis was divided into:

Chapter (2): This chapter briefly discusses the main concepts of the microstrip patch antenna and literature review for reconfigurable dual band microstrip antenna.

Chapter (3): This chapter introduces design of rectangular microstrip antenna; slots design and calculate all parameters of proposed antenna.

Chapter (4): This chapter discussed simulates and analyze results for the antenna performances.

Chapter (5): Conclusion and future works are included in this chapter.