INTRODUCTION

Emergence of cell phones and mobiles has revolutionized the field of communication covering every corner of the world. Microwave is at the core of the wireless communication system, which uses different types of antennas. Antenna is the port through which Radio Frequency (RF) energy is coupled from the transmitter to the outside world and in reverse, to the receiver from the outside world. In recent years, the limitations of broadcast antenna technology on the quality, capacity, and coverage of wireless systems have prompted an evolution in the fundamental design and role of the antenna in a wireless communication system. There are many types of antennas depending upon the performance, shapes, sizes, volumes and costs. However, user’s needs compact, small in size and cost effective models of antennas. As Microstrip antenna is visualized to serve this purpose effectively, it motivates us to select this area for our research work.

Microstrip antennas are often referred as patch antennas because of the radiating elements photo etched on the dielectric substrate. This radiating patch may be square, rectangular, circular, elliptical and triangular or have any other configuration discussed latter. Microstrip patch antennas inherently have a narrow bandwidth. The bandwidth enhancement is usually necessary for many practical applications. In wireless communication system smaller antenna sizes are essential to meet the need of miniaturization. Thus, size reduction and bandwidth enhancement are becoming major design considerations for practical applications of Microstrip patch antennas. For this reason, study to achieve compact and broadband operations of Microstrip antennas is highly desirable. Because of the unique properties, Microstrip technology is often used to manufacture small internal antennas for portable terminals as well as antenna arrays for base stations. It also seems to be a very promising technology for multi system antennas, for which there is an ever-growing demand. Microstrip patch antennas are low profile, conformable to planar and non planar surfaces, simple and inexpensive to manufacture using modern printed circuit technology. It is also possible to design mechanically robust antennas mounted on rigid surfaces, compatible with specific designs with particular patch shape and mode. These antennas are selected they are very versatile in terms of resonant frequency, polarization, pattern and
impedance. The antennas built with Microstrip patch elements exhibit better orthogonality over the desired coverage area and hence promote improved system performance compared to antennas that use dipole elements.

In telecommunications there are several types of Microstrip patch antennas (also known as printed antennas). A patch antenna is a narrowband, wide-beam antenna fabricated by etching the antenna element pattern in metal trace bonded to an insulating substrate. Because such antennas have a very low profile, are mechanically rugged and can be conformable, they are often mounted on the exterior of aircraft and spacecraft, or are incorporated into mobile communications devices. Few samples shapes of Microstrip patch antennas used in wireless communication system are as shown in Figure 1.

![Typical shapes of Microstrip patch antennas](image)

Figure 1: Typical shapes of Microstrip patch antennas

The resonant frequency of such various shapes of antennas for wireless communications must be determined with precision because they operate in a very narrow bandwidth. Therefore, during the fabrication process of such kind of antennas, experimental data of the same class can preliminary be used to estimate the resonance frequency, reducing the number of real prototypes to be constructed ultimately saves the time and resources.
Microstrip patch antennas are relatively inexpensive to manufacture and design because of the simple two-dimensional physical geometry. They are usually employed at Ultra High Frequency (UHF). Various wireless applications and their frequency band along with bandwidth are as shown in Table 1. These applications include Global System for Mobile (GSM), International Mobile Telecommunications (IMT), Wireless Local Area Network (WLAN), Bluetooth and Worldwide Interoperability for Microwave Access (Wi-MAX).

**Summary of the features of Microstrip patch antennas are as follows:**

1. Lightweight, small volume and a low-profile planar configuration
2. Can be made conformal to the host surface
3. Ease of mass production using printed-circuit technology that leads to a low fabrication cost
4. Easier to integrate with other monolithic integrated circuits on the same substrate
5. Allows both linear polarization and circular polarization
6. Can be made compact for use in wireless communication
7. Allow for dual- and triple-frequency operations

Examples of applications of microstrip patch antennas:

1. Telemetry and communications on missiles
2. Radar altimeters
3. Aircraft-related applications
4. Telephone and satellite communications
5. Smart weapon systems
6. Global system for mobile communication (GSM)
7. Global positioning system (GPS)