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ANALYSIS OF UWB BASED ANTENNA FOR WIRELESS COMMUNICATION

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Abstract:
Ultra-wideband wireless communications techniques have many merits, including an extremely simple radio that inherently leads to low-cost design, large processing gain for robust operations in the presence of narrowband interference, covert operations, and fine time resolution for accurate position sensing. However, there are a number of challenges in UWB receiver design, such as capturing multipath energy, inter symbol interference especially in a non-line-of-sight environment, and the need for high-sampling-rate analog-to-digital converters. Microstrip Patch antenna (MPA) provides low profile and low volume, so it is use in a now a days communication devices. In this paper study of past few year shows that most of labour on MPA is targeted on planning compact sized microstrip antenna. A novel ultra-wideband printed monopole antenna can be used in wireless communication devices.

Keywords: *UWB; Microstrip Patch Antenna; Operating Frequency; Communication Devices.*

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1. Introduction

An antenna is used for both transmitting and receiving the information so it is the essential part of the microwave communication. It is a device that is made to efficiently radiate and receive the radiated electromagnetic waves. Antenna is a transducer which converts the voltage and current on a transmission line into an electromagnetic field in a space, consisting of an electric and magnetic field travelling right angles at each other. In microwave imaging systems, over the full operative band one of key issues is that the style of a compact antenna whereas providing wideband characteristic. It is a well-known incontrovertible fact that placoid monopole antennas physical options, like easy structure, little size and low price present very appealing. Consequently, variety of planner monopoles with totally different geometrics are through an automatic style strategies and experiment characterized have been developed to attain the optimum placoid form. With the event of band wireless communication systems, ultra wide band (UWB) systems have been increasing quickly. The Federal Communications Commission allotted the wave band 3.1~10.6 GHz for the UWB services. These UWB systems have been used for radiolocation applications, localization, information communications etc. The antennas of UWB systems area unit embedded into these transmission devices, the house networking

system is wide utilized in transmission devices like HDTV's, DVD's, cameras and private computers through the UWB service channels. The most commonly employed microstrip patch antenna is a rectangular patch. The rectangular patch antenna is approximately a one wavelength long section of rectangular microstrip transmission line. Microstrip resonators will be classified into two sorts counting on the length and width of antennas. Resonators with a slim conductor known as microstrip dipole and resonators with a large conductor are referred to as microstrip patch. When the signal frequency is within the section of a resonance, a microstrip resonator radiate comparatively broad beam, broadside to the plane of the substrate. A serious a part of the sign participates in radiation and so the resonator acts as an antenna. Since patch dimensions should be of the order of a radio-controlled wavelength, its directivity is extremely low as an example, a half-wavelength dipole generally features a gain of regarding 5-6 db. and beam width between 70 and 90 degrees. The design of a microstrip antenna begins by deciding used for the antenna so the size of the patch. Due to the fringing fields on the radiating edges of the antenna there's a line extension related to the patch. The basic structure of the microstrip patch antenna design is shown in fig.1 [3]

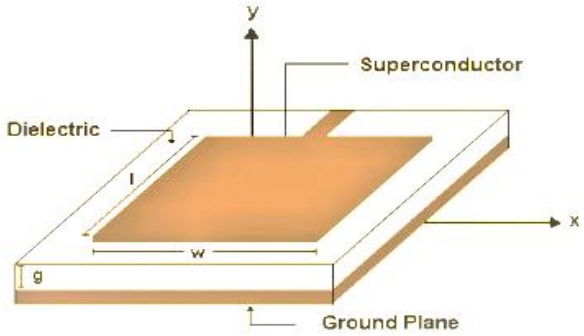

Figure 1: Basic structure of the Microstrip patch

Different shapes of microstrip antenna is shown on fig.2 [3]

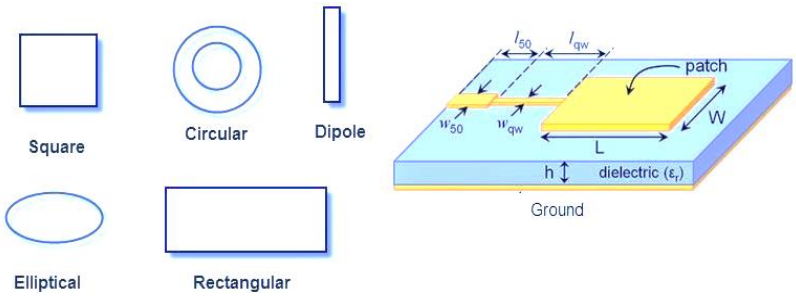

Figure 2: Different shapes of Microstrip Antennas

2. Literature Review

The construction of microstrip patch antenna with conducting patch on a ground plane separated by insulator substrate was undeveloped till the revolution in electronic circuit shrinking and large-scale integration in 1970. After that several mortal have drawn the radiation from very

cheap plane by an insulator substrate for numerous configurations. Various mathematical analysis models were developed for this antenna and its applications were extended to several numerous fields. Nasser Ojaroudi [1] has proposed a compact with multi-resonance characteristics UWB/Omni-Directional Microstrip Monopole Antenna with multi-resonance characteristic has been projected for microwave imaging systems leads to compact antenna with smart omni-directional radiation characteristics for projected in operating frequencies. The fictious antenna satisfies the VSWR. The size of the antenna is obtained through parametric analysis. As the designed antenna meets the requirements of GSM application, it could be highly useful for mobile application, design and Analysis of Microstrip Patch antenna for GSM application is presented. Antenna parameters such as Return Loss, VSWR of the designed antennas are -29.21dB, 1.0717 respectively Design of Rectangular Microstrip Patch Antenna Using Particle Swarm Optimization is shown here. In this Particle swarm optimization is a popular optimization algorithm used for the design of microstrip patch antenna. The paper presented design using soft computing technique, particle swarm optimization (PSO) of probe fed rectangular microstrip patch antenna for WCDMA.A Compact Printed Monopole Antenna (PMA) for Dual-band RFID and WLAN Applications.From 9-shaped folded antenna, dual-band operation is achieved which is printed on a non-conductor backed dielectric. Impedance bandwidth 33.13% at 2.43 GHz and 36.43% at 2.43GHz is measured of the PMA.

3. Antenna Design Parameters

There are three essential parameters for design of a rectangular Microstrip Patch Antenna. Firstly, the resonant frequency (f_0) of the antenna must be selected appropriately. The frequency range for ultra wide band applications is 3.1 to 10.6 GHz and the design antenna must be able to operate within this frequency range. Second important parameter of antenna is substrate thickness. The height of dielectric substrate employed in this design of antenna is h= 1.6mm.Third important parameter of good antenna design is dielectric substrate (Ɛr). A thick dielectric substrate having low dielectric constant is desirable. This provides better efficiency, larger bandwidth and better radiation. The look of patch is going to be fed by a microstrip transmission line. Patch will act as a conductor. This structure of the antenna having length of patch L, width W , height of dielectric substrate H and Loss tangent.
The antenna parameters antenna can be calculated as exemplified below:

4. Width of Patch

$$\mathbf{W} = \frac{\boldsymbol{C}}{\boldsymbol{2f\sqrt{\frac{\epsilon_{r+1}}{2}}}}$$

Where c= speed of light in free space

5. Resonant Frequency

$$\boldsymbol{f_0} = \frac{\boldsymbol{c}}{\boldsymbol{2le\sqrt{\epsilon_r}}}$$

Where le= effective length

6. Ground Dimension

For practical considerations, it is essential to have a finite ground plane.

If the size of the ground plane is greater than the patch dimensions by approximately six times the substrate thickness all around the periphery then it is given by the formula:-

$$L_g = 6h + L$$
$$W_g = 6h + W$$

7. Feed Location

To radiate the antenna, a feed is used to excite by direct or indirect contact. The feed of microstrip antenna can have many configurations like microstrip line, coaxial, aperture coupling and proximity coupling. But to fabricate easily microstrip line and the coaxial feeds are relatively used.

Coaxial probe feed is used because it is easy to use and the input impedance of the coaxial cable in general is 50Ω.

8. Results and Analysis

Result and analysis of previous literature papers is given below:-

Sr No.	Approach	Conclusion
1.	Modified ground plane with pairs of L-shaped slits and parasitic Structures [1]	Bandwidth of more than 130% (2.95 -14.27 GHz) radiation efficiency is greater than 86%
2.	VSWR and Radiation Pattern[3]	Return loss of -29.2133 dB at 1.8 GHz
3.	Inverted U - shaped slots and two L-shaped parasitic elements [5]	Bandwidth of more than 130% & good Omni-directional radiation pattern
4.	I-shaped slot on the feed - line and a pair of S -shaped slots in the ground plane[8]	Wider impedance bandwidth & radiation efficiency is greater than 82%

9. Conclusion

This review paper shows study of the Microstrip Patch Antenna using UWB frequency ranges for Wireless communication devices applications. After study of literature survey it is concluded that multi resonance characteristics of MPA such as Return loss, VSWR, Radiation pattern,

Impedance bandwidth can be improved by changing the parameters such as operating frequency, ground plane structure dimensions, feeding techniques.

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