

LPM RECONFIGURABLE ANTENNA FOR WLAN

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Abstract: WLAN is wireless local area network. Its main job is to integrate the network of the computer where the technology introduced is wireless. The frequency bands mentioned here are around 2.5 GHz and 5.2 GHz. The ISM is the Industrial Scientific Medical band which is widely recognized in this field. The major reason for the wide use of wireless system is since there is no need for getting authorized by the band. Here the main components introduced are micro strip antennas. The principle behind the micro strip antennas are higher frequency with reconfiguring capability and the operation involved is dual band. A simple FR4 material is used here. It has a lot of advantages and a few are its reduced cost and it is small in size. Now FR4 is the dielectric substrate used here. These are the necessities of the WLAN communication.

Index Terms: Patch antennas, low-profile, monopole, dual-band, reconfigurable antennas.

1. Introduction

The market of WLAN has reached a peak due to the development in the wireless system. The two main properties of WLAN are duplex way of transmission and reception. This enables data transmission and reception in an efficient way and provides more reliability. Antenna subsystem expects this characteristics and it is satisfied.

In the recent days an increased need for captivating multifunctional antennas is seen. These are reconfigurable antennas that can play the following important roles. They can change the model of their antennas according to the specifications required. Based on its properties it is categorized into four. They are

- Frequency reconfigurable antennas
- Polarization reconfigurable antennas
- Pattern reconfigurable antennas
- Hybrid antennas

Some kind requires wideband and even ultra wide band (UWB), where some kind can be satisfied just from a dual- or multi-band design approach. Narrow bandwidth is needed for low-profile integrated vehicle antennas and now even a lower profile of

antenna can be utilized. Using the reconfigurable antennas over and over again a large range of frequencies can be covered up. Additional RF filter's use can be rejected by using reconfigurable antennas since they possess superiority over out-of band rejection.

The frequency reconfigurable antenna is either endless or switched. Continuous frequency reconfigurable antenna moves smoothly to different operating frequencies and in switched it jumps to other operating frequencies. The way in which the length of the frequency varies gives its difference.

Few advantages of reconfigurable antennas are providing support to many wireless standards. They help in reducing the effect of noise and the gain of the system is developed and another important use is providing a broad pattern and saving of energy. The process of integration is performed to reduce the requirement of volume and also to reduce the cost.

A number of techniques that feeds micro strip antennas are

- Inset feed
- Pin feed
- Aperture coupling
- Proximity coupling

Inset feed is the most efficient technique than any other type due to its exact matching in impedance and more gaining process. Its easy method of fabrication has few advantages over other feeding techniques.

Changes made with radiation edges and current distribution of the surface the antenna reconfigurability can be achieved. By changing the feed position or feed point else the physical alteration the reconfigurability of the antenna can be achieved. The changes in the resonant frequency for different operating bands pave way for the frequency antennas. Many switching techniques can be used to obtain any operating state of frequency reconfigurable antenna for example; any desired single band resonant frequency and corresponding tuning band or multiband resonant frequencies. A patch antenna utilizes PIN diode for switching purpose which controls the surface current path length for different mode of switches. Microcontroller can control the coaxial feed and this coaxial feed is slide over the feed of the microstrip line changes the position of the feed which make antenna resonate at different frequencies.

While some applications need wideband or ultra wide band (UWB) operation other might be fulfilled with a dual- or multi-band design. For definite applications such as low-profile integrated vehicle antenna, narrow band used as the operating bandwidth and lower antenna profile. Moreover, in order to cover a wider range of instantaneously available frequencies, endless frequency-reconfigurable antennas can be utilized. With this desire, a dual-band reconfigurable antenna based on the geometry of the monopole antenna with low-profile will be proposed in this paper.

2. Antenna Configuration and Design

The monopole antenna for WLAN works in the frequency band of 2.5GHz and 5.2GHz. In this method, dual-band antennas according to the demand of WLAN for multi frequency communication are designed. The designed antenna has a favorable transmission characteristic in the operating band, which is in accordance with the demands of WLAN communication.

The antenna adopts dielectric substrate of FR4 material, with the benefits of small size and low cost.

3. Structure of Proposed Antenna

The antenna has been printed on the FR4 antenna substratum with a relative dielectric constant of 4.4. $W_s \times L_s$ is the size of the substrate, the thickness is 1.6 mm. The ground plane of the antenna is printed on the back ground of substrate, which has L_g and W_s as the length and width, respectively.

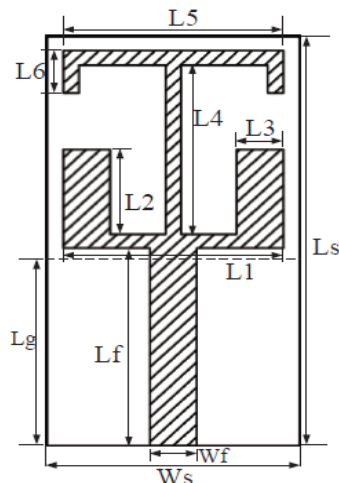


Figure 1. Structure of Dual Band Microstrip Antenna

In this antenna design, the main part of the antenna is printed on the front of the substrate. The characteristic impedance of microstrip antenna is 50 ohm. The size

of microstrip line is $W_f \times L_f$. Two rectangular patches and a T-shaped folded patch are the radiating element of the element. The rectangular patch has the length L_2 and the width L_3 . L_4 is the length of the vertical portion of the T-shaped, L_5 is the length of horizontal section and L_6 is the folding part.

4. Antenna Design in Hfss

Some of the properties that detect the performance of micro strip antennas are its operations and dimensions. The return loss and directivity are some other properties that are also needed to be considered. Steps taken for designing the antennas are made with care to obtain high efficiency.

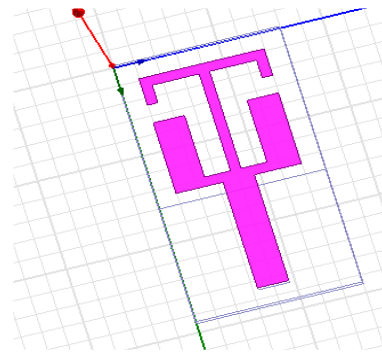


Figure 2. Design of Microstrip Patch Antenna in HFSS

The calculations of the design pattern of the patch antenna are as shown in the following table:

Table 1. Design Parameters of Dual Band Microstrip Patch Antenna:

W_s	L_s	L_f	W_f	L_g	L_1
16	29	14	3	13	14
L_2	L_3	L_4	L_5	L_6	H
7	3	12	12	3	1.6

5. Microstrip Patch Antenna Simulation Results

Stimulation of Micro strip antenna is done using HFSS. There is no match in the characteristic impedance and impedance at transmission line and patch edge since there is reflection in the waves.

The total amount of power that is being transferred to the load and the amount of reflected power gives the

return loss. The following shows that the Return loss characteristics of the proposed antenna.

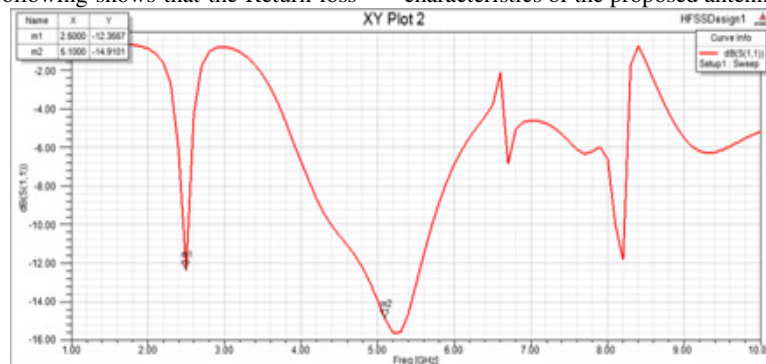


Figure 3. S Parameter Curve for Proposed Antenna

The mismatch between feeding system and antenna gives the VSWR measurement. Mismatch is directly proportional to VSWR. When VSWR increases mismatch increases and vice versa. The condition of

unity and perfect mismatch occurs when the value of VSWR is minimum.

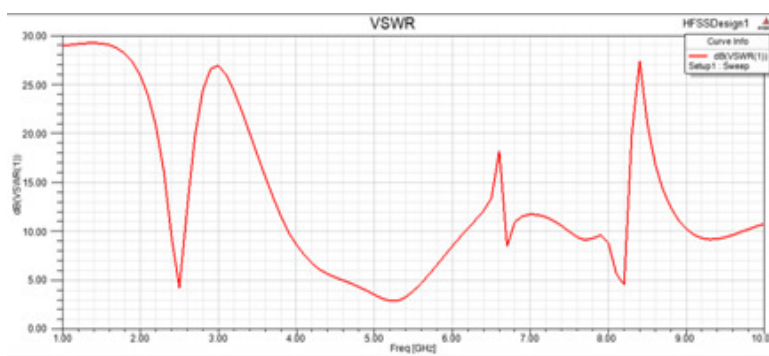


Figure 4. VSWR Curve for Proposed Antenna

Here radiation pattern says about the angular or directional dependence on few characteristics. These

characteristics include power of the waves from the radio of an antenna.

Radiation Pattern at 2.5GHz Frequency:

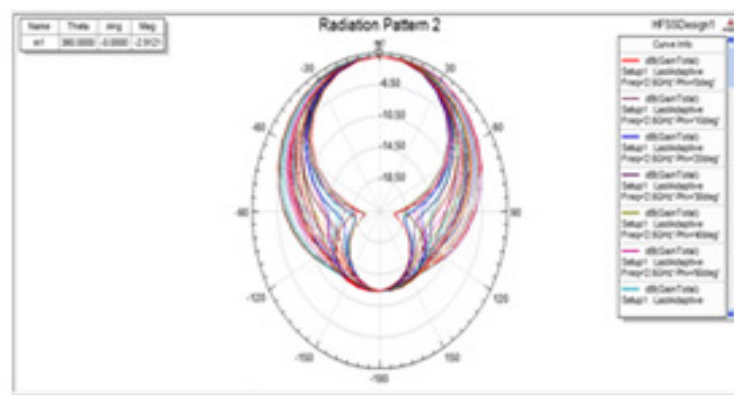
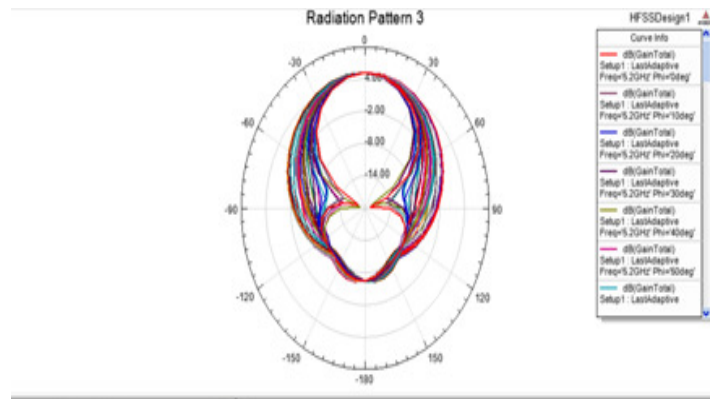
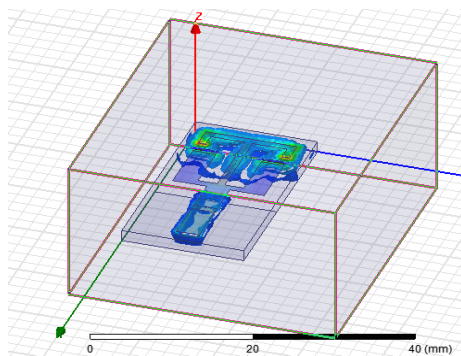
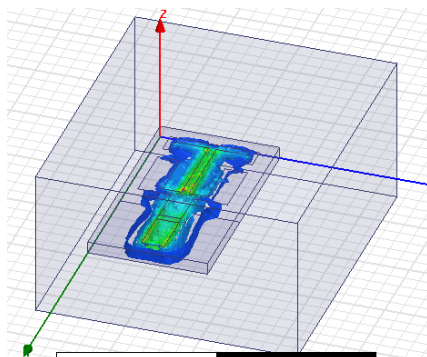
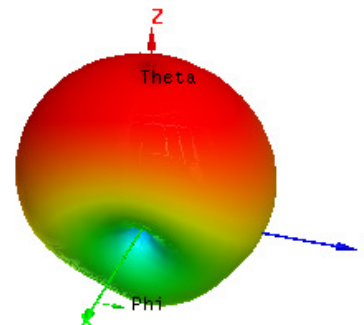


Figure 5. Radiation Pattern at 2.5GHz

Radiation Pattern at 5.2 GHz Frequency:

**Figure 6.** Radiation Pattern at 5.2GHz

The following shows the distributions in field of the optimized antenna. It can be subjectively observed that the designed frequency band the designing plays an important role.

**Figure 7.** E Field Distribution of the Proposed Antenna**Figure 8.** H Field Distribution of the proposed Antenna
3D plot for Dual Band Microstrip Antenna:**Figure 9.** 3D plot for Proposed Antenna

6. Conclusion

Designing of dual-band antennas based on the need of multi frequency communication is carried out here. Dual-band printed monopole antenna operates at 2.5 GHz and 5.2 GHz frequency bands.

A novel dual band reconfigurable antenna configuration containing T shaped folded patches with a slotted ground plane is projected. Simulation is investigated by using different substrates length and different switching characteristics for the same antenna. Compact structure of the antenna leads to simpler designing and simple manufacturing of the antenna. This structure helps this antenna for the better functioning with the WLAN properties.

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