Design and Development of Compact Microstrip Patch Dual Band Antenna for Wireless Communications

K.V.S.Pavani[1], Keerthi Sai.B[2], G.V.Ramanaiah[3], N.Mounika[4]
Department of Electronics and Communication Engineering
PSCMR College of Engineering and Technology, Vijayawada, Andhra Pradesh, India.

Abstract **-** In this paper, a novel double band microstrip patch antenna dependent on composite patch antenna and transmitting part. By choosing a reasonable balance feed position, it is possible to give 50 Ω trademark impedance and along these lines improving impedance coordinating. The proposed antenna has been improved more extensive transfer speed by utilizing RT Duroid substrate. The emanating part is assumes an imperative job in making a lower working band (2.45 GHz) notwithstanding accomplish scaling down. The proposed antenna must be created with RT/Duroid substrate and measurements of19X 22X 1.6 mm. The deliberate _10 dB data transfer capacity of 200 MHz at 3.45 GHz and 990 MHz at 5.45 GHz, which is very valuable for Industrial, Scientific and Medical (ISM) and Wireless applications.

Keywords **-** Microstrip patch antenna, ISM, RT/Duroid substrate and Wireless applications.

I. INTRODUCTION

In late research work, most of the mobile, wireless and communication systems, the antenna innovation has been utilized. To expand the quality factor, utilize higher information rate, and increment the nature of flag [1]. This innovation especially utilized in 3G and 4G gadgets. In this technique, a few antennas are associated in single board at both collector and transmitter and working in same full recurrence. Printed microstrip fix antennas are broadly utilized in ISM Band and wireless applications. Because of huge utilization of wireless communication gadgets, double band or multiband antennas have gotten extraordinary consideration for various wireless applications. Various strategies have been accounted for in writing for the structure of multiband antenna. Multiband activity with a solitary transmitting patch was planned utilizing emanating branch [1], parasitic element [2], rectangular notch [3], presenting spaces in the transmitting element, ground plane [4,5]. As of late, Electro Magnetic (EM) antennas have obtained a unique consideration around there on account of their strange electromagnetic Properties. These are materials with remarkable properties which have not been found in regular materials, which will in general show negative penetrability upon electromagnetic wave impedance vertical to its pivot. Microstrip antennas have an imperative component in these days because of the constants decline in size of the communication systems because of a more noteworthy mix of hardware, so there is a need of progressively minimal antennas. Since they are low, confirmable. The microstrip antennas comprises in a metallic fix imprinted over a slender substrate place over a ground plane.The metallic patch antenna can have diverse shapes, anyway the most widely recognized are the rectangular and circular since they are the simplest to manufacture and investigate. Printed microstrip patch antennas are generally utilized in wireless communications Due to gigantic utilization of wireless specialized gadgets, double band or multi band antennas have gotten more prominent consideration for various wireless applications. Microstrip has been utilized as a transmitting structure for accomplishing minimal double band antennas in the WLAN frequency range. Their job in antenna configuration turns out to be increasingly alluring a result of their capacity to accomplish multiband [8,9],reconfigurability [10], gain and bandwidth enhancement [11], and scaling down [6]. and emanating part is displayed for (2.45 GHz) and WLAN (5.41 GHz) applications.The transmitting part place a vital job in making a lower working band (2.45GHz) notwithstanding accomplish scaling down. Microstrip has been utilized as a transmitting structure for accomplishing minimized double band antennas in the WLAN frequency range. It assumes a noteworthy job in antenna structure and it turns out to be progressively attractive in light of their capacity to accomplish gain and VSWR (voltage and standing wave ratio).In the field of antenna plan the term radiation example (or antenna design or far-field antenna) alludes to the directional (precise) reliance of the quality of the radio waves from the antenna or other source. This alludes to the positional reliance of the electromagnetic field in the close field of the source. The close field design is most generally characterized over a plane put before the source. The radiation example might be spoken to graphically. The plotted amount might be appeared on a straight scale, or in dB.

II. DESIGN

In structure of radio wire to meet the craving necessities, we pursued a few systems as pursues. At first picked the ε(dielectric permittivity) of the dielectric material to give maximum data transfer capacity. RT/Duroid substrate is a common dielectric utilized in circuit loads up as the cover between the ground plane and flag follows. In this way, picked the dielectric from Rogger-corp as RT/Duroid 5880. It was utilized as substrate here. The propose reception apparatus having the measurements with a compact size of 19mm x 22mm x 1.6 mm. The reception apparatus is encouraged by a 50 Ω offset line and has a fractional ground

plane. This mix is utilized to produce a resonant frequency of 5.13 GHz. The fix size is made ideal so as to reverberation at 5.13 GHz. It is utilized to incite attractive reverberation and it turn improves the transmission capacity. By determination appropriate inset feed position is achievable to give a 50 Ω characteristic impedance and consequently improving impedance matching. After finished with troupe, utilized HFSS to simulate the circuit. The Antenna parameters are determined from the formulae given underneath. Length and width of the Rectangular patch are determined utilizing the underneath formulae,The length and width of the sustrate are calculated by using below formulae.

Parameter	Optimized values
L_{p_2}	6.5
W_{p_2}	10
L_{p_3}	5.5
W_{p_3}	9
L_{p_4}	4.5
w_{p_4}	8

Table 1

Parameter	Optimized values
L_s	19
W_s	22
H_s	0.8
W_h	0.8
W_w	2
L_p	9.5
W_p	13

Table 2

$$L_S = L_p + 6h_1$$
$$W_S = w_p + 6h_1$$

Where,

$$h_1 = \frac{0.606\lambda}{\varepsilon_r}$$

Antenna has to be fabricated with FR4 epoxy substrate and dimensions of 19mm x 22mm x 1.6mm. Multiband operation with a single radiating patch was designed using rectangular notch, introducing slots in the radiating element, ground plane.

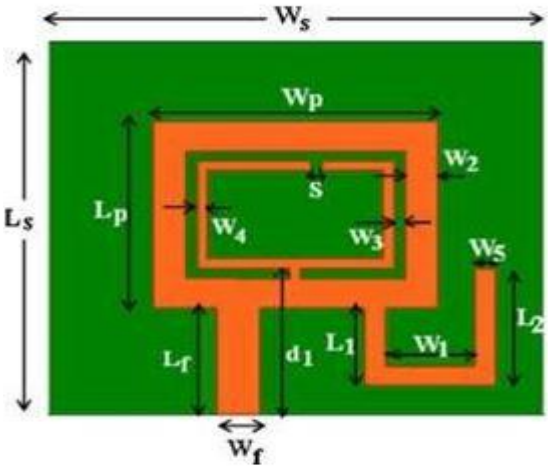

Figure 1: Geometrical view

III. PROPOSED METHOD

The proposed antenna is encouraged by a 50ω offset line and has a partial ground plane. Ground plane is utilized to instigate magnetic resonance and thus improves the bandwidth. The proposed antenna has been improved the broader bandwidth by utilizing FR4 epoxy substrate. The ground and patch are assigned to boundaries. This combination is utilized to generate a frequency of 9 GHz and VSWR is 0.9.

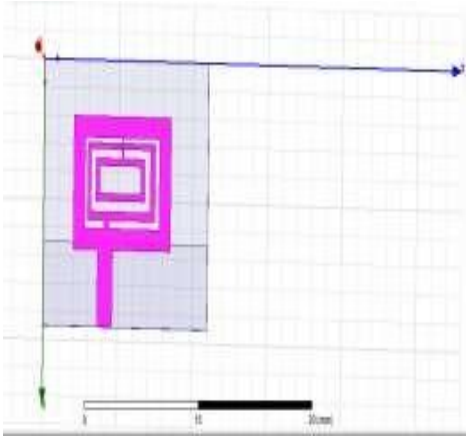

Figure 2: Micro strip Patch Antenna

IV. RESULT

The simulation of micro strip antenna is simulated utilizing HFSS software. The examination of simulated and estimation aftereffects of return misfortune qualities. The electrical length of the radiating branch plays out a significant capacity in understanding the lower most frequency to accomplish miniaturization. At 2.45 GHz, the present concentration is more around the radiating branch and at 5.45 GHz, the present circulation antenna indicates dual band attributes. The primary band has a resonance frequency of 2.45GHZ with an impedance bandwidth of 200 MHZ (2.3-2.5GHZ) and the second band has dual resonance of 5.45 GHz and 6.04 GHz with an impedance bandwidth of 1000 MHZ (5.2-6.2 GHz).

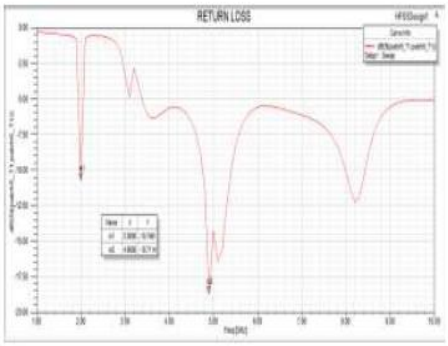

Figure 3: Simulated Design-1

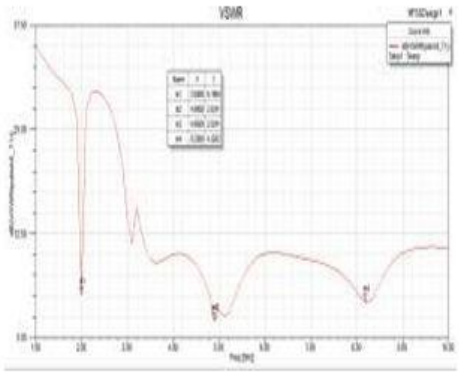

Figure 4: Simulated Design-2

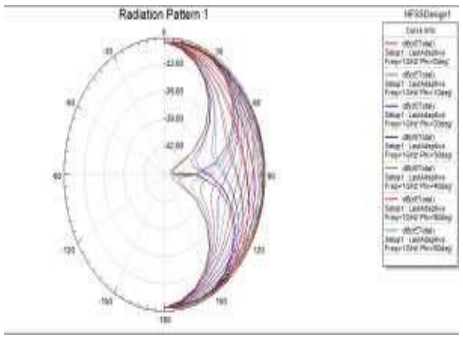

Figure 5: Radiation Pattern

The recreated and estimated far-field radiation examples of proposed radio wire at reverberation recurrence of 2.45 GHz and 5.45 GHz. The outcomes demonstrate a homogeneous dipole radiation design is acquired in the h-plane for both working groups. The radiation productivity speaks to the level of intensity transmitted when contrasted with information intensity of the reception apparatus. A decent impedance coordinating and wide data transmission are accomplished by balance nourished microstrip line and RT/Duroid substrate. The transmitting branch is utilized to accomplish WLAN reverberation recurrence of 5.45 GHz. The proposed reception apparatus has a scaling down, more extensive data transfer capacity and homogeneous radiation design.

Figure 6

V. CONCLUSION

An epic micro strip radio wire for ISM band and WLAN applications is proposed, with a reduced size of 19 x22x1.6 mm3. A decent impedance coordinating and wide transmission capacity are accomplished by balance bolstered microstrip line and RT/Duroid substrate. The emanating branch is utilized to accomplish WLAN reverberation recurrence of 5.45 GHz. The model radio wire is manufactured and estimated. The reproduced and estimated outcomes Coordinate with one another. The proposed radio wire has a scaled down size , more extensive transmission capacity and homogeneous radiation design rendering it compelling for remote correspondence applications.

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