Compact Inset Fed Microstrip Patch Antenna for Dual Band Application

Kuldeep Kumar Parashar, Dr.V.K.Singh, R. S. Pathak

***Abstract*— In this paper the microstrip inset feed patch antenna for various wireless applications. The Antenna is fed by inset line Feed technique. Using proposed configuration of patch antenna Dual Bandwidth of about 67.05% & 14.76% has been obtained operating in the frequency range of 1.033 to 2.075 and 2.378 to 2.757 GHz. The Antenna parameters such as smith chart, VSWR, 3 D radiation pattern has been analyzed by IE3D simulation software.**

***Index Terms*— Rectangular slot, IE3D Software, Inset Line feed, patch antenna.**

I. INTRODUCTION

Microstrip patch antennas has planar structure, compactness, low-profile, directive with high efficiency, light weight, low profile, low cost and ease of integration with microwave circuit and portable communication equipments[1-3].

These antennas typically suffer from narrow bandwidth and gain, limited power capacity, poor polarization purity & tolerance problem. But researchers have been proposed and investigated many techniques to overcome the drawbacks. Such as slotted patch antennas, electrically thick substrates, defected ground plane and use of many feed techniques & impedance matching techniques and the use of multiple resonators [4-10]

It is easy to model and easy to match by controlling the probe feed coordinates. The ground plane is made defected, i.e. cut from the corners. A defected structure introduces discontinuities on the signal plane and disturbs the shielded current distribution in signal plane. As a result apparent permittivity of the substrate varies as a function of frequency.[11-16]

The proposed antenna has been designed on glass epoxy substrate to give dual wide bandwidth of 67.05% and 14.76%. The presented Antenna is well suitable for WLAN (2.48-2.484 GHz) applications.

II. ANTENNA DESIGN AND LAYOUT

In this paper, a compact Circle slotted rectangular patch antenna having dimensions L×W has been designed on glass epoxy substrate having dielectric constant equal to 4.4. Figure1 shows the layout of Inset feed slotted patch antenna. Other parameters like patch Length & Width are shown in figure-1. For a proposed rectangular patch antenna, the length and the width are calculated as below

$$W = \frac{c}{2f\sqrt{(\varepsilon_r + 1)/2}} \quad (1)$$

Where c is the velocity of light, ε_r is the dielectric constant of substrate, f *is* the antenna working frequency, W is the patch width, the effective dielectric constant and the length extension are given as,

$$\varepsilon_{eff} = \frac{(\varepsilon_r + 1)}{2} + \frac{(\varepsilon_r - 1)}{2}\left[1 + 10\frac{h}{W}\right]^{-\frac{1}{2}} \quad (2)$$

$$\frac{\Delta l}{h} = 0.412\frac{(\varepsilon_{eff} + 0.300)\left(\frac{W}{h} + 0.262\right)}{(\varepsilon_{eff} - 0.258)\left(\frac{W}{h} + 0.813\right)} \quad (3)$$

$$L = \frac{c}{2f\sqrt{\varepsilon_{eff}}} - 2\Delta l \quad (4)$$

Table 1.Proposed antenna design parameters.

Parameters	Value (mm)
ε_r	4.4
h	1.6
W_g	100
L_g	100
L	35.44
W	45.64
L1	20
W1	30
L2	27.72
W2	6

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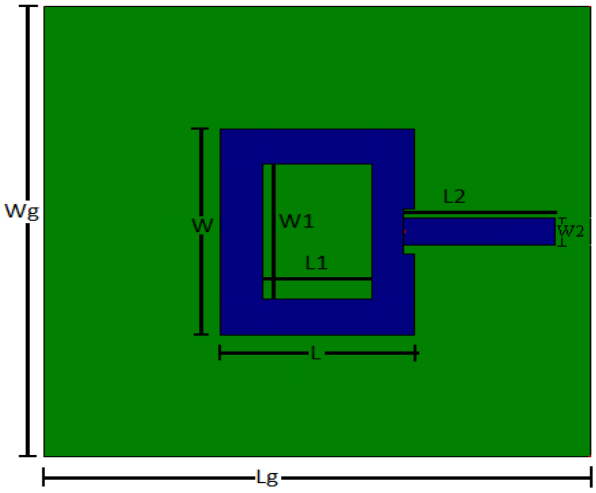

Figure 1: Geometry of proposed microstrip antenna

III. RESULT AND DISCUSSION

Figure 2 shows the return loss plot of proposed microstrip antenna. The proposed antenna gives a dual band width of 67.05% & 14.76%. It is suitable for wide band operation. Figure 3 shows the smith chart & Figure 4 shows the 3D radiation pattern which is obtained from IE3D.The proposed microstrip antenna have better gain and good radiation efficiency. Fig 5 shows VSWR Vs frequency of proposed microstrip antenna.

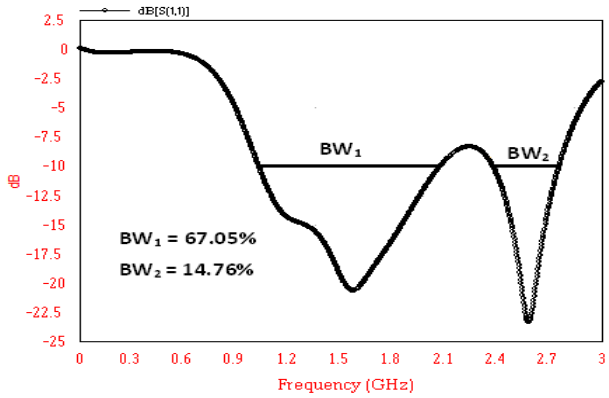

Figure 2: Return loss Vs frequency of proposed microstrip antenna

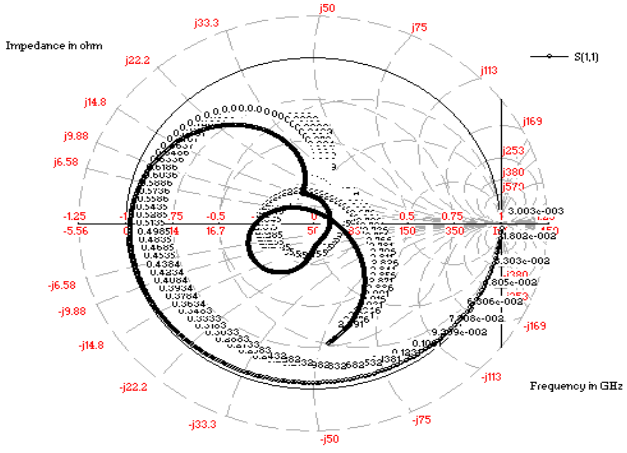

Figure 3: Smith chart plot of proposed microstrip antenna

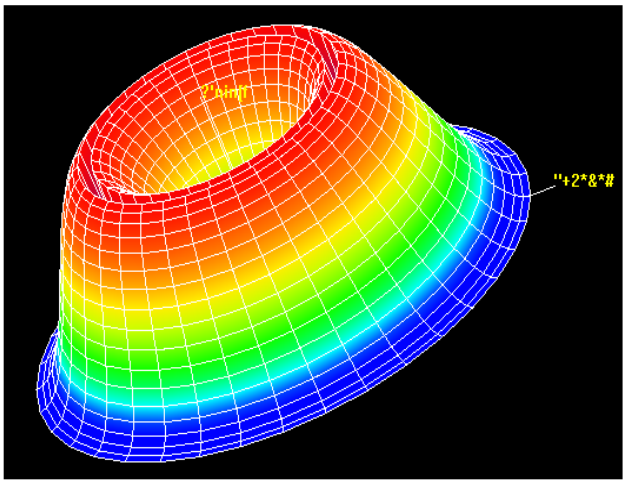

Figure 4: 3D radiation pattern of proposed microstrip antenna

IV. CONCLUSION

The proposed antenna has been studied for dual band application. The simulated results shows that it has a dual bandwidth 67.05% and 14.76%. The presented Antenna is well suitable for WLAN (2.48-2.484 GHz) applications.

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