SINGLE FEED DUAL BAND PIFA FOR WIRELESS COMMUNICATION

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ABSTRACT
The development of small antenna plays a vital role in the rapid expanding of wireless communication. In this paper, a single feed compact Planar Inverted F-Antenna (PIFA) is presented. The wireless communication need compact and efficient antenna. The PIFA antenna which satisfies the condition of the wireless communication. The antenna is proposed for the wireless communication which supports GSM and WLAN frequencies. The antenna has compact structure 19x22 mm, which covers the 1.8 GHz GSM and 5.5 GHz WLAN applications. Simulation based upon Method of Moments. It has the gain of about 12db.The commercial electromagnetic software CADFEKO is used to design and analysis the structure.

KEYWORDS: *Planar Inverted F Antenna, WLAN, Stub, Short pin.*

I. INTRODUCTION

Now a day the wireless communication has developed rapidly. The demands for the antenna which have been used for mobile communication also have increased. Antenna which has been used as internal antenna like mobile handset antenna has to satisfy many categories like size, performance and multiband. Here Planar Inverted F Antenna (PIFA) satisfies the condition, which is compact in size and can be used for the mobile handsets and operate multiband frequency and other wireless applications.

A new built-in quad-band handset antenna for covering GSM900, DCS1800, PCS1900, and UMTS2000 bands has been proposed, the simulation is based on the finite-difference time-domain (FDTD) method [4]. A prototype is designed and built featuring behavior suitable for low frequencies (GSM850 and GSM900) and for high frequencies .Spanning from DCS1800 to Bluetooth, and including, for instance, PCS1900, UMTS2000, and other possible systems. The frequency range is between 900 to 1800MHz [5]. The paper is organized as follows. Section III gives the structure and design parameter of the PIFA and the PIFA with Slots. In the section IV it is briefly discussed about the results of the PIFA and PIFA with Slots. Finally in the section V the summary of the work is provided.

II. RELATED WORK

The Planar Inverted F Antenna which is compact and it can be used in mobile application, but narrow bandwidth is a major drawback of the antenna. The problem is overcome by using slots in the radiating patch. Though the bandwidth and the size of an antenna are generally mutually conflicting properties, that is, improvement of one of the characteristics normally results in degradation of the other, hence compact size antennas are needed for mobile handsets with improvement in bandwidth. By varying the location and size of the slot, the equivalent length of the ground plane can be adjusted to the optimal lengths of the low and high bands, which thus enhance the bandwidth of PIFA antennas for both the low and high bands [10]. The resonance frequency depends inversely on the slot length and feed point, while it increases with increasing the slot width and feed pin of the antenna

.Transmission line feeding is provided in order to provide excitation to antenna and RF module. The operational bandwidth is increased because the electrical length of the ground plane increases when meandering or open-end slots are used on the ground plane, although its physical size is fixed [4].

III. ANTENNA DESIGN

The Proposed antenna structure has been given in the figure 1. The ground plane is with a size of 50x30 mm. The radiating patch is over the ground plane with a size of 19x22 mm. The antenna is shorted by using short pin connecting both the radiating and ground plane.

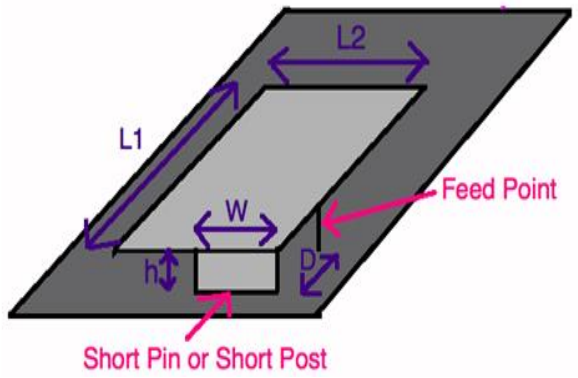


Figure 1.PIFA Structure

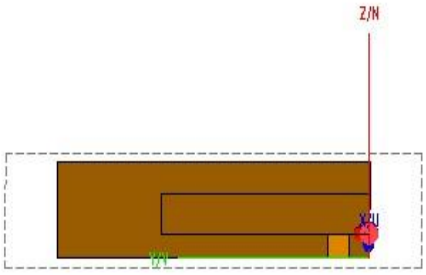
Where

L1=Length of the Radiating Patch
L2=Width of the Radiating Patch
h=Height between the Ground and patch Plane
W=Width of the stub
D=distance of the Feed point from the origin

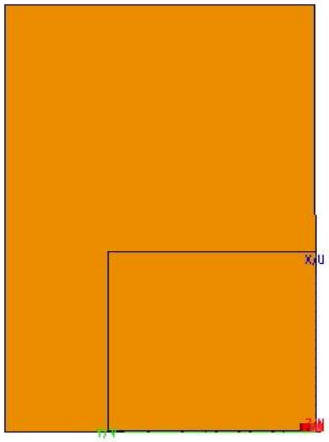
$$L1 + L2 = \frac{\lambda}{4} \quad (1)$$

3.1 Design Values

In the feeding part, the edges fed have been used for the antenna. The design parameters for the proposed antenna are as following: Lg=50mm, Wg=30mm, Lp=19mm, Wp=22mm, h=2mm



(a) Side View



(b) Top View

Figure 2 PIFA in CAD FEKO

Here the structure of the Planar Inverted F antenna have been shown in the figure 2.The Planar Inverted F Antenna which have been given with E shape slot on the radiating patch of the antenna, by introducing the slot on the patch which makes the antenna to radiate in different resonant frequency.

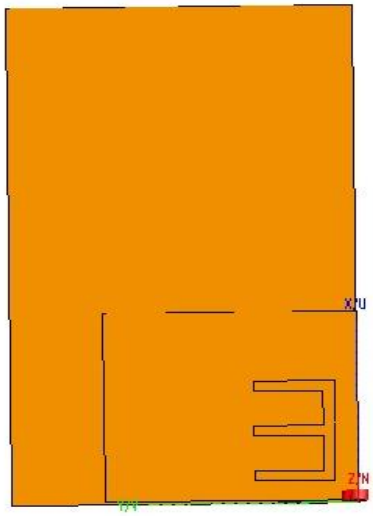


Figure 3 PIFA with E Slot in CAD FEKO

IV. RESULT AND DISCUSSION

From the simulation results the influence of the slots on the patch has been shown, simulations of the ordinary PIFA without slots were conducted. The height of the upper patch was fixed at 2mm from the ground plane, and the other parameters were kept constant except for the slot on the patch plane.
The Planar Inverted F Antenna have been designed for the resonant frequency 1.8 GHz which the illustrated in the figure 4, which it can be used for the GSM Application.
By using the same model, then by introducing E shape slot in the radiating patch the antenna can be made to operate in two different frequency 1.8 and 5.5 GHz which is shown in figure 5, that can be used for GSM and WLAN application.

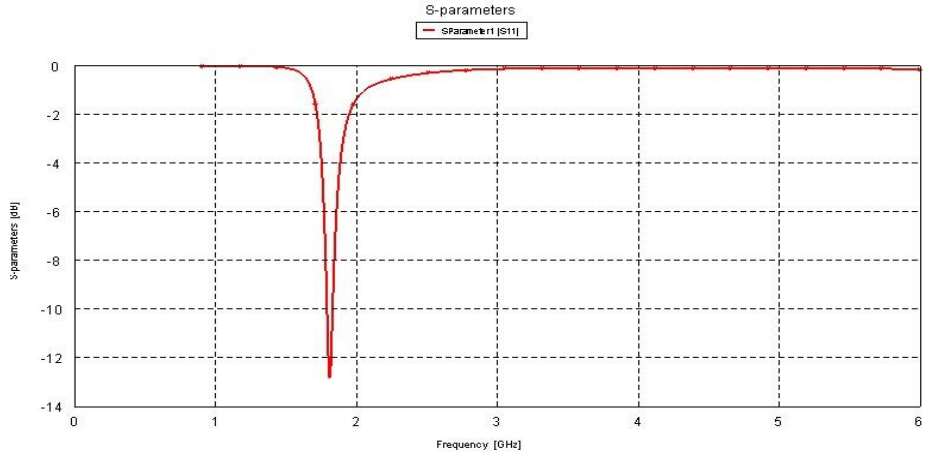


Figure 4 Return loss as a function of frequency of PIFA

The antenna resonance frequencies as obtained from the simulator are 1.8 with reflection coefficients 8.5 dB, respectively. Figure 4 Illustrates results of this single-band PIFA.

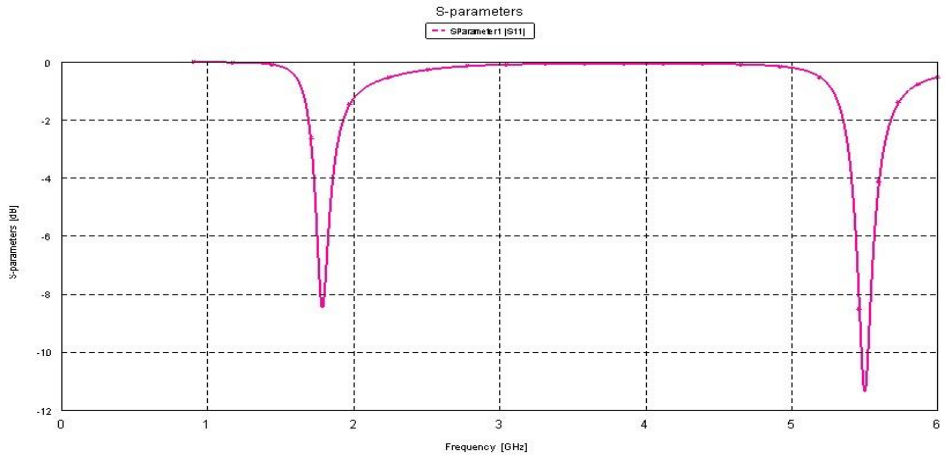


Figure 5 Return loss as a function of frequency of PIFA with E Slot

By the same concept, the second E-shaped slot is added to patch of the antenna. The simulated frequencies of this dual-band antenna are 1.8 and 5.5 GHz, respectively, as shown in Figure.5

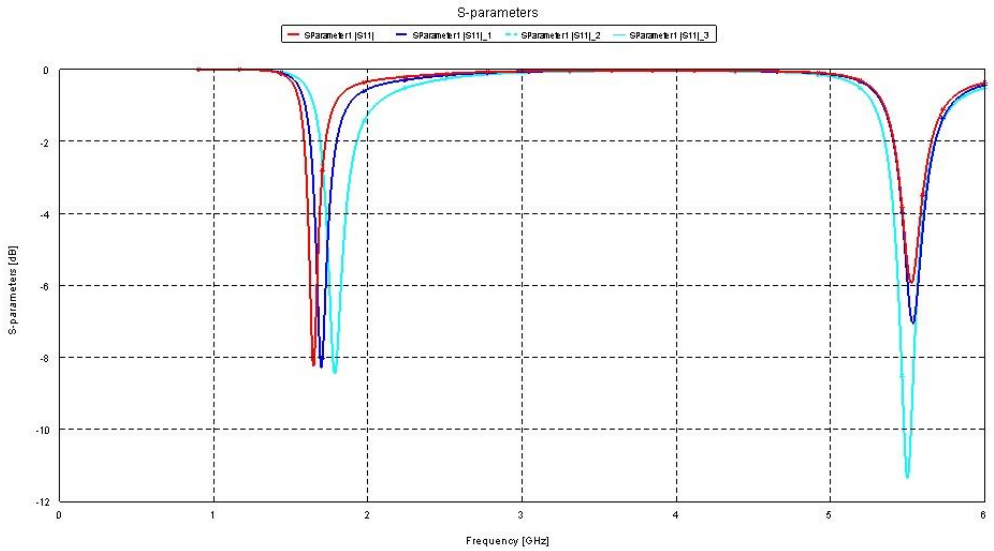
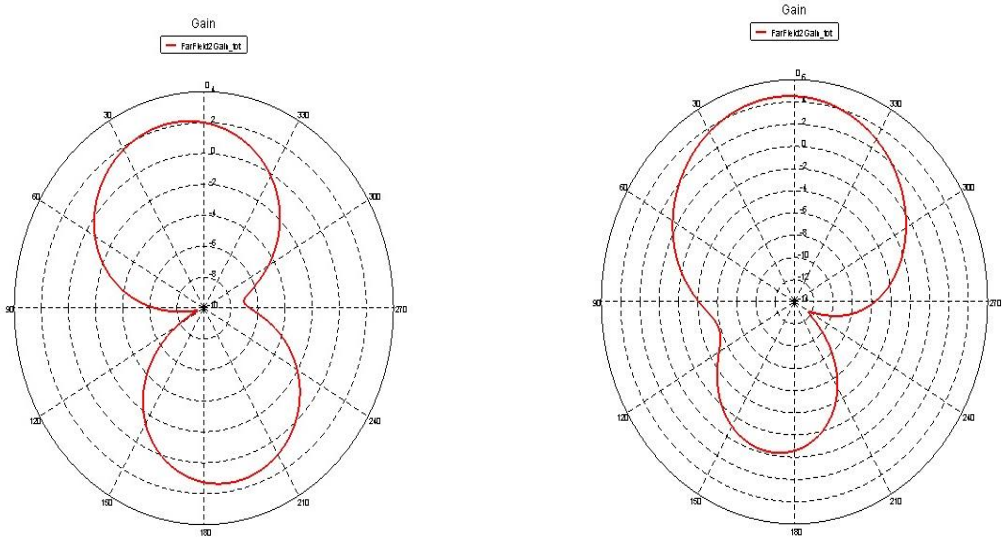


Figure 6 Comparisons in Stub Placement in PIFA

By adjusting the stub place from the origin output frequency can be changed, here by adjusting the place of stub the resonant frequency that can vary that is given figure 6 and which shows the effect of the stub in antenna.

Here the radiation pattern of the antenna have been given in the figure 7.Through this the radiation of each frequency can known and the pattern of the antenna can determine even the gain can estimated through the polar chat which have been given



a b

Figure 7 The Simulated Radiation pattern have been shown (a) For 1.7 GHz (b) For 3 GHz

V. CONCLUSION

A low profile Planar Inverted F Antenna for GSM and WLAN application is proposed in this paper. The proposed antenna with compact size meets requirements for the mobile communications. By introducing the E slot in the radiating patch the antenna is made to operate in different frequency. The antenna is small and thin which is suitable for the mobile application. From the analysis antenna gain, radiation pattern, return loss and impedance is measured which is suitable for the specified application. Future by introducing slots in radiating patch more efficient than introducing slot ground plane. By designing the antenna for different frequency the operating of the antenna can be changed, ever by introducing different slot in the patch the antenna can radiate for different frequency which can support different wireless application

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