Base–Shaped Coaxial Feed Microstrip Patch Antenna for WLAN and WIMAX Applications

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Abstract -- Micro strip patch antennas are mostly known for their versatility in terms of possible geometries that makes them used for many different situations. In this paper, a Base-shaped coaxial feed microstrip patch antenna has been designed. The antenna is designed to operate between 5.725 to 5.85 GHz frequency bands. Here Ansot's HFSS software has been used for designing the proposed antenna. The FR4 epoxy dielectric material of relative permittivity 4.4 and loss tangent of 0.0013 having the thickness of 1.6 mm is used as a substrate of the proposed antenna.

Indexed Terms: Base-shaped, Coaxial feed, HFSS, WiMAX and WLAN

I. INTRODUCTION

The antenna is very important element of wireless communication as it is used for a transmitting and receiving electromagnetic waves. Microstrip patch antennas are gaining applicable in wireless communications due to many uses like low profile, less weight, low cost, and ease of integration with microstrip circuits (C. A. Balanis, 2007; R. Garg, 2001). But, the main disadvantage of microstrip antennas is the small bandwidth. Many methods have been proposed to improve the bandwidth (Dharmendra Rishiwar, 2013; Meenal Kate, 2016; R. Mishra, 2015; Dinesh Pratap Singh, 2016). Some of the Base-shaped patch antenna is presented in (Devan Bhalla, 2013; Ram Krishan, 2015; R. Mishra, 2015; Apporva Jain, 2016; B. Karthik, 2018) So, improvement of large bandwidth becomes an important need for many applications such as for high speed networks.

Now a day, high-speed wireless computer networks have attracted the attention of researchers, especially in the 5-6 GHz band (e. g. WiMax and IEEE 802.11a Indoor and Outdoor WLAN). This typeof networks have the ability to provide high-speed connectivity (>50 Mb/s) between notebook computers, PCs, personal organizers and other wireless digital appliances.

In this paper, a simple Base-shaped microstrip patch antenna is presented. The Ansoft's HFSS which is the industry standard simulation tool for 3D full-wave electromagnetic field simulation based on Finite Element Method (FEM) has been used for simulation purposes.

II. ANTENNA DESIGN

The side view of the microstrip antenna structure has been shown in Fig. 1. At the begging a simple rectangular microstrip patch antenna has been taken. Dimension of the antenna is calculated from the basic patch antenna equations (C. A. Balanis, 2007) and appropriate changes have been done to make a Base shape patch antenna. Coaxial feeding is chosen for the excitation of the proposed antenna.

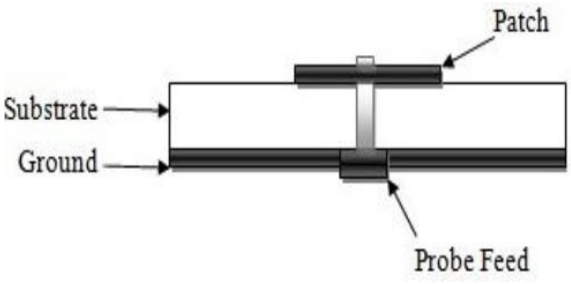

Fig.1 Side view of the proposed antenna structure

Fig.2 shows the patch antenna of the proposed antenna. The proposed antenna with design parameters resonates at 5.725GHz to 5.85GHz has been shown in Table 1.

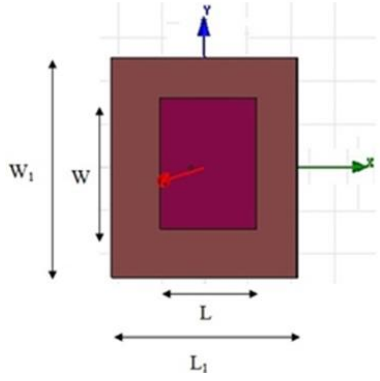

Fig.2 Base-shaped patch

Table1 Parameter of the optimized Base–shaped patch antenna

Parameter	Dimension(mm)
L	11.2
W	15.2
L_1	21.46
W_1	25.47
H	1.6

III. RESULTS

From the Fig 3, the graph shows that the return loss below -10 dB is started from 5.6496 GHz to 5.9102 GHz which covers the entire range of WiMaX and WLAN applications. The bandwidth of the proposed antenna is 260.06 MHz. Fig.4 shows that the circle is close to VSWR = 2 circle in the smith chart.

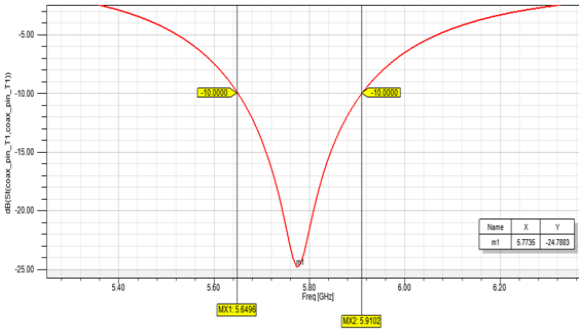

Fig.3 Return loss plot of optimized antenna Base-shaped

The radiation pattern can be shown in Fig. 5 at the 5.725GHz frequency. The radiation pattern shows that the antenna radiates more power in a certain direction than another direction.

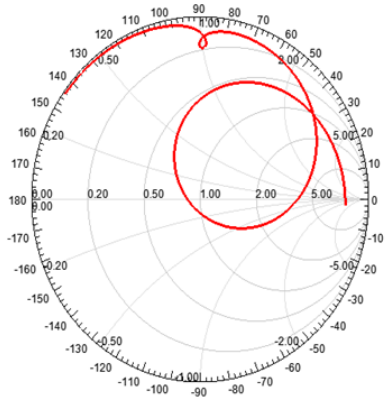

Fig.4 Smith chart of Base-shaped patch antenna

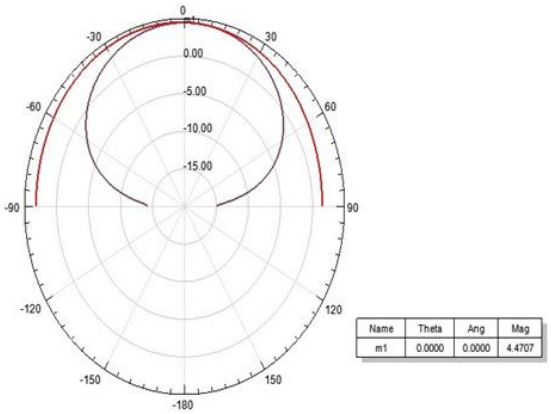

Fig.5 Radiation pattern of Base-shaped patch antenna

From the Fig.6 we can be seen that the VSWR lies below the value 2 from 5.6496 GHz to 5.9102 GHz frequency.

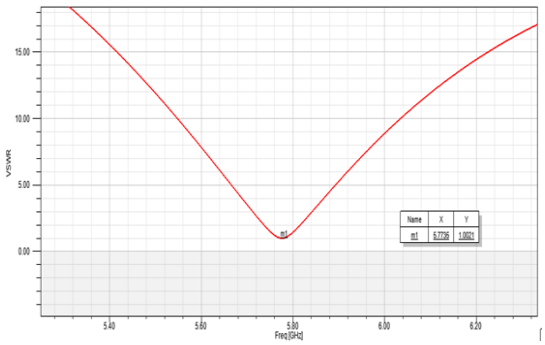

Fig.6 VSWR of Base-shaped patch antenna

IV. CONCLUSION

In this paper, a Base-shaped patch antenna has been designed with coaxial feeding technique. At begging rectangular shape patch is simulated and different

results are plotted. The return loss plot of the proposed antenna has been shown that the antenna starts resonant from 5.6496 GHz to 5.9102 GHz having return loss of -24.7883 dB frequency band. This Show that the proposed antenna can be used for WiMaX, WLAN and other high-speed wireless communications.

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