IJCSC International Journal of Computer Science and Communication Vol. 3, No. 1, January-June 2012, pp. 145-147

STACKED THREE LAYER RECTANGULAR MICROSTRIP PATCH ANTENNA FOR ULTRA WIDE BAND APPLICATIONS

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ABSTRACT

Microstrip patch antennas are well suited for low volume profile, light weight and easily integration. These antennas are generally useful for mobile communications, Wireless communications applications which requires very wide bandwidth. This paper presents a three layered rectangular microstrip patch antenna with parasitic patches and a single probe feeding to the lower patch. The ultra wide band utilizes the frequency band 3.1-10.6 GhZ. Here the proposed antenna is simulated by ansoft designer and The Bandwidth of the antenna is 2.8 GHz and the % Bandwidth 50 % is achieved.

Keywords: Microstrip patch antenna, permittivity, %Bandwidth, height, return loss.

1. INTRODUCTION

From long time the microstrip antenna has been intensively used due to its significant Merits of small size, light weight, low profile and easy integration [1, 2]. However, the microstrip antennas inherently have a narrow bandwidth. To overcome it's inherent Limitation of narrow impedance bandwidth and to increase the bandwidth various techniques have been suggested such as probe fed stacked antenna, microstrip patch antennas placed on electrically thick substrate, slotted patch antenna and stacked shorted patches, Parasitic patches. In general, the bandwidth of a patch antenna is proportional to the antenna volume, measured in wavelengths. However, by using three stacked patches and two parasitic patches on right and left side of lower patch one can obtain enhanced impedance band width. In the present paper, a novel probe fed stacked three layer rectangular patch and two parasitic patches wideband microstrip antenna is presented. The simulation of the proposed antenna has been carried out using ansoft designer. A bandwidth of 2.8 GHz and %Bandwidth of 50% is achieved. Radiation and other characteristics of the proposed antenna have also been investigated.

2. ANTENNA DESIGN

The proposed antenna configuration is shown in Figure 1[6, 7]; the design consists of three stack layers and two parasitic layers respectively. By making use of stacked patch concept one can obtain enhanced impedance and using high permittivity can enhance the AR bandwidth. The value of various parameters which is used for design of the antenna is shown in Table 1.

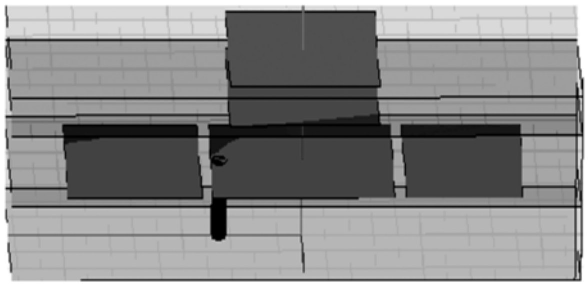

Figure 1: The Proposed Three Layer Stacked Patch Antenna

Table 1
Design Specifications of the Proposed Antenna

Specifications	*Symbol*	*values*
Length of lower patch	L1	15.25 mm
Width of lower patch	W1	9.07 mm
Height of lower Substrate	h1	3.048 mm
Dielectric Constant of lower substrate (Rogers RO 3003(tm))	εr1	3
Permeability	μ	1
Loss Tangent	tanδ	0.0013
Length of middle patch	L2	12.5 mm
Width of middle patch	W2	9.07 mm
Height of middle substrate	h2	3.048 mm
Dielectric Constant of middle substrate (Rogers RO 3003(tm))	εr2	3
Permeability	μ	1
Loss Tangent	tanδ	0.0013
Length of upper patch	L3	12.5 mm
Width of upper patch	W3	9.07 mm

Table Cont'd

Table 1 Cont'd

Height of upper substrate	h3	1.524 mm
Dielectric Constant of upper substrate (Rogers RO 3003(tm))	εr3	3
Permeability	μ	1
Loss Tangent	tanδ	0.0013
Length of Left parasitic patch	Ll	9.83 mm
Width of Left parasitic patch	Wl	9.07 mm
Height of Left parasitic substrate	hl	3.05 mm
Dielectric Constant of Left parasitic substrate (Rogers RO 3003(tm))	εr1	3
Permeability	μ	1
Loss Tangent	tanδ	0.0013
Length of Right parasitic patch	Lr	11.26 mm
Width of Right parasitic patch	Wr	9.07 mm
Height of Right parasitic substrate	hr	3.05 mm
Dielectric Constant of Right parasitic substrate (Rogers RO 3003(tm))	εrr	3
Permeability	μ	1
Loss Tangent	tanδ	0.0013
Feed point location of probe	(x0, y0)	(6.93,0)

3. SIMULATION RESULTS

Referring to the configuration shown in Figure 1, the polarization depends on choosing the feed point location. By changing the signal feed positions the polarization is obtained. The proposed antenna is simulated by ansoft designer at a center frequency of 5.5 GHz. Figure 2 shows that the simulated return loss (S11 in dB) of the proposed antenna are less than –10 dB over 4.14 GHz to 6.94 GHz. The return loss is shown in Fig. 2. Figure 3 shows the 2D radiation pattern of the antenna it is a variation of angle ? with Gain dB from this plot the gain of the antenna is found tobe 5.8 dB. Figure 4 shows the input impedance loci for the antenna from the impedance plot we get 4 to 7 GHz impedance is very close to 1 hence we are getting the 10 dB return loss. Figure 5 shows the current distribution diagram of antenna here the current is radiated along x direction. Figure 6 shows the radiation pattern at 5.5 GHz, the same radiation pattern has been obtained throughout the operating frequency band. Figure 7 shows the variation of VSWR with frequency here the VSWR is found to be 1.27.

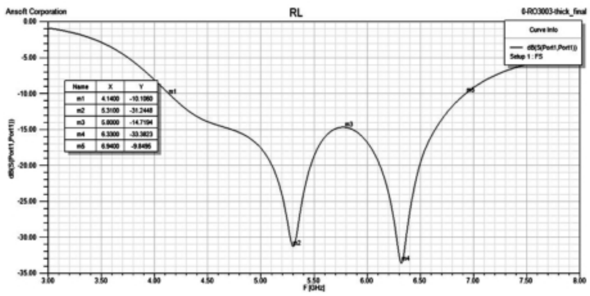

Figure 2: The Return Loss Plot of the Proposed Antenna

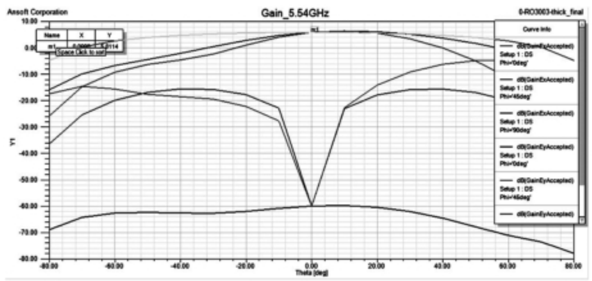

Figure 3: 2D Radiation Pattern of the Proposed Antenna

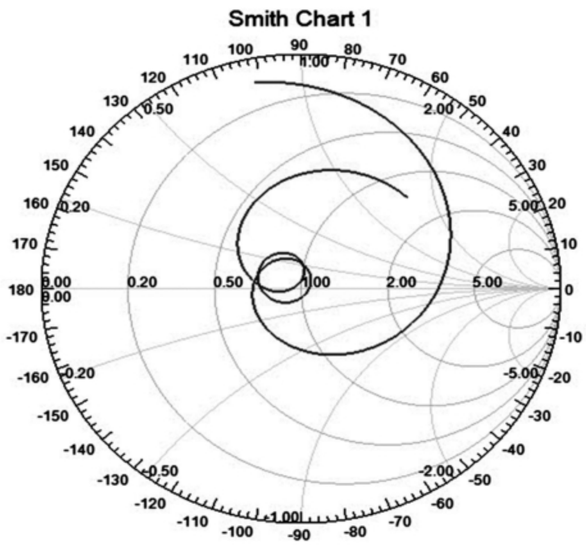

Figure 4: Impedance Plot (Smith Chart) of the Proposed Antenna

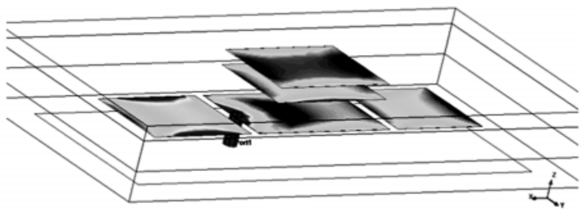

Figure 5: Current Distribution Diagram of the Proposed Antenna

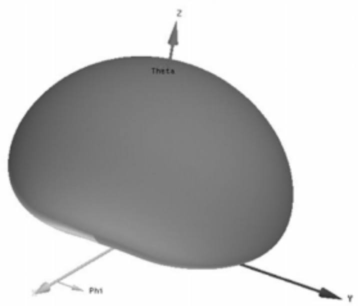

Figure 6: 3D Radiation Pattern of the Proposed Antenna

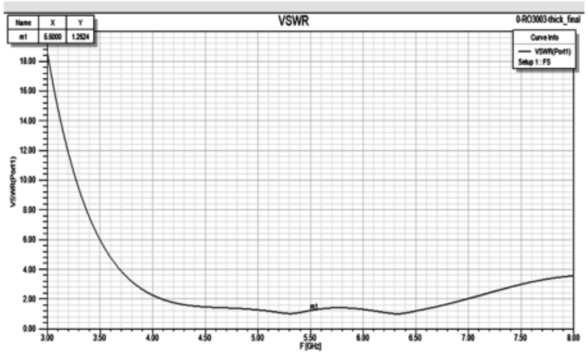

Figure 7: Variation of VSWR with Frequency

4. CONCLUSION

In this paper, a new small microstrip antenna for ultra wideband applications is designed, optimized Simulated by ansoft designer. It is very useful for wireless and Mobile communications. Here we obtain 50% bandwidth and gain of 5.8dB. It was found that the proposed antenna achieves the main requirements needed for UWB sectoral applications.

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