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Design of multiband microstrip patch antenna for wireless application

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Abstract - *In this article, the rectangular multiband Microstrip patch antenna is introduced. Here one cross slot in the patch is used to produce different resonant frequencies. The correct probe feed location is decided by parametric method give the promising results. The interesting features of proposed structure are that we get a multiband response in the frequency range 2.54GHZ-2.67GHZ, 5.11GHZ-5.26GHz and 5.8GHZ-6GHZ which has applications for IEEE 802.11a and IEEE 802.11b WLAN.*

Key Words: Multi-band, Microstrip patch Antenna, wireless Application

1. INTRODUCTION

In the modern wireless communication devices, the most important device to develop wireless communication link is an antenna. Microstrip patch antennas fulfill these requirements. These antennas have been used in an increasing number of wireless communication systems because of their simple structures, low weight and their production of low-profile, broadband radiation patterns. The selection of the size of length and width of the patch and materials of the substrate is most important part of designing desired antenna [1-2].To increase the bandwidth either slit or slot should be made on the ground plane. The compactness of the antenna is done by embedding slots in the correct position on the radiating patch [3-4].

In this article, the rectangular multiband Microstrip patch antenna has been proposed. In this proposed antenna the close ended rectangular slot is inserted in the ground plane. The radiating patch is generally made by any conducting materials and it can be any shape like a rectangle, triangle, circular and elliptical. After inserting a cross slot in the patch it creates a slow wave effect and shifted in lower band frequency which is applicable for WLAN.

2. ANTENNA DESIGN

A configuration of reference antenna is given in figure (1) and figure (2) and the result of the reference antenna is shown in figure (4).The dimension of the reference antenna is shown in table -1.Here the size of the ground plane is 50mm×50mm and the size of the radiating patch is 25mm×25mm.the antenna is mounted on FR4 substrate of dielectric constant 4.4 have a tangent loss ($\tan^{\delta}$) =0.02 and thickness is 1.6mm. The inner and outer diameter of the feeding probe is 1mm and 3mm respectively. The performance of reference antenna is optimizing using change the position of the slot on patch and ground plane and dimension is given in table 2. [3]

Table -1: Parameter of Reference Antenna (All the dimensions are in mm)

Lg	50	d1	1
Wg	50	d2	2.5
Lp	25	d3	3
Wp	25	g1	20
x	13.5	g2	3
y	6	xg	25
l1	2	yg	1
l2	8	Єr	4.4

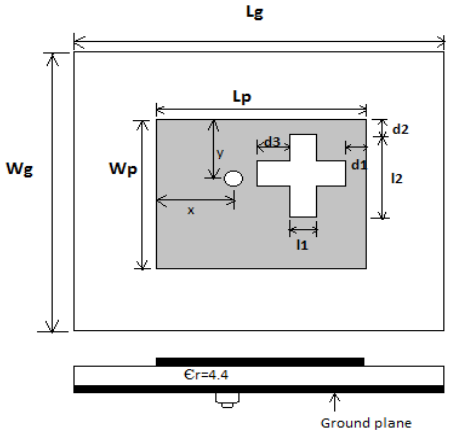

Figure 1: Top view of reference Antenna [3]

In the table -2 dimensions of the proposed antenna are given and bottom view of proposed antenna is shown in figure (3).The results of the proposed antenna are shown in figure (5) and figure (6).

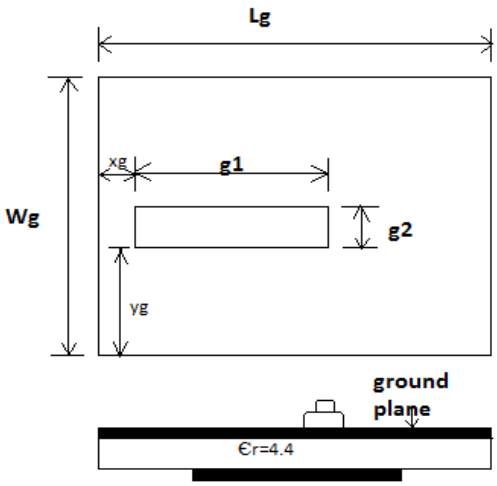

Fig -2: Bottom view of reference Antenna [3]

Table -2: Parameter of proposed Antenna (All the dimensions are in mm)

Lg	50	d1	1
Wg	50	d2	2.5
Lp	25	d3	3
Wp	25	g3	20
x	13.5	g4	3
y	6	xg1	11
l1	2	yg1	20
l2	8	€r	4.4

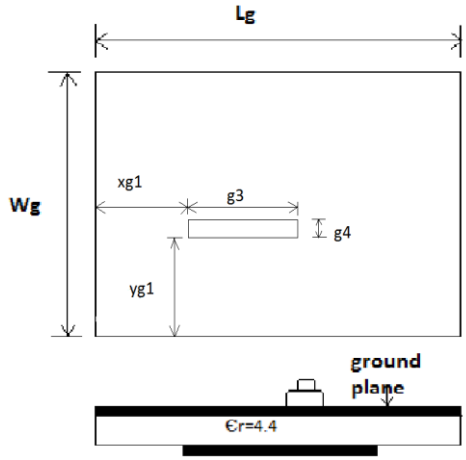

Figure 3: Bottom view of proposed antenna

3. RESULTS AND SIMULATION

The reference antenna is 25mm×25mm patch and a 50mm×50mm ground plane which is design to work as a reference antenna. The plot of reflection coefficient vs. frequency of reference antenna is shown in figure (4).

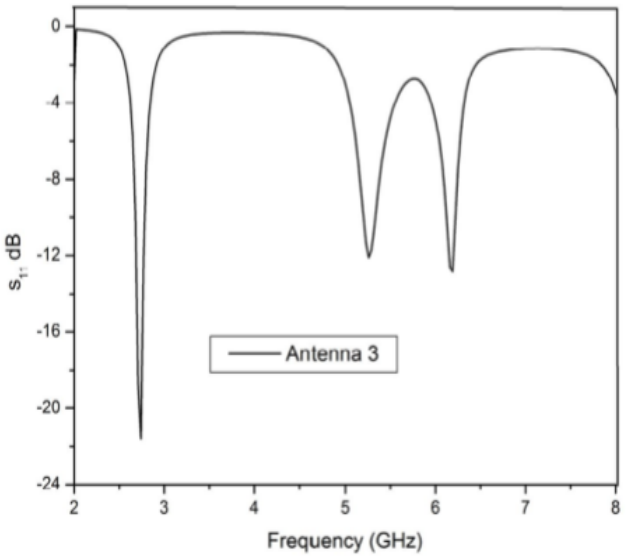

Fig -4: Plot of reflection coefficient vs frequency of reference Antenna [3]

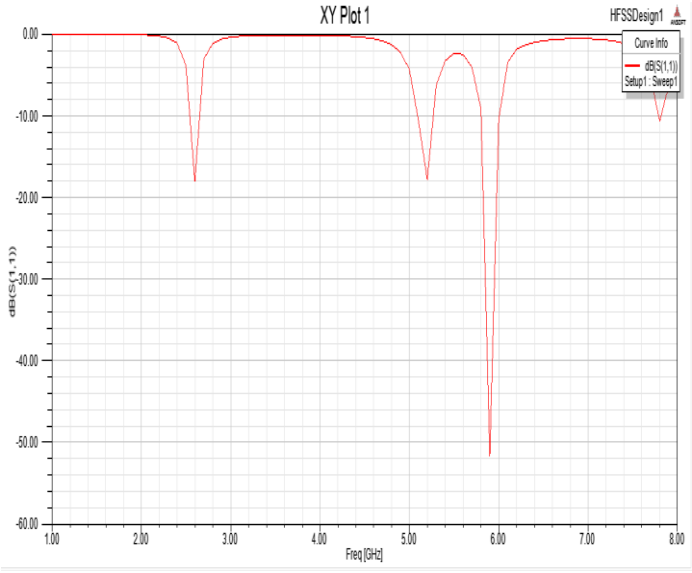

Figure 5: Plot of reflection coefficient vs frequency of proposed Antenna

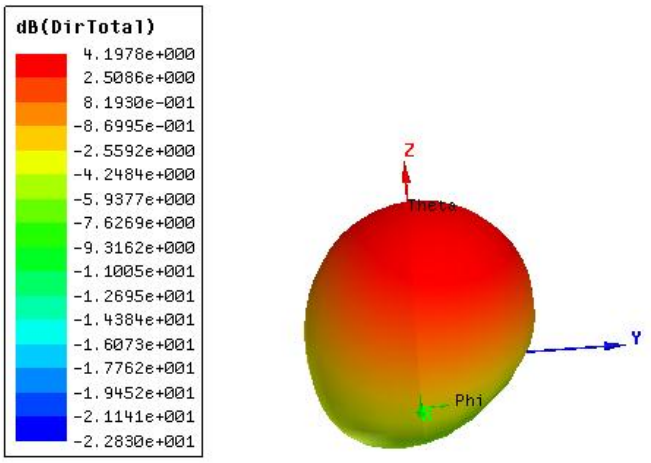

Fig -6: Directivity of proposed antenna

3.1 Cross slot in patch

After inserting a cross slot in patch it's create a slow wave effect and shifted in lower band frequency which is applicable for WLAN.

3.2 Rectangular slot in the ground plane

In this structure, the close-ended rectangular slot is inserted in the ground plane. The simulated reflection coefficient vs frequency plot is changed and we get a better-optimized result in proposed one. In proposed antenna -10dB impedance bandwidth are 2.54GHZ-2.65GHZ, 5.09GHZ-5.26GHZ and 5.80GHZ-6.0GHZ, which is applicable for WLAN.

4. CONCLUSIONS

The multiband, single feed, low profile and low-cost patch antenna are configured, simulated and measured. In this article close ended cross slot in the patch and rectangular slot in the ground plane is inserted. The simulation results show multiband characteristics at frequency 2.54GHZ - 2.65GHZ, 5.09GHZ - 5.26GHZ and 5.80GHZ - 6.0GHZ.These bands can be used for various wireless applications.

REFERENCES

[1] Constantine A. Balanis,"Antenna Theory-Analysis and Design", Second Edition, John Wiley and Sons, Inc.,1997.

[2] Ramesh Garg,"Microstrip Antenna design handbook", Artech house Antennas and propagation library, Inc.,2001.

[3] Bappadittya Roy, P. Das, Ankan Bhattacharya, A.K. Bhattacharjee, S.K. Chowdhury, "compact multiband rectangular antenna for wireless Application", IEEE, 2016.

[4] Ishita Sharma, Jatin Kumar, Jayatee Sarma, Prateek Kumar Singh, Ratnesh Dwivedi, Abhishek Kumar Jain," Multiband microstrip antenna with circular polarization for wireless communication", IEEE,2015.