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Design of Microstrip Antenna for WLAN Applications

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***Abstract*—In this paper micro strip antenna is considered as it is having small size less weight and compactness which makes it useful for WLAN and mobile application. There are various types of characteristics of antenna which would be changed as W/L ratio of antenna is to varied, we have considered three designs with three different aspect ratio and designs are simulated on IE3D (Integral equation three dimensional).**

Index Terms— **patch antenna, W/L, Efficiency ,IE3D**

I. INTRODUCTION

Introduction of Micro strip antenna [1] gives Birth to long distance communication iin1993 due to less weight small size and compact structure which makes it suitable for many wireless application [2] . For last four decades it is having huge popularity, the basic design of antenna consist of metal plate with ground plate followed by the substrate. Our design is also a rectangular micro strip antenna with metal plate and ground plate followed by the substrate of thickness 1.6mm.We used to consider three different designs with each having substrate of FR4 and having thickness of 1.6 mm. The basic design of antenna is shown in fig-1. The range of dielectric constant varies from 2.2 to 12 , we considered the FR4 because it gives good antenna characteristics and efficiency as compared to others .If we increase the substrate thickness then operating frequency is reduced and greater the thickness would result in fringing effect in the design which may degrades the performance of the antenna . so there is tradeoff between substrate dielectric constant and operating frequency .The another parameter is operating frequency we used to operate our antenna at 5.8GHz which is operating frequency of WLAN applications . This is the range in which wireless antenna for WIFI is worked . Another term is came that the type of feeding method for antenna, there are different types of feeding methods i.e. coaxial probe feed , microstrip line feed etc we are using here probe feeding method because it is less complex and give better antenna characteristics. The simulation of design is done on IE3D .It is a electromagnetic simulator which is a new technology to yield high accuracy analysis , its formally introduced in 1993 MTT-symposium and its main applications are RF printed circuits , antenna , high speed digital circuits and other electronic analysis. The best part of IE3D is that its becomes the most versitile , easy to use , efficient simulation tool.

II. DESIGN GEOMETRY OF PATCH ANTENNA

A. *Figures*

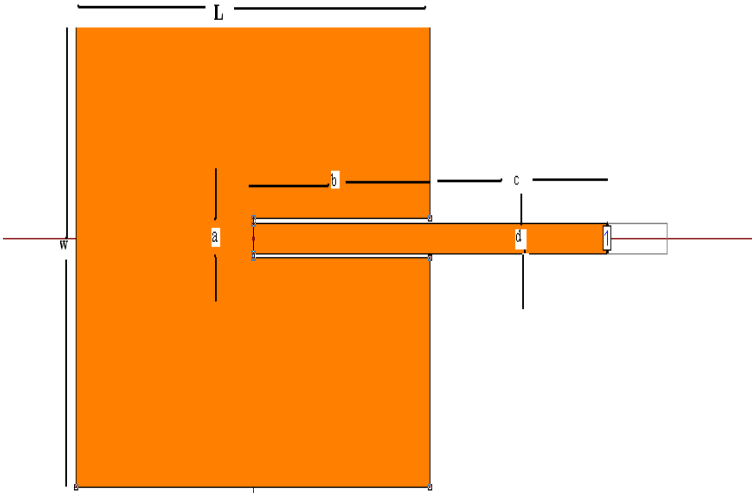

Fig .1 Basic Design of microstrip antenna

B. *Antenna modeling*

The basic model consist of three design with same dieectric constant i.e.FR4 . the feeding port is taken at the center point and having length equal to length of micro strip antenna and all the three design are operated on 5.8Ghz frequency

Table -1 shows the dimension of all the three design

Design	Patch length(mm)	Patch width(mm)	Dielectric constant of material	Frequency(i n Ghz)
1	49	51	4.4	5.8
2	51	49	4.4	5.8
3	50	50	4.4	5.8

The common dimension of micro strip antenna for all the three designs are shown in table-2

Table -2 common dimension of all the three design

Design	a (mm)	b (mm)	c(mm)	d(mm)
1	4	24.5	24.5	3
2	4	25.5	25.5	3
3	4	25	25	3

C. *Method of feeding*

The feeding method is the important factor on which antenna characteristics were depends , In our designs we use coaxial probe feed with matching impedence the less matching of antenna port and feeding port causes irregular radiations.
And the basic structure of coaxial microstrip feed is shown infig.3

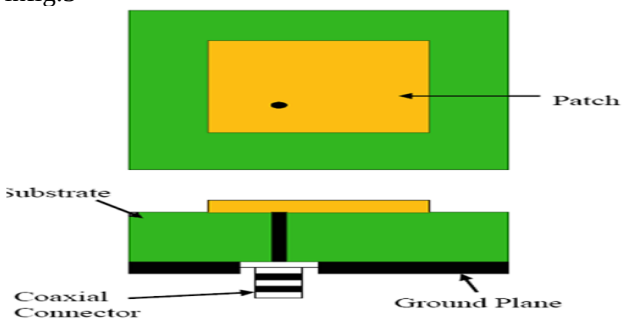

fig.3 coaxial feed

III. ANALYSIS OF ANTENNA

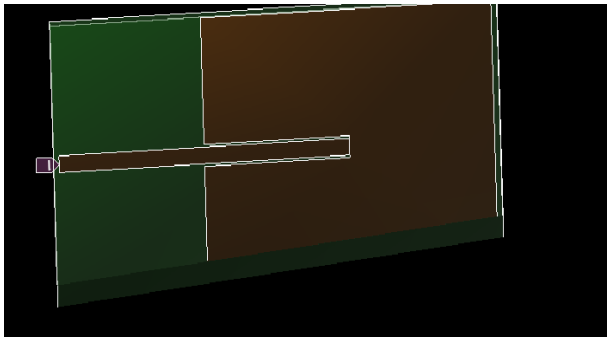

Fig .2 3D geometry of microstrip antenna

The analysis of micro strip antenna is shown by 3 dimensional geometry .Three dimensional geometry of micro strip antenna consist of three axis (i.e. X ,Y,Z) view of micro strip antenna the 3 dimensional view is taken on IE3D software by giving dimension and type of substrate The inward arrow shows the feeding port of antenna

IV. STIMULATED RESULTS

It is observed that as W/L ratio <1 or W/L=1 the efficiency is less as compared to the W/L>1 . the most effective design from above is design -1, and resonating frequency of 5.8Ghz which is choose for fr4 substrate and result in higher efficiency and low loss. The Efficiency versus frequency relation of all three design are shown in figures as follows

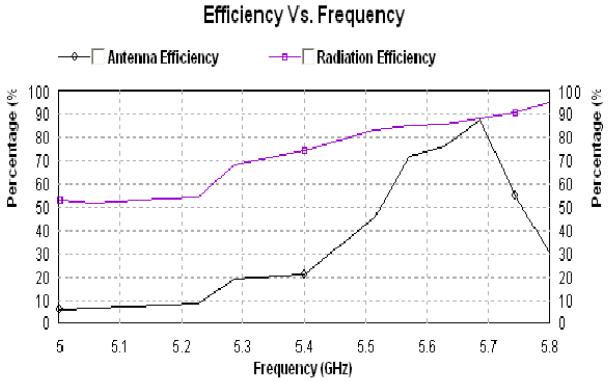

fig. 4 Efficiency of Design -1

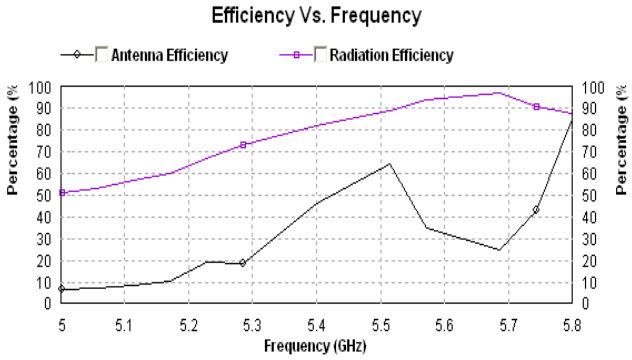

Fig-5 Efficiency of Design -2

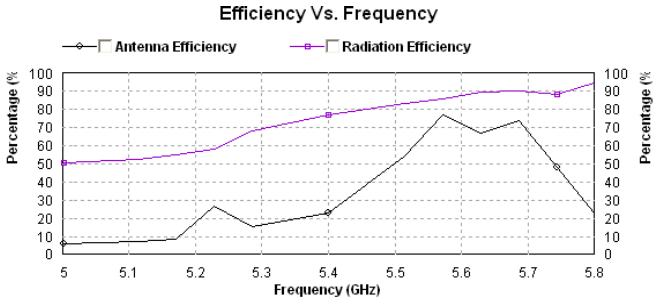

Fig -6 Efficienxy of Design -3

Design	W/L	Effeciency(%)
1	>1	98
2	<1	89
3	=1	95

Table .3 Results of Microstrip antenna

V. CONCLUSION

This technique for enhancing the efficiency of antenna has been proposed for WLAN application , And for increasing the efficiency of antenna for a particular resonating frequency 5.8 Ghz. And the width to length ratio must be greater than one i.e. W/L>1 for better efficiency and other characteristics of .the antenna .The disadvantage is that increases the height of the antenna causing trade of issues in the various parameters of the antenna.

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