REVIEW ON RECTANGULAR SHAPED MICRO-STRIP PATCH ANTENNA (RMSA) WLAN

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ABSTRACT

This paper highlights on the review of design of Micro-strip patch Antenna(MSA). We havealready analyzed Micro-strip patch antennaswith different variations of patch length, width, variations in dimensions of feed line and variations in dimensions of substrate. Theproposedreview of Rectangular Microstrip Antenna includes the required impedance bandwidth,necessary for dual-band (2.4 GHz and 5.1 GHz) forWLAN application. RMSA which are simulated using Ansoft HFSSand the results such as Return loss, VSWR etc. are reviewed.

Index Terms: WLAN, wireless communication.

I. INTRODUCTION

Microstrip Patch Antenna designed using various structures are reviewed and thus studied and compared.

Conventional MSA (Microstrip Antenna) in general has a conducting patch printed on a grounded microwave substrate and have the attractive features of low profile, light weight, easy fabrication etc.

In first part of paper we have designed rectangular shaped microstrip patch antenna at 2.4 GHz and simulated with ANSOFT HFSS.

In second part, the hardware prototype is designed with photolithographic process and its parameters like VSWR, return losss and smith chart are observed on vector network analyzer.

In third part, we compared the MSA based on various parameters.

II. Antenna Design

RMSAntenna Dimensions:

The proposed MS Patch Antenna has following parameters :

Patch:Width:28.8(mm),Length:37.7(mm),Height:0.05(mm)

Substrate:- Width :80(mm), Length :75(mm), Height:1.6(mm)

Ground:Width:80(mm)Length:75(mm),Height: 0.05(mm)

Air Box:- Width:100(mm), Length:100(mm), Height:35(mm)

Feed line:- Width :3(mm),Length:9(mm), Height:0.05(mm)

Port:-Width:3(mm), Length:1.65(mm).

And we are Comparing this antenna with **Compact Dual Band** [2.4 GHz and 5.1 GHz]**Microstrip Antenna** for WLAN [1].

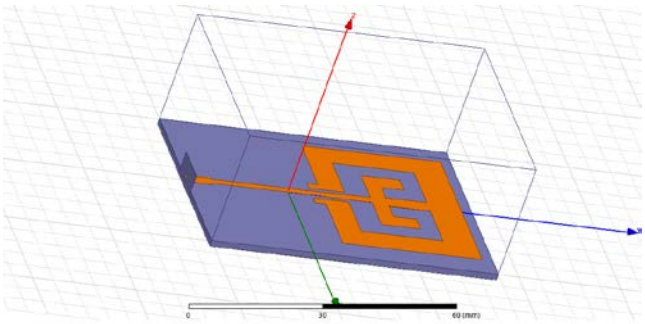

Fig: 1. **'Dual Band Microstrip Antenna'** simulated using HFSS for [2.4 and 5.1 GHz].

II Software Simulation

A. Simulation Results of RMSA:

From simulation of RMSA, the Return loss , VSWR and smith chartand radiation patternare observed as below:

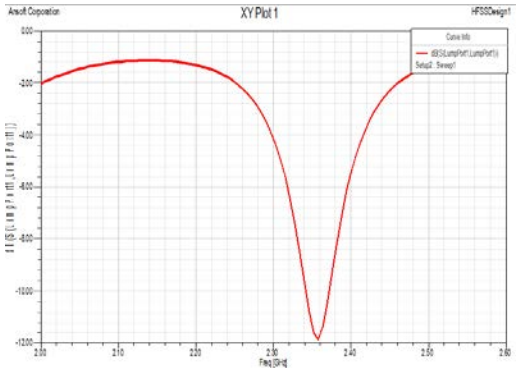

Fig: 2 Return Loss(S11 Parameter)

As shown in above fig..2, the return loss has a single band for WLAN.

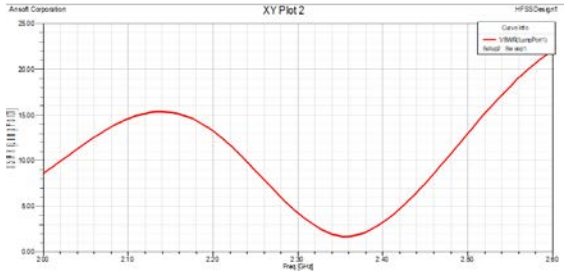

Fig: 3 VSWR

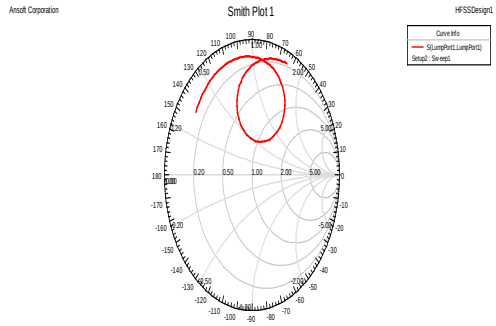

Fig4: Smith Chart

The Omni-Directional radiation pattern is observed as below:

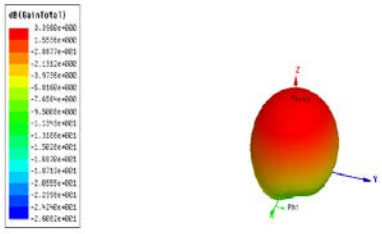

Fig5 : Polar radiation plot

B. Review on Simulalated results of *"Dual Band Microstrip Antenna":*

We reviewed the '***Double band Microstrip Antenna' with simulated results such as*** Return loss, VSWR and smith chart and radiation pattern are studied.

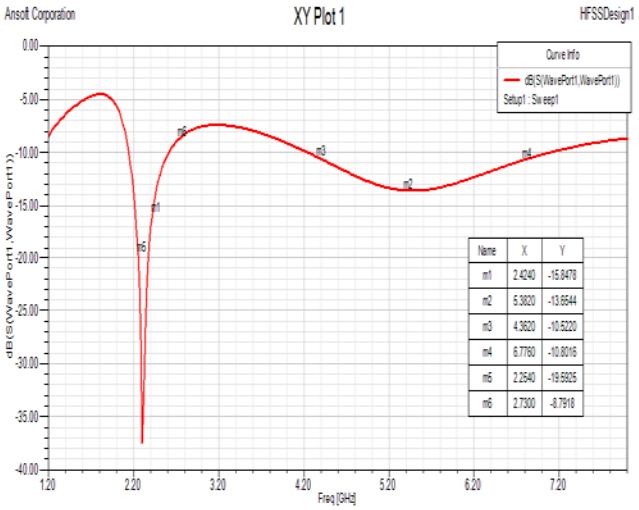

Fig 5: S11 paramenter of 'MSPA *Microstrip Antenna'*

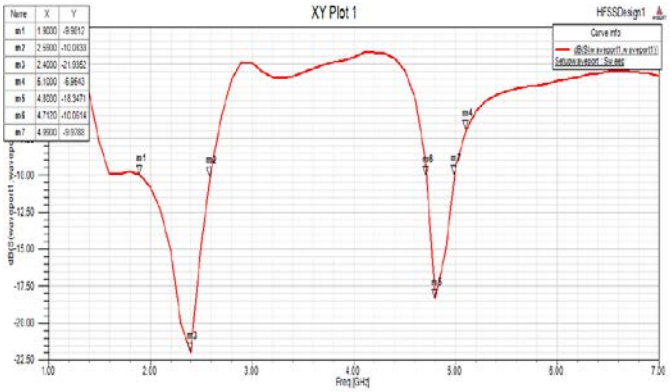

Fig 6: Return Loss(S11 Parameter) of ***Dual Band Microstrip*** with improved return loss

Whereas the above fig.6 shows two bands for WLAN.

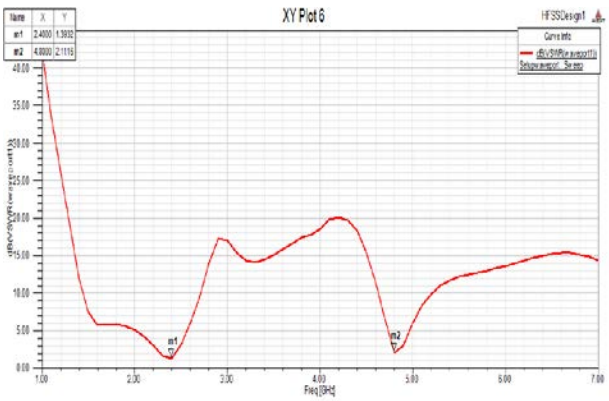

Fig.7: VSWR of '***Dual Band Microstrip Antenna'***

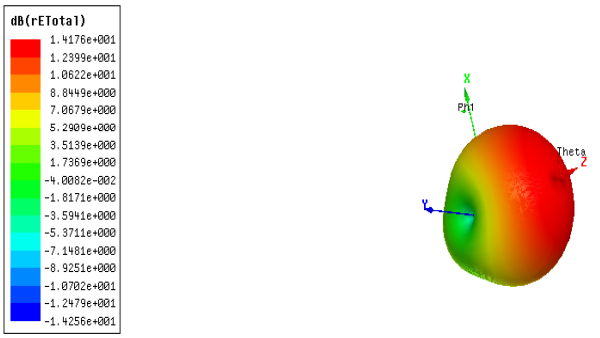

Fig8: Polar radiation plotof ***Dual Band Microstrip Antenna'***

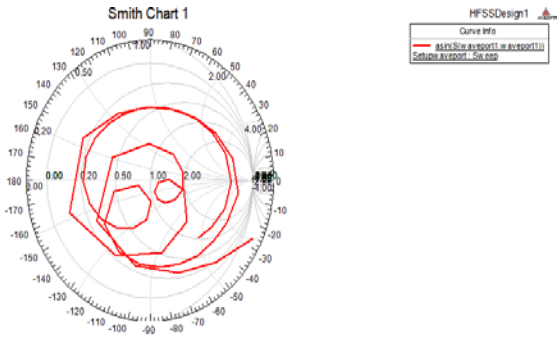

Fig.9: Smith Chart of ***Dual Band Microstrip Antenna'***

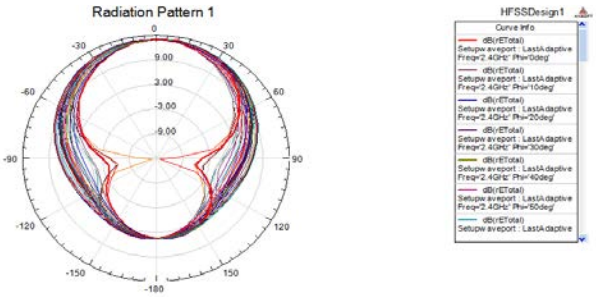

Fig 12: Omni-directional radiation of '***Dual Band Microstrip Antenna'***

1. **Calculations for '*Rectangular Microstrip Antenna':***

A From Fig.2, at mark m1, the frequency is equal to 2.256 GHz and mark m2,the frequency is 2.441 GHz.

Therefore the **Impedance Bandwidth** is

Band Width = (2.441-2.256) GHz
= 0.185 GHz**= *185 MHz***

Review for '*Dual Band Microstrip Antenna'*

Fig 6, Lower frequency fc1=2.4GHz with return loss= -15dB .

Similarly the %BW for lower central frequency fc1=m1=2.4GHz, can calculated as :

Impedance Bandwidth = fmax – fmin
=(2.6GHz- 2.15GHz)
=0.45GHZ

%BW= (fmax - fmin)*100/ fc1

% BW = (2.6GHz- 2.15GHz) *100 /2.4GHz

%BW=19%

Thus the %Bandwidths for Dual band Omnidirectional MSA can be improved and thus we can say that it may be **used for UWB operation** , and also **the Return loss can be reduced upto -35dB.**

"We know that if percentage bandwidth is greater than 25%, then its called as Ultra Wide Band."

Here the S11 Parameter is -33.15dB at mark m3

i.e. Center Frequency Fc=2.414703 GHz

To get Impedance Bandwidthfor Higher Frequency [5.1 GHz]:

Consider the higher frequency band in ***Dual Band Microstrip Antenna' f***rom fig.6 , the Higher frequency fc2=5.3GHz with return loss= -13dB.

The value f_{max} = m_4= 6.77GHzand the value of f_{min}=m_3=4.36GHzand fc_2= 5.2GHz

Impedance bandwidth= f_{max} - f_{min}
=6.77GHz – 4.33GHz =***2.4 GHz***

Therefore %BW is given bym, **%BW=(f_{max} - f_{min})*100/ f_{c2}**

% BW = 2.4GHz*100 /5.2GHz Hence **% BW = 46%**

The Comparision of 'RMSA' and 'Dual Band MSA, is given in Table.1 , below

Type of Microstrip Antenna	**Impedance Bandwidth**	**Return Loss**	**Resonating Frequincies**
Rectangular Micro-strip Antenna	**185MHz**	-19dB	**2.414GHz**
Dual Band Microstrip Antenna'	**450MHz**	-33.1dB	**2.4GHz**
	2400MHz	**-13dB**	**5.1GHz**

Table 1. : Review values of 'RMSA' and 'Dual Band MSA,

III. Hardware Implementation and Comparison of results

A. Hard Ware of RMSA:

The RMSA is designed with Photolithographic process shown
in figure 7.

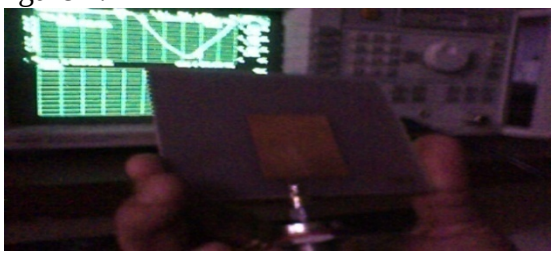

Fig10 : Hardware Prototypeof ***RMSA***

B. Hardware of '*Dual Band Microstrip Antenna*'

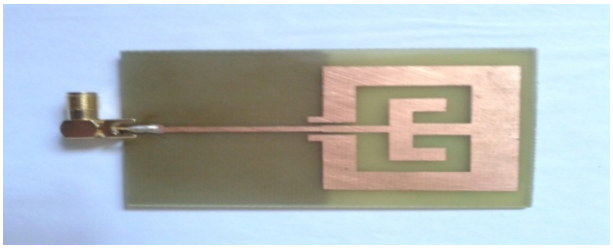

Fig 11: H/W of Dual Band Microstrip Antenna'

Hardware results of RMSA

The ***RMSA*** is analyzed usingAgilant Technologies Network Analyzer (Serial Number-8714ET) the practical values such as return loss, SWR etcare observed.

Fig 12**:** S11 parameter of ***RMSA***with Network Analyzer.

Fig 13: Measured Smith Chart of ***RMSA***

The smith chart is as shown above.

Fig 14:Measured VSWR of ***R***

III. CONCLUSIONS

Thusreview of rectangular microstrip patch antennas at 2.4 GHzare simulated, designed and also tested for various parameters like SWR, S11, etc using network analyzer.

The observed and simulated results are studied with parametric analysis of antenna is carried out. Here achieved ***185 MHz*** bandwidth with centrefrequency at 2.414 GHz for ***RMSA can be used for WLAN***

Here the two different *Band Microstrip Antenna* is having better impedance Bandwidth and it resonates at 2.4 GHz and 5.1GHz . Which can be used for WLAN.

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