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Effect on Bandwidth by Changing Feed point On MSA

Jai Prakash Thakural, Reena Tomar, Sweta Gautam, Sandeep Kumar

***Abstract*— The basic Microstrip patch antenna consists of a thin metallic patch separated from the ground plane by a dielectric layer usually used at microwave frequencies. The Microstrip antenna, because of its small size, light weight, low profile, and low manufacturing cost is finding increasing applications in the industry. This paper briefly describes some of the features of the patch antenna and presents several examples of the antenna's commercial applications such as Mobile satellite communication, Direct broadcast system, Global positioning system, Medical hypherthermia.in here we desinged a patch at 3GHz frequency,and find various bandwidth at different feed point.in this work we obtained 40% bandwidth frequency range 2 to 2.9 GHZ.**

***Index Terms*— Microstrip antenna, Feed point, Bandwidth,Return Loss,**

I. Introduction

A microstrip antenna is characterized by its Length, Width, Input impedance, and Gain and radiation patterns. Various parameters of the microstrip antenna and its design considerations were discussed in the subsequent chapters. The A microstrip antenna consists of conducting patch on a ground plane separated by dielectric substrate. This concept was undeveloped until the revolution in electronic circuit miniaturization and large-scale integration in 1970. After that many authors have described the radiation from the ground plane by a dielectric substrate for different configurations. The early work of Munson on micro strip antennas for use as a low profile flush mounted antennas on rockets and missiles showed that this was a practical concept for use in many antenna system problems. Various mathematical models were developed for this antenna and its applications were extended to many other fields. The number of papers, articles published in the journals for the last ten years, on these antennas shows the importance gained by them. The micro strip antennas are the present day antenna designer's choice. Low dielectric constant substrates are generally preferred for maximum radiation. The conducting patch can take any shape but rectangular and circular configurations are the most length of the antenna is nearly half wavelength in the dielectric; it is a very critical parameter, which governs the resonant frequency of the antenna. There are no hard and fast rules to find the width of the patch.

Jai Prakash Thakural, Scholar Eshan College of Engineering,Farah Mathura
Reena Tomar, Scholar Eshan College of Engineering,Farah Mathura
Sweta Gautam, Scholar Eshan College of Engineering,Farah Mathura
Sandeep Kumar, Scholar Eshan College of Engineering,Farah Mathura

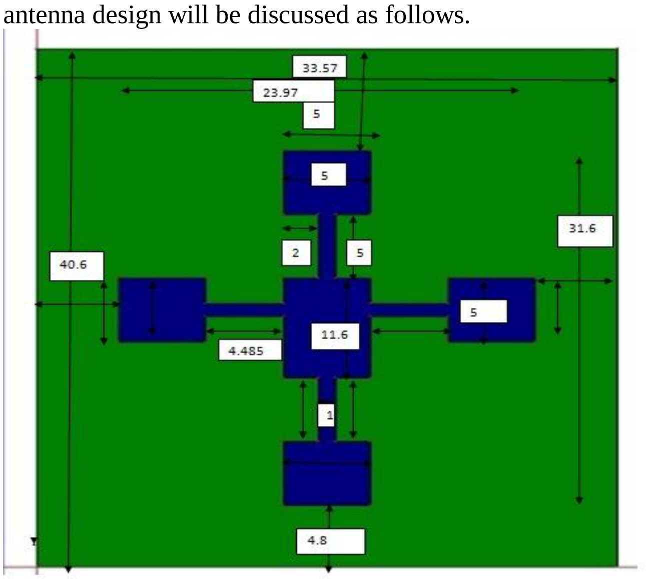
A microstrip patch antenna consists of a radiating patch on one side of the dielectric substrate with a ground plane on the other side. These antennas are characterized by

- Radiation polar pattern
- Directivity
- Efficiency
- Gain
- Equivalent area
- Reciprocity
- Noise power (receiving)
- Terminal impedance, including radiation resistance
- Bandwidth and Q-factor

These antennas have found increasing applications in different fields like, mobile communication system, Global Positioning System, medicine, military applications, Direct Broadcast Satellite (DBS) system, etc. because of its advantages like low profile, small size, light weight, low manufacturing cost etc.

II. .DESIGN OF MICROSTRIP PATCH ANTENNA:

The geometry of the proposed dual-band antenna is based on the microstrip antenna technique which is the most popular because of the ease of analysis and fabrication.For its simple structure, the proposed antenna can be easily simulated by IE3D simulator. Some useful guidelines for the antenna design will be discussed as follows.



Design of proposed antenna (Fig 1)

The proposed structure of the antenna is printed on an epoxy substrate with dielectric constant of 4.2 and loss tangent of .001 .The operation is done at 3Ghz frequency and height of a substrate is 1.6mm. For the simulation we are used the IE3D v 9.0 software.

Table 1: Design Parameters Of Proposed Antenna	
Antenna Parameters	Dimension in mm
H	1.6
W_g	40.6
L_g	33.57
W_p	31
L_p	23.97
K_1& K_2	8.445
LOSS TANGENT	0.002
DIELECTRIC CONSTANT	4.2

A. Calculation of the Width (W):

The width of the Microstrip patch antenna is given by equation (3.6) as:

$$W = \frac{c}{2 f_r \sqrt{\frac{\varepsilon_r + 1}{2}}} \quad (3.1)$$

Substituting c = 3e8 m/s, ε_r = 4.2 and f_r = 3 GHz, we get:

***W* = 0.03100 m = 31.00 mm**

B. Calculation of Effective dielectric constant (ε_{reff}):

Equation (3.1) gives the effective dielectric constant as:

$$\varepsilon_{reff} = \frac{\varepsilon_r + 1}{2} + \frac{\frac{\varepsilon_r - 1}{2}}{\sqrt{\left[1 + 12\frac{h}{W}\right]}} \quad (3.2)$$

Substituting r ε = 4.2, W = 31.0 mm and h = 1.6 mm we get:

ε_{reff} **= 3.86**

C. Calculation of the Effective length (L_{eff}):

Equation (3.4) gives the effective length as:

$$L_{eff} = \frac{c}{2 f_r \sqrt{\varepsilon_{reff}}} \quad (3.3)$$

Substituting ε_{reff}=3.86, c = 3e8 m/s and f_r = 3 GHz we get:

L_{eff} = 25.44mm

D. Calculation of the length extension (ΔL):

Equation (3.2) gives the length extension as

$$\Delta L = 0.412h \frac{(\varepsilon_{reff} + 0.3)(\frac{W}{h} + 0.264)}{(\varepsilon_{reff} - 0.258)(\frac{W}{h} + 0.8)} \quad (3.4)$$

Substituting ε $reff$ = 3.86, W = 31.0 mm and h = 1.6 mm we get:

ΔL = .7421 = 7.421mm

E. Calculation of actual length of patch (L):

The actual length is obtained by re-writing equation (3.3) as:

$$L = L_{eff} - 2\Delta L \quad (3.5)$$

Substituting L_{eff} = 25.44 mm and ΔL = 7.421 mm we get:

***L* = 23.97 mm**

F. Calculation of the ground plane dimensions (L_g and W_g):

The transmission line model is applicable to infinite ground planes only. However, for practical considerations, it is essential to have a finite ground plane. It has been shown by [9] that similar results for finite and infinite ground plane can be obtained if the size of the ground plane is greater than the patch dimensions by approximately six times the substrate thickness all around the periphery. Hence, for this design, the ground plane dimensions would be given as:

$$L_g = 6h + L = 6(1.6) + 23.97 = 33.57mm \quad (3.6)$$

$$W_g = 6h + L = 6(1.6) + 31 = 40.6mm \quad (3.7)$$

III. RESULTS

Coaxial probe feeding is feeding method in which that the inner conductor of the coaxial is attached to the radiation patch of the antenna while the outer conductor is connected to the ground plane. Advantages of coaxial feeding are easy of fabrication, easy to match, low spurious radiation.The MSA antennas specified above has been analysed by the zeland IE3D evaluation version 12.32.For RMSA design used glass epoxy which is Teflon based, microstrip board with dielectric constant 4.2 and the substrate height is 1.6 mm, and loss tangent is 0.002. The properties of antenna such as bandwidth, S-Parameter has been investigated and compared between different feed points.

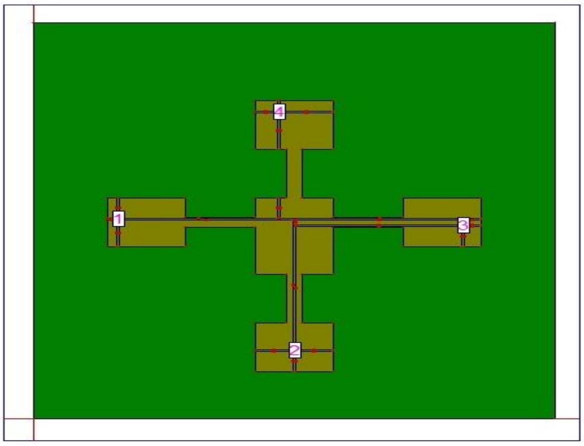


Figure2. Different feed points on proposed antenna

Now we have to change the value of the feed point which shows the improvement in return losses(S11 parameter) Bandwidth & VSWR without changing any other parameter, then we get the following results.

Feed points	1	2	3	4
X	5.45	16.8	27.625	15.8
Y	20.45	6.95	19.8	31.45
Return Loss	22	20	17	26
Bandwidth	40%	12.76%	40%	12%

Table.1 Performance table at different feed point

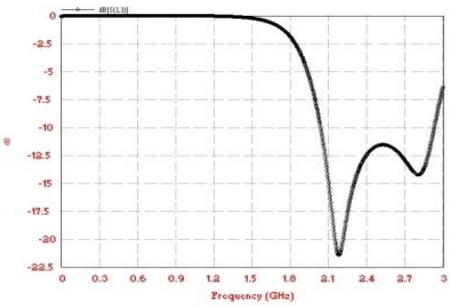


Figure.3 1st Feed Point X= 5.45,Y=20.45

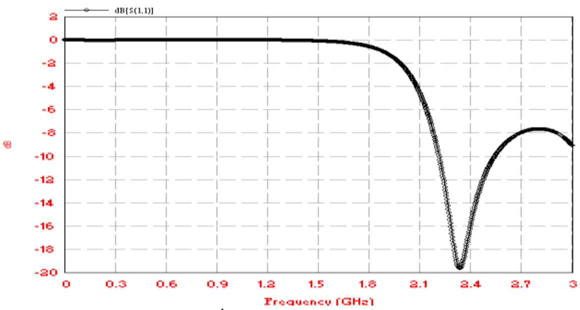


Figure.4 2st Feed Point X= 16.8,Y=6.95

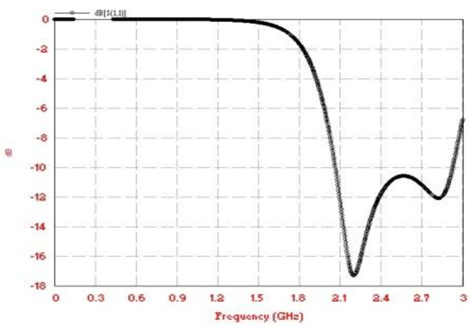


Figure.5 3st Feed Point X= 27.62,Y=19.8

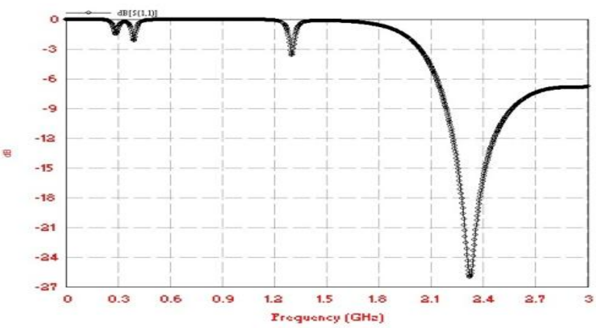
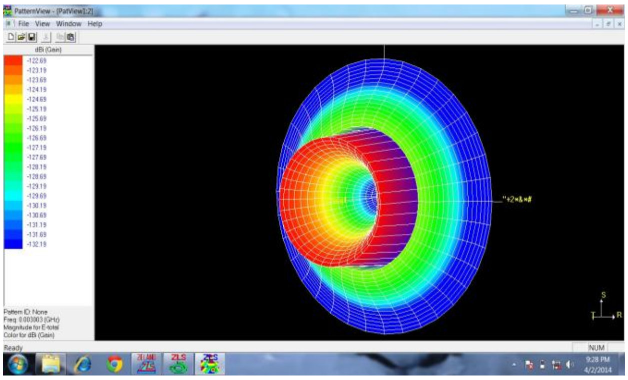


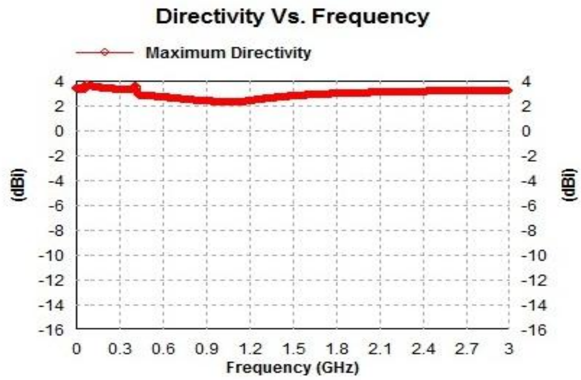
Figure.6 4st Feed Point X= 15.8,Y=31.45

IV. RDIATION PATTERN

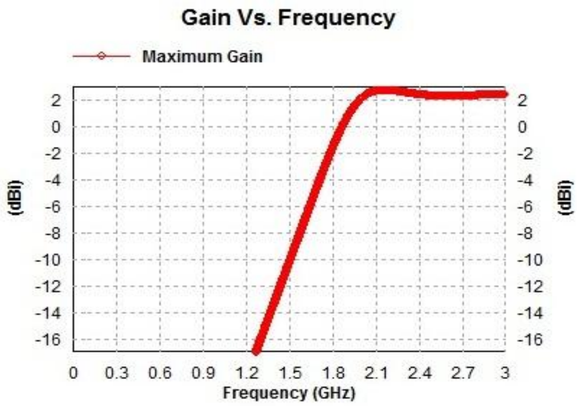
A radiation pattern defines the variation of the power radiated by an antenna as a function of the direction away from the antenna. This power variation as a function of the arrival angle is observed in the far field.



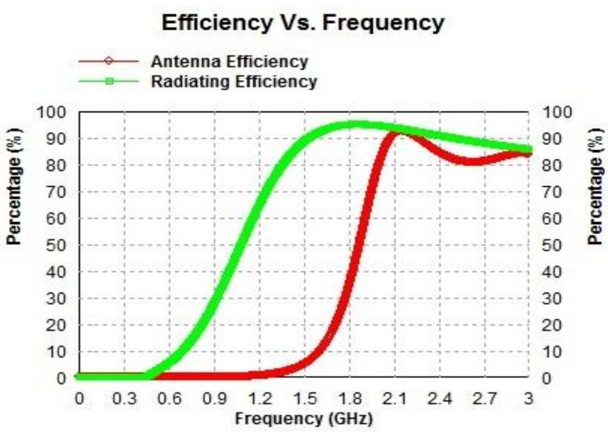
Radiation Pattern (Fig 7)



Directivity v/s frequency(8)

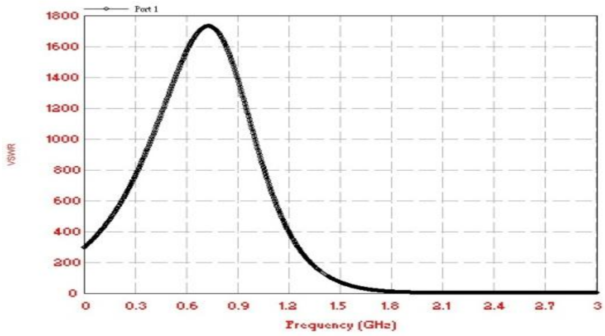


Gain v/s frequency(9)

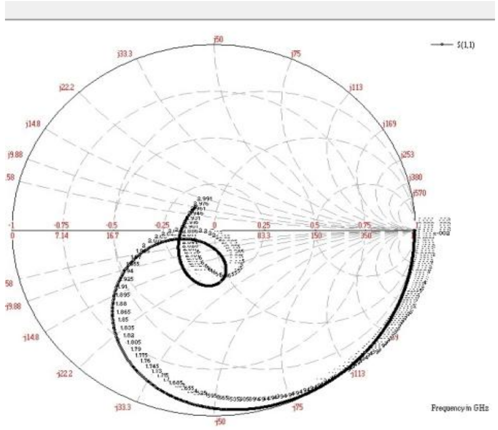


Efficiency v/s frequency (Fig 10)

V. VSWR AND SMITH CHART:



VSWR (Fig 11)



Smith Chart (Fig 12)

VI. APPLICATIONS:

FREQUENCY RANGE	NAME OF APPLICATION	FEED POINT
2.31 to 2.36 GHZ	Digital audio radio satellite(DARS)	1 and 3
2.7 to 2.7	Direct to home satellite	1 and 3
2.45 GHZ	Microwave oven	All feed points
2 to 2.2 GHZ	Mobile satellite service	All feed points
2.6 GHZ	Mobile tv ,satellite radio	1 and 3
1.98 to 2.01	Earth to space communication	1 and 3
2.17 to 2.2 GHZ	Space to earth communication	All feed point
2.4 GHZ	IEEE 802.11b and IEEE 802.11g	All feed points
2.4 to 2.483GHZ	Cordless phones,video senders, WLAN	All feed points
2.4 to 2.483GHZ	Wireless headphones	All feed points
2.402 -2.480 GHZ	Bluetooth	All feed points
2.4 GHZ	Amateur radio	All feed points
3 GHZ	Amateur satellite	1 and 3
1.575GHZ	GPS	Point 4
2.4 GHZ	Wi-fi	All feed points

VII. CONCLUSION:

In the above work we have found that by changing the value of feed point coordinates and keeping other parameters constant, it is seen that as the value of return losses(S11 parameter) and Bandwidth is improves. It suggests that the microstrip antenna performance can be upgraded concerning the feed type, the size of the patch and the

VIII. VARIOUS APPLICATIONS AT DIFFERENT FREQUENCIES

substrate used. Compactness of microstrip patch antenna can be achieved. This concept is used in designing miniaturized

microstrip patch antenna.Fom the above table we can conclude that our proposed antenna is very use full for various application such as Bluetooth,W-fi GPS,Wireless Less headphones etc.

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Main Authors Details:

+91-9557435201 (Sweta Gautam)
+91-8923313463(Reena Tomar)