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Design and Simulation of Multiband Microstrip Antenna Fed by SMA Coaxial Probe Technique for Wireless Communication

Sandeep Thakur

Assistant Professor
MGMCET Kamothe,Navi Mumbai
Sandeepatism@gmail.com

Abstract

In this paper we proposed a multi band antenna in which fed is provided by SMA Coaxial Probe. This antenna is contain circular patch and Microstrip line. Using Microstrip line and providing different feed the antenna provide different frequency band. These are 1.2-1.4GHz, 1.6-1.7GHz and 2.1 to 10.7GHz. In this paper we design and simulated antenna use for different application. Here we use FR4 substrate for the design of antenna. The simulation of our proposed design is done with the help of full wave electromagnetic software which is based on FIT.

***Keywords**: Circular Diaphragm , MATLAB , Observer Unit , Sensitivity ,Sensor*

1. Introduction

With the advancement of technology the need of multiband antenna is increasing in many kind of wireless communication system. Various kind of antenna can be made using Microstrip feed line. By the addition of extra element to the patch , a Microstrip fed multi-band antenna was presented [1].MSAs are widely used because of their planar structure, light weight and moderate efficiency and compatibility with active devices. Maximum all types of wireless communication lies in the band fromm 900Mhz to 5.5 Ghz which also includes GPS<GSM,PCS and DCS.However the MSAs with normal ground plane offers narrow bandwidth [2].various technique has been already proposed by researcher to improve gain, bandwidth *etc.*, of MSAs by using different kind of structure like cutting slots, patch edges, using shorting pins etc.Compact antenna with multiband performance including dipole antenna, monopole antenna and planner antenna configuration has been presented [3]. Multiband operation can be achieved by using various types of structure as well as various kind of feed.

This paper is divided into five section. First section deals with introduction. Second section describe the theory and working principle. Third section describe the design of proposed antenna. Fifth section describe the various simulation results. And last section deals with conclusion.

2. Theory

Multiband antenna can be designed using coaxial feed [4].In this paper we proposed a simple multiband antenna. This antenna have three band and it consist of circular patch ,Microstrip line and fed is provided by using SMA coaxial probe. The circular patch is fed by various three probes which are connected to Microstrip line. Our antenna cover three bands which are 1.2-1.4GHz,1.6-1.7GHz and 2.1 to 10.7GHz.In this paper we analyze radiation pattern at different frequencies and the gain across operating bandwidth.

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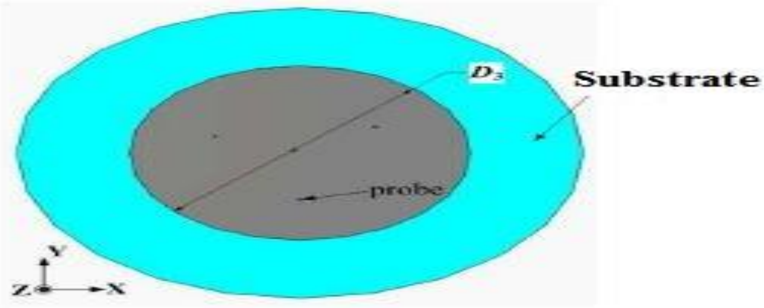

Figure 1(a). Structure of Proposed Antenna

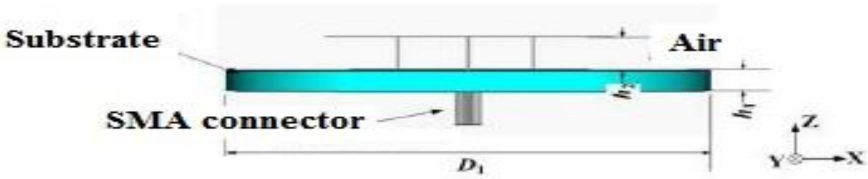

Figure 1(b). Structure of Proposed Antenna

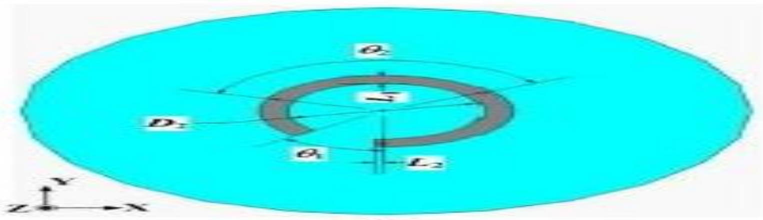

Figure 1(c): Structure of Proposed Antenna

3. Design of Antenna

The structure of proposed antenna already shown in Figure 1. The antenna contain three layer of conductor which include radiating patch [5-6], Microstrip feed line and ground plane. The Microstrip line is fabricated using FR4 with a diameter D_1 = 150mm,thickness h_1=3mm,relative permittivity ε_r= 4.4. The inner diameter and with are D_2=40mm and L_1=5.8mm. The loop has a $\theta_1 = 46^0$ and it is connected with rectangular metal. The antenna is fed by SMA probe which is placed 22.9mm away from center along y-axis and connected to Microstrip line. The Table 1 provide detail description about parameter used for our proposed antenna [7-8].

Table 1. Parameter Used

Sr. No.	Parameter	Value of Parameter
1.	D_1	150mm
2.	D_2	40mm
3.	D_3	90mm
4.	h_1	3mm
5.	h_2	5mm
6.	L_1	5.8mm
7.	L_2	2mm

8.	ε_r	4.4
9.	θ_1	46^o

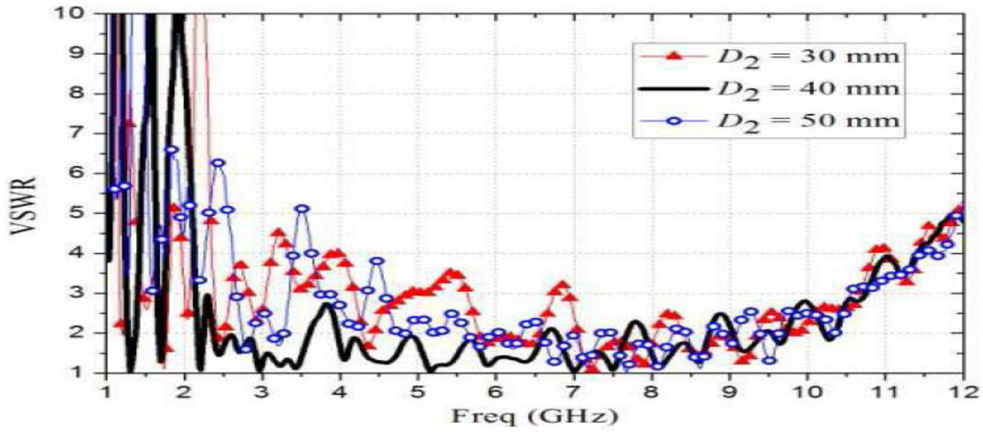

Figure 2(a). VSWR Variation for Different Value of D_2

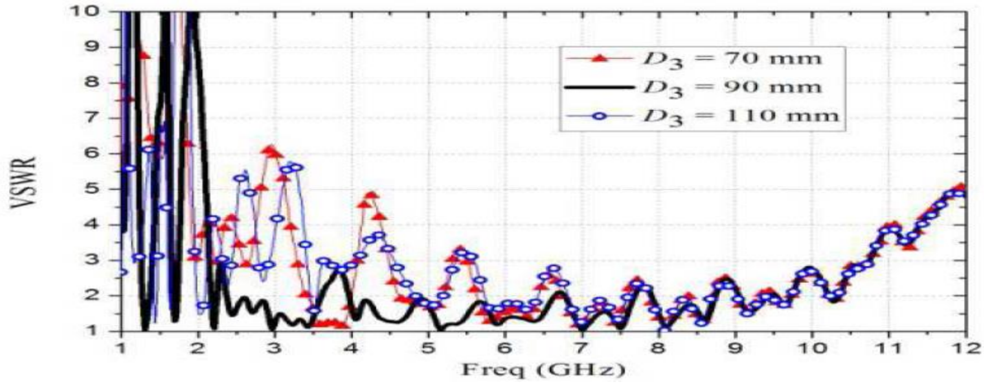

Figure 2(b). VSWR Variation for Different Value of D_3

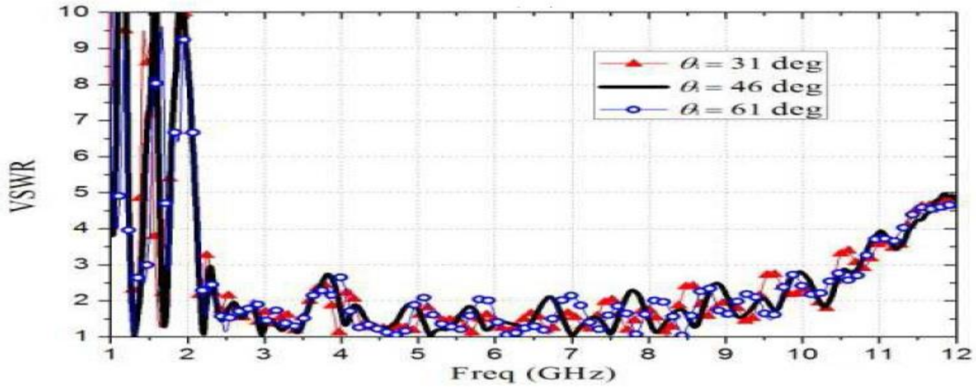

Figure 2(c). VSWR Variation for Different Value of θ_1

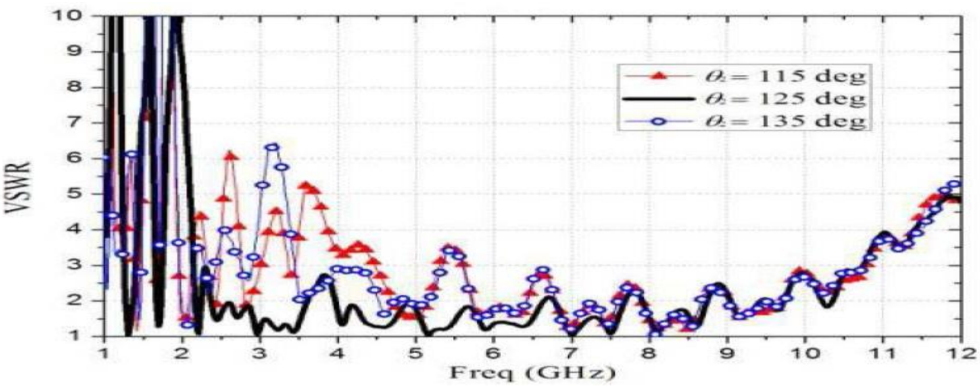

Figure 2(c). VSWR Variation for Different Value of θ_2

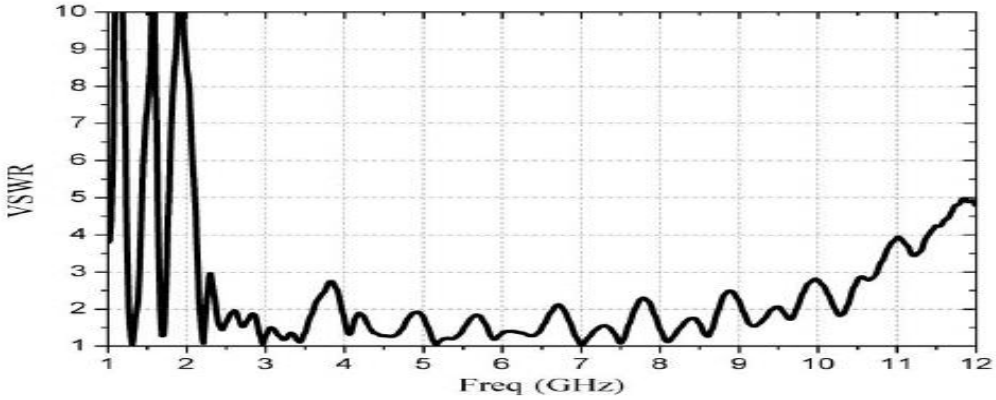

Figure 3. VSWR of Proposed Antenna

4. Results and Discussion

From above Figure 2, it is clearly shown that the impedance bandwidth is greatly depends upon the value of D_2andD_3. If we increasing or narrowing these parameter then the impedance bandwidth will reduce. Figure 2(c), and Figure 2(d), show the effect of angle on impedance matching. It is shown in the Figure 2(c), that angle θ_1 affect more the performance of frequency band [8].

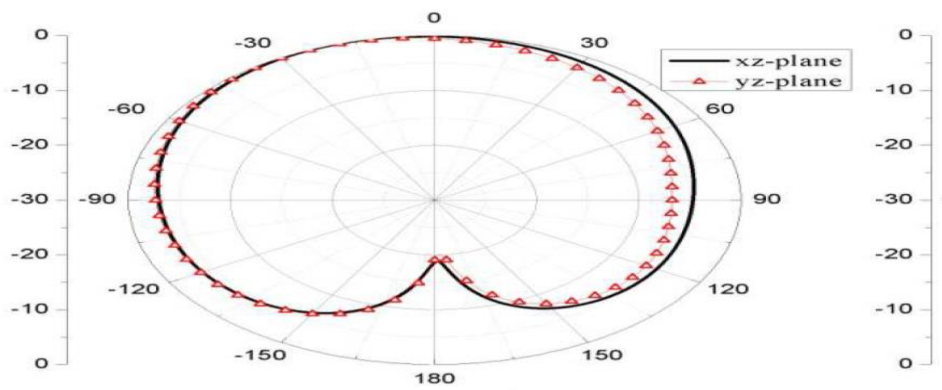

Figure 4. Radiation Pattern of Antenna at 1.3GHz

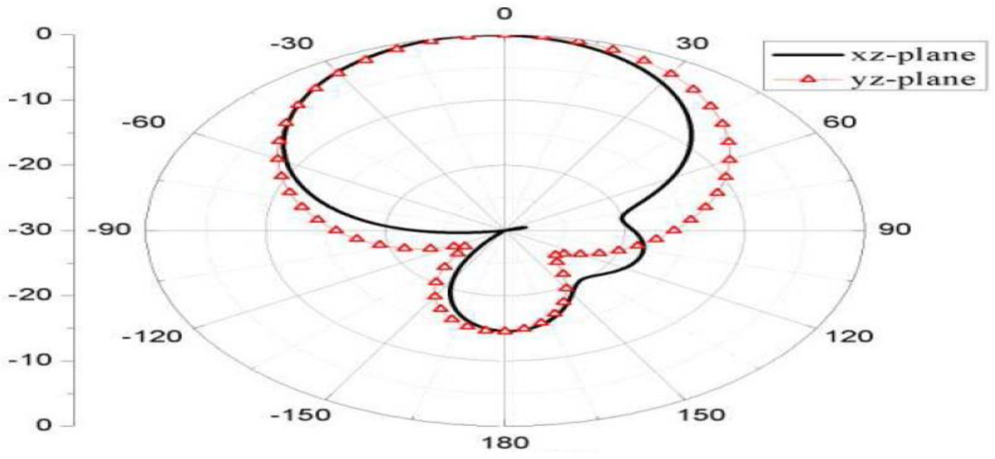

Figure 5. Radiation Pattern of Antenna at 1.6GHz

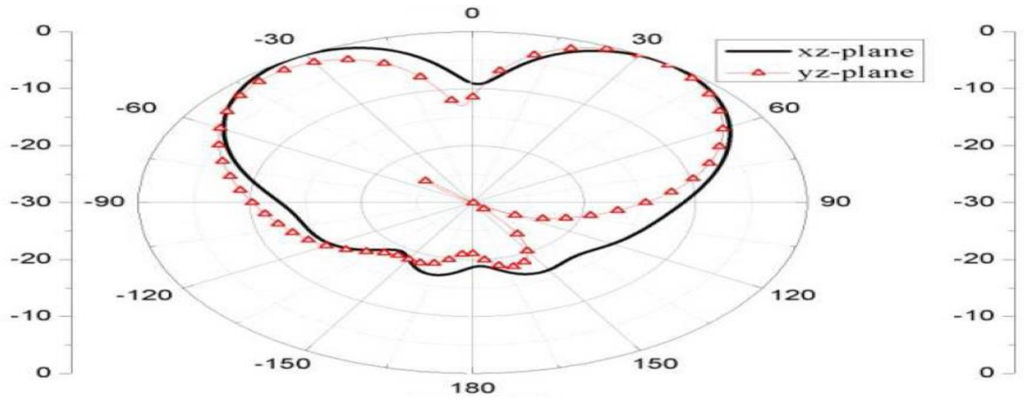

Figure 6. Radiation Pattern of Antenna at 2.5GHz

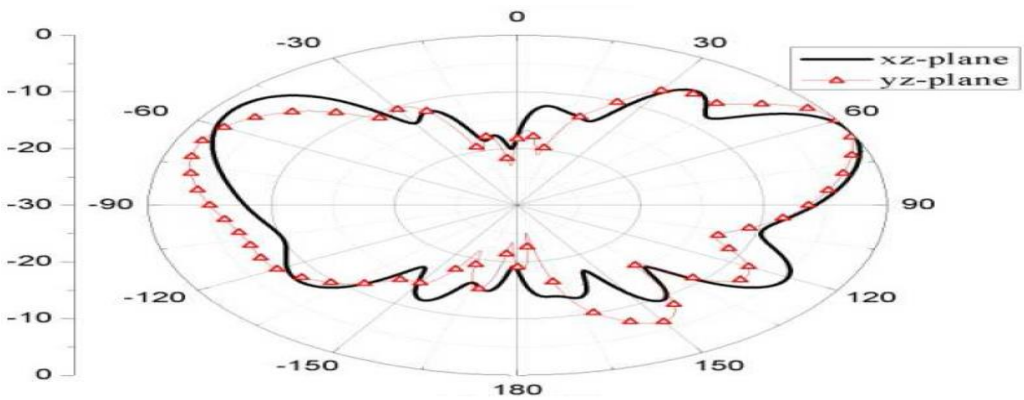

Figure 7. Radiation Pattern of Antenna at 8.5GHz

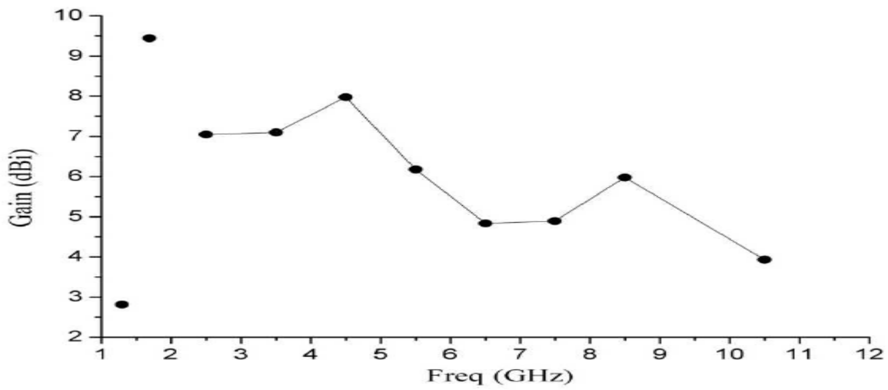

Figure 8. Gain of Proposed Antenna

The impedance matching can be obtained by tuning θ_2 .the radiation pattern of proposed antenna is shown in Figure 4, Figure 5, Figure 6, and in Figure 7, from radiation pattern it is clear that antenna is highly direction at frequency 1.3 GHz and 1.6 GHz. However at frequency 2.5GHz and 8.5GHz antenna shows conical pattern. The gain of proposed antenna is 2.8dBi for 1.3GHz, 9.4dBi for1.6GHz and 3.9-8.0dBi for third band as shown in Figure 8.

4. Conclusion

In this paper we proposed a multiband antenna which is fed by SMA coaxial probe and it shows very good impedance matching characteristics. The height of antenna is 8mm and diameter of antenna is 150mm respectively. The VSWR bandwidth is ranging from 1.2 to 1.4 GHz, 1.6 to 1.7 GHz and 2.1 to 10.7GHz proposed antenna also exhibits the stable radiation pattern across the whole band. The proposed antenna can be used for many types of application in wireless communication.

References

[1] B. Smith and K. L. Wong, "An approach to graphs of Compact and Broadband Microstrip antennas", NewYork: Wiley, **(2002)**.

[2] S. S. Zhong and J. H. Chui, "Compact dual frequency patch antenna", Antennas and propagation Soc. Int. Symp., vol. 4, **(2000)**, pp. 2196-2199.

[3] Y. C. Lin and K. J. Hung, "Compact ultra -wideband rectangular aperture antenna and band-notched designs", IEEE Trans.Antennas Propag., vol. 54, **(2006)** Nov., pp. 3075-3081.

[4] K. L. Wong and S. C. Pan, "Compact triangular Microstrip antennas", Electron. Lett., vol. 33, no. 6, **(1997)** March, pp. 433-434.

[5] S. L. Latif, L. Shafai and S. K. Sharma, "Bandwidth enhancement and size reduction of microstrip slot antenna", IEEE Trans. Antenna Propag., vol. 53, no. 3, **(2005)**, pp. 994-1003.

[6] J. George, K. C. Anandan, P. Mohanan and K. G. Nair, "Analysis of a new compact Microstrip antenna," IEEE trans. Antenna Propag., vol. 46, no. 11, **(1998)** Nov., pp. 1712-1717.

[7] A. A. Abdelaziz, "Bandwidth enhancement of microstrip antenna", Progress In Electromagnetics Research, PIER, vol. 63, **(2006)**, pp. 311–317.

[8] S. Thakur, "A Complete Analysis of Channel Estimation and Peak to Average Power Ratio in Wireless Communication Using Discrete Fourier Transform", International journal of Future Generation communication and Networking, vol. 9, no. 1, **(2016)** Jan., pp. 107-114.

[9] J. Y. and J. W. Su, "Bandwidth enhancement of a printed wide-slot antenna with a rotated slot", IEEE Trans. Antennas Propag., vol. 53, no. 6, **(2005)** Jun., pp. 2111–2114.

