

Design of Back Fed E Shaped Microstrip Antenna with Triple Bands

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Abstract - Reduced size E shaped Microstrip antenna was designed using high frequency structure simulator (HFSS) software for wireless communication; the antenna was designed to work with triple bands in the range of 2 to 5GHz. The antenna was designed to work efficiently at 2.92GHz, 3.93GHz and 4.47GHz; these are very useful frequencies that can be used for varieties of wireless communications.

INTRODUCTION

Microstrip Patch antenna is a type of open wave guiding structure, which consist of a radiating patch on one side of a dielectric substrate and ground plane on the other side. In other words Microstrip patch antenna consists of a conducting patch of any planar or non-planar geometry on one side of a dielectric substrate with a ground plane on the other side. The radiating patch can be a regular or irregular shape but the most common are the regular shapes such as rectangular, square, triangular and circular, these are sometime more easily to analyze because of their low cross polarization and very easy to fabricate. However with advent of some powerful numerical solution techniques, the complexity of analysis of the irregular shapes has drastically reduced.

Because of its unique and attractive features it has currently been the most reigning antenna in the world of wireless communication and it would continue to find many applications in the future [1]-[5].

It's widely used in the areas of communication and telemetries, radar altimeters uses arrays of smaller patch radiators, it's also found very useful in the field of satellite imaging system; its conformability makes it very much desirable for the use in mobile phone [1]-[3], hand held devices and vehicles such as aircrafts, spacecrafts, marine craft, trains and cars. Other important areas of applications include global positioning system (GPS), biomedical, missiles and much more.

Antenna Design

Here an E shaped Microstrip antenna is designed to operate at a triple frequency bands; the patch was designed as rectangular shaped resonating on Taconic RF-60 (tm) substrate with dielectric constant of 6.15 and height (h) of 2mm. The dimension of the antenna is 30mmX40mm, i.e. 30mm length (L) and width (W) of 40mm. Although we have gotten the desired resonating frequency but the performance was very low in terms of VSWR and radiation pattern. To attain optimum performance the patch has to be modified, a rectangular slot with dimension of 25mmX5mm was initially drilled from the left side, there was a significant improvement as the VSWR became less than two, but we still need more improvement. Another rectangular slot with the same dimension was drilled from the right side. The two slots were separated by a distance of 10mm this give us the E structure presented by figure 1. The feed line is directly connected to the reverse side of the E structure which can be made at the same time with a single piece of metal; this is easy and suitable for mass production [1].

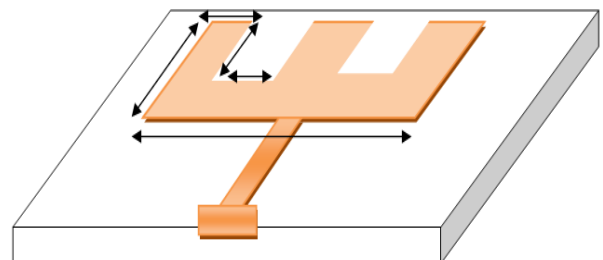


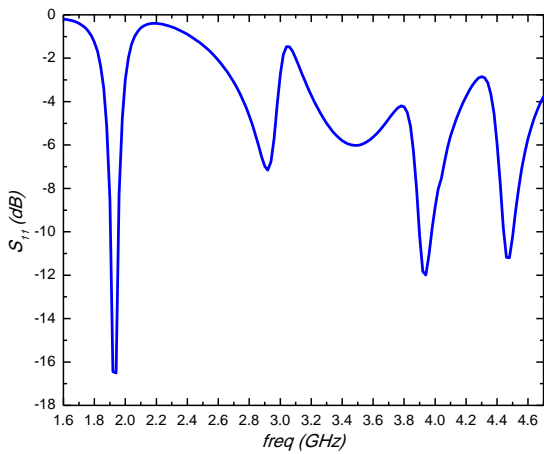
Fig. 1, E-shaped Antenna

Simulation Result

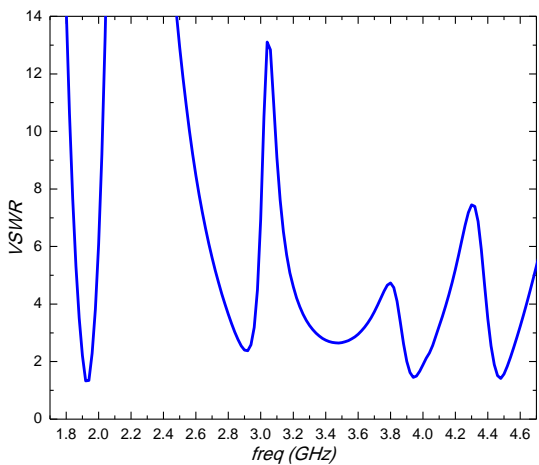
The result of the simulation is summarized in table 1 and the radiation pattern of the three bands is presented in terms of E and H planes in figure 2 a, b and c respectively.

Table 1

S/N	Frequency (GHz)	Return loss (dB)	VSWR	Bandwidth (MHz)
1	1.94	-21	1.3	100
2	3.93	-11.5	1.45	280
3	4.47	11	1.4	260

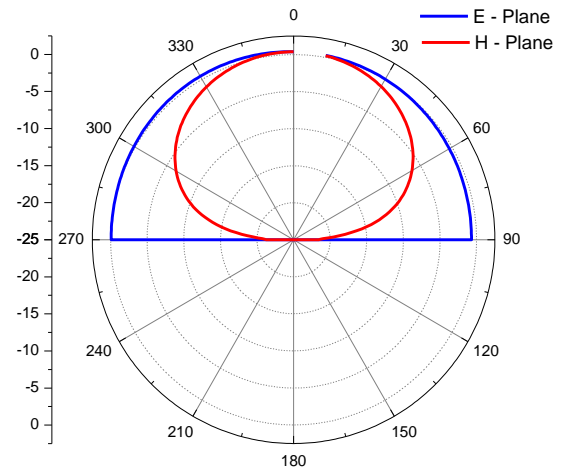


(a)

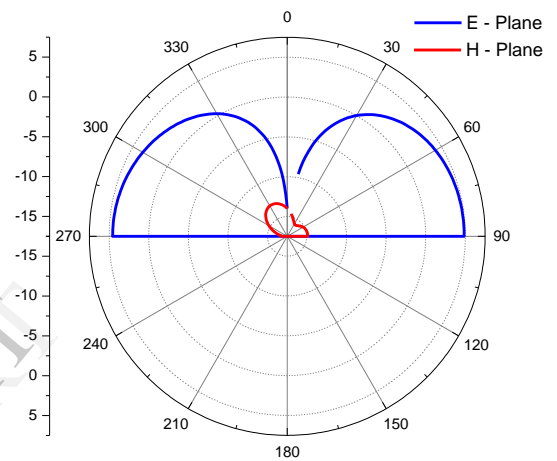


(b)

Fig. 2 (a) S_{11} of the back feed E shaped antenna, (b) VSWR of the back feed E shaped antenna.



(a)



(b)

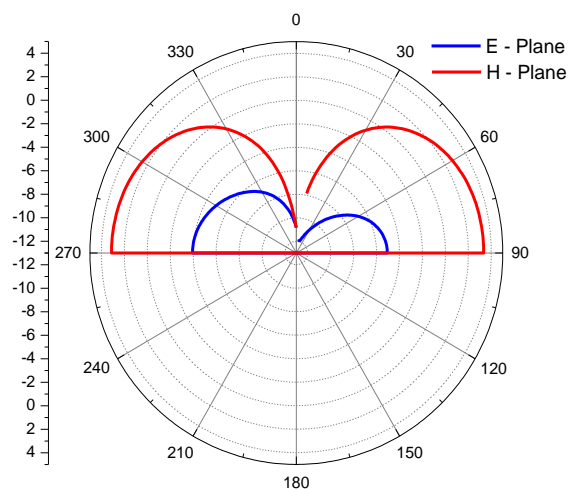


Fig. 3 Radiation patterns of (a) 1.94 GHz, (b) 3.93GHz and (c) 4.47GHz.

CONCLUSION

Triple frequency bands at 1.94GHz, 3.93GHz and 4.47GHz has been realized with their corresponding return loss of -12dB, -11.5dB and -11db as well as their VSWR of 1.3, 1.45 and 1.4 respectively.

REFERENCE

1. Yuehe Ge, Karu P. Esselle, and Trevor S. Bird, "E-Shaped Patch Antennas for High-Speed Wireless Networks." Ieee Transactions On Antennas And Propagation, Vol. 52, No. 12, December 2004
2. Gehan Sami, Mahmoud Mohanna and Mohamed L. Rabeh, "Tri-band microstrip antenna design for wireless communication applications," Journal of Astronomy and Geophysics, Vol. 2, pp. 39-44, 2013.
3. Seddik Bri, Safa Zaakri, Abdelrhani Nakheli and Ahmed Mamouni, "Simulations of Dual and Broadband Patch Antenna," European Journal of Scientific Research. Vol.60, No.2 (2011), pp. 237-249.
4. M. A. S. Alkanhal, "Composite Compact Triple-Band Microstrip Antennas," Progress In Electromagnetic Research, PIER 93, 221-236, 2009.
5. Sonali Kushwah, P. K. Singhal and Vandana V. Thakare, "A Miniaturized Square Pifa Antenna for Cellular Communication Application," Journal of Global Research in Electronics and Communication, Volume 2, No. 2, March - April 2013.

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