ISSN (Print) : 0974-6846
Indian Journal of Science and Technology, *Vol 10(35), DOI: 10.17485/ijst/2017/v10i35/118958, September 2017* ISSN (Online) : 0974-5645

Designing Simulation of T-Slotted Antenna with Two Feeding Method

Tanu Thakur, Yogesh Bhomia and Arushi Bhardwaj

DOEC, Sri Sai College of Engineering and Technology, Badhani, Pathankot – 145001, Punjab, India;
tanuthakur04@gmail.com, bhomia9yogesh76@gmail.com, bhararushi@gmail.com

Abstract

Objectives: To simulate a unique design with T slotted with two different feeding methods. **Method:** In this paper we use IE3D software in which we select mgrid with basic parameters 0.025 mgrid size and FR4 substrate 4.4 having thickness 1.6 mm and loss tangent 0.001. Then select a rectangular patch from entity with 10 mm length and 10 mm width and cut 3-T slots alternately. After complete our design we fed it 50 ohm to with 10 mm feeding for transmission line feed and (0, 3.5) its x and y value for probe feed and then operate it at different frequencies. **Findings:** The simulated results fetched at the frequency of 0-4, 8-16 GHz for TL feed and PB feed individually. The RL of TL feeding is -20.696 dB resonant at 1.32492 GHz and -28.27 dB for PB feeding resonant at 13.33 GHz. After comparing the outcomes for both feeding techniques, we conclude that the result of antenna in transmission line feed is more negative than probe feeding as shown in Table 1. The BW of desired antenna is 44.6% for TL feed and 9.8% for PB feed which is appropriate for wideband. As the notch frequency falls in SHF range so the antenna is right for many commercial as well as for typical services like WLAN, Satellite links. **Application:** This antenna is useful in WLAN, satellite links etc

Keywords: Coaxial Feed, Microstrip Patch Antenna, T-Slotted Antenna, IE3D, SHF, VSWR

1. Introduction

In today's era, everyone is looking for smart new improved techniques for better communication moving from wired technology to wireless technology. Antenna is the most commonly and well-known device use for wireless communication for interconnection .Antenna is a radio communication device fall under the category of Duplex i.e. it can receive or transmit data simultaneously[1]. There is thousands of antenna design which goes smoothly with typical to modern technology. One of them is slotted microstrip antenna also acknowledged as patch antenna having compact size, easy to handle and low cost[2]. According to ISM Band, above said antenna is appropriate for Satellite linking, NFC and Bluetooth plans. The constituents used for micro strip patch are copper and gold and give satisfactory results with different feeding techniques[4].

2. Antenna Design

The proposed antenna works on two feeding technique that is Transmission line feed and probe feed. After the designing, the simulation is done in IE3D software[6] for getting result of several Antenna parameters like RL, VSWR, smith chart, Radiation pattern. At last the correlation of results is done for optimized antenna considering both feeding techniques.

For designing an antenna firstly the substrate should be known, here FR4 substrate is used after that the slots are cut on a simple patch moving towards the T shaped slot. Furthermore to design a T shaped MSP slotted antenna the fundamental parameters should be known. The Simulation Software IE3D is used to set basic parameters. In this paper the basic parameters are Grid Size of Patch is 0.025 mm, Top surface is 1.6, loss tangent is 0.001, relative permittivity of 4.4. The Wideness of

* *Author for correspondence*

Substrate decides how mechanically strong it is and that automatically will increase the radiated power, improve impedance, bandwidth and reduces the loss so here we use 1.6 mm of thickness. These are the basic parameters of our patch antenna. As we use four-sided patch so length, breadth is 10mm x10mm. Third is the Feed technique, we used transmission line and Probe feeding to feed the above said antennas which are explained Figure 1 shows the MS Line feed.

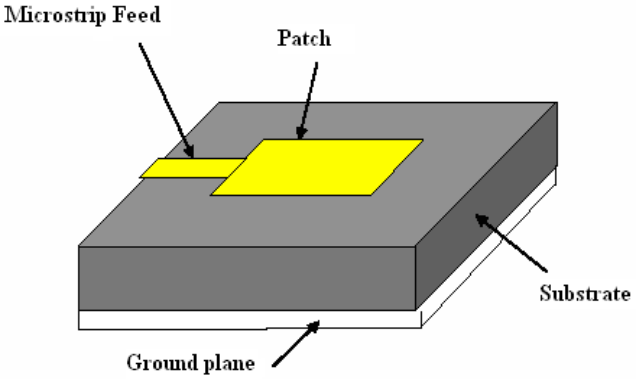

Figure 1. Microstrip line feed.

2.1 Micro Strip Line Feed

In this TL Feed is classification of supply in which a directing band is associated with the patch as appeared in Figure 1. The leading band has less thickness when contrasted with the patch and has the improvement with the aim of the feed be capable to fixed on the same substrate to afford a planar design.

2.2 Coaxial Feed

The probe feed is an extremely general method used to feed antennas. As implicit in Figure 2, the interior piece of the conductor of the co-axial connector ranges through the dielectric and is fastened to the emanating patch, while the external transmitter is associated with the ground plane Figure 2 shows the coaxial feed.

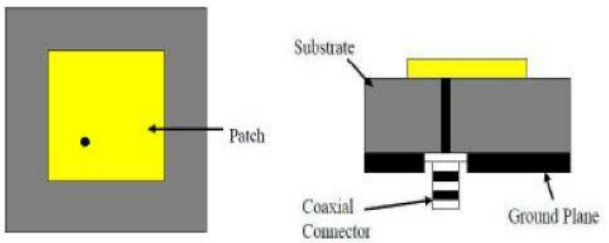

Figure 2. Coaxial feed.

3. Design Parameters

3.1 Design and Results with TL Feeding

Patch size of propose antenna is 10-10mm (L, W) respectively and also the feeding length is 10mm as shown in Figure 3 below. In this design we cut three T-slots structure. After designing we perform simulation by using TL feeding. The desired antenna is operated at 0-4 GHz. The graphical portrayal of Antenna parameters like return loss, bandwidth and VSWR, gain, directivity, radiation pattern are demonstrated as follows Figure 3 shows the model of antenna using TL feed.

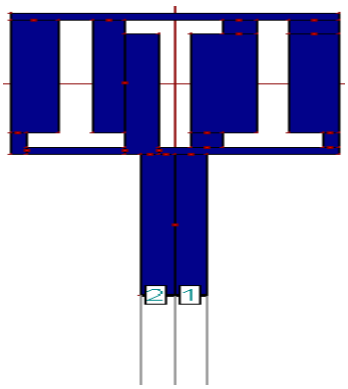

Figure 3. Model of antenna using transmission line feed.

3.2 Design and Results using Coaxial Probe Feeding

Patch size of propose antenna is 10-10mm (L, W) respectively having feed points 0.3, 5 as shown in Figure 4. In this design we cut T slots and the frequency slot is 8- 16 GHz with resonant frequency at 13.33 GHz. After designing we perform simulation by using probe feed. The proposed antenna is operated at 11-20 GHz. The resulting parameters namely return loss, bandwidth, radiation pattern, gain, VSWR are shown in Figures 5-10.

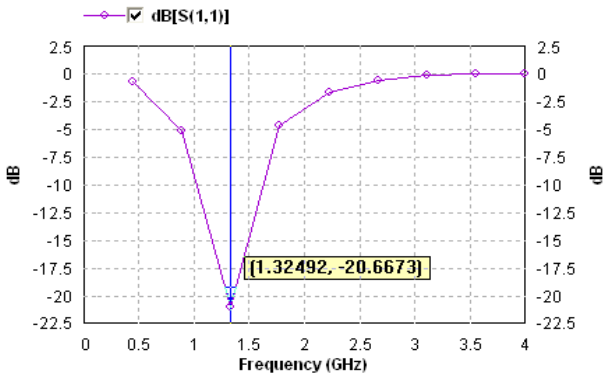

Figure 4. Return loss versus frequency.

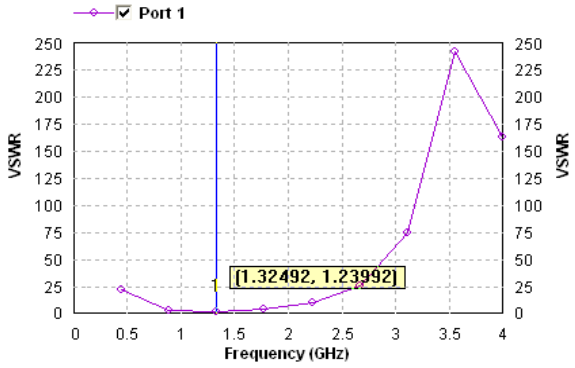

Figure 5. VSWR versus frequency.

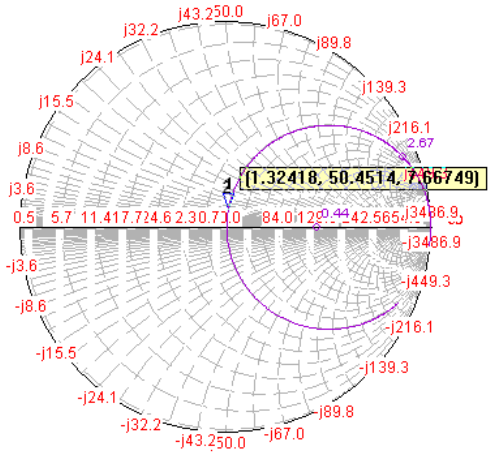

Figure 6. Smith chart.

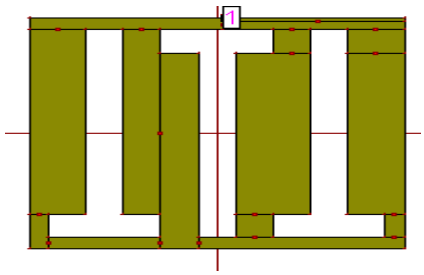

Figure 7. Model of antenna using probe feed.

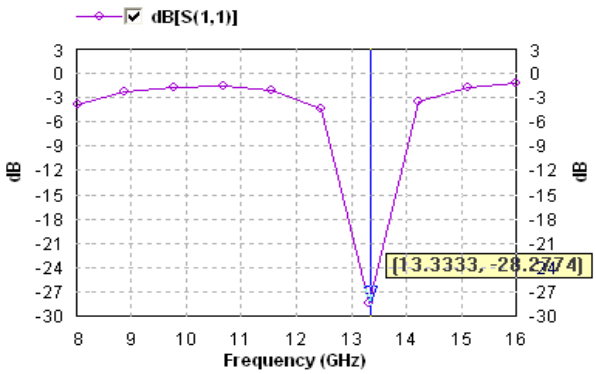

Figure 8. Frequencies vs. Return Loss.

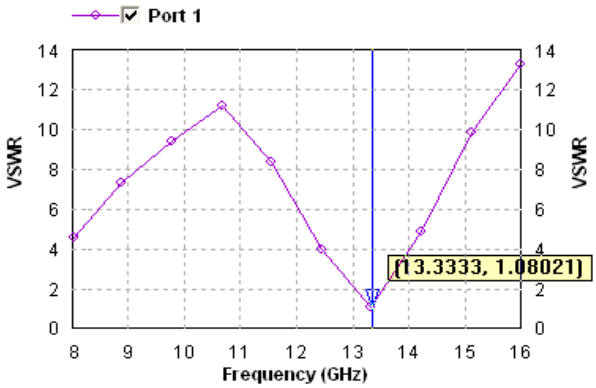

Figure 9. Frequency vs VSWR.

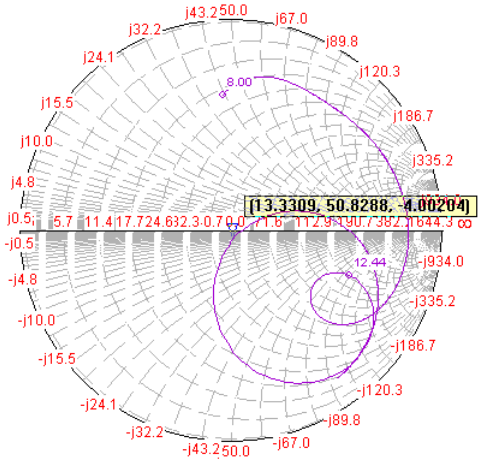

Figure 10. Smith chart.

4. Conclusion

In this paper, we conclude that the considered antenna performance was mimicked by IE3D software. The simulated results fetched at the frequency of 0-4, 8-16 GHz for TL feed and PB feed individually. The RL of TL feeding is -20.696 dB resonant at 1.32492 GHz and -28.27 dB for PB feeding resonant at 13.33 GHz. After comparing the outcomes for both feeding techniques, we conclude that the result of antenna in transmission line feed is more negative than probe feeding as shown in Table 1. The BW of desired antenna is 44.6% for TL feed and 9.8% for PB feed which is appropriate for wideband. As the notch frequency falls in SHF range so the antenna is right for many commercial as well as for typical services like WLAN, Satellite links.

Table 1. Different feeding results

Feding techniques	Transmission line feed	Coaxial feed
Resonant Frequency	1.32492 GHz	13.33GHz
Bandwidth	44.6%	9.8%
VSWR	1.2399	1.08
Return loss	-20.6673 db	-28.27db

5. Acknowledgement

Dr. Yogesh Bohmia acknowledged the B.E degree from IETE, New Delhi in Electronics and telecommunication and M.E in digital communication from M.B.M College, Jodhpur and also got Ph.D Degree from Bhagwat University, Ajmer, and Rajasthan, India. He is currently working as a Director Principal in SSCET, Badhani. He has printed more than 25 papers in International journals. He is reviewer of various journals and also members of various IEEE technical Committees. He has written a book on Electromagnetic Field Theory.

Er. Arushi Bhardwaj acknowledged the B.Tech Electronics & Communication from the PTU. M.Tech in EPDT (Electronic Product Design and Technology) from C-DAC,Mohali . She is currently working as an assistant Prof. in SSCET, Badhani, in Post Gradutaion ddepatment of ECE.

Er. Tanu Thakur received the B.Tech from PTU, Punjab in Electronics and Communication and M.Tech in ECE from PTU, Punjab

6. References

1. Deepak Sood, Gurpal Sign, Chander Charu Tripti, Suresh Chander Sood, Pawan Joshi. Design fabrication and characterization of microstrip square patch array for X-band application, Indian Journal of Pure Applied Physics. Aug. 2008; 46:593–97.
2. Loren I. Basilion, Michael A. Khayat, Jeffery, T. Williams, Sturat A. Long. The Dependence of the input impedance on feed position of probe and Microstrip line-fed patch antennas, IEEE Transaction on Antenna and Propagation. Jan. 2001; 49(1):45–47.
3. Alameddine K, Abou Chahine S, Rammal M, Osman Z. Wideband patch antennas for mobile communication, International J. of Electron. Communication (AEU). 2006; 60:596–98.
4. Vasant Naidu, Ashok Kumar M, Ahamed SKA, Chandra Prakash. Mg Sm Ferrite for Nano structured E-shaped Patch Antenna studies, International Journal of Computer Application. Sep. 2011; 30(5):45–50.
5. Pozar DM, Schaubert DH. Microstrip Antenna, the Analysis and Design of Microstrip Antenna and Array, New York, USA; 1995.
6. James JR, Hall PS. Handbook of Microstrip Antenna, Peter Peregrinus, Constantaine A Balanis, Antenna Theory, Analysis and Design, Third Ed., John Wiley & Sons. London, UK; 1989.
7. IE3D Software Release 9 and developed by M/S Zeland Software, Inc.
8. Bhattacharyya AK, Garg R. Generalized Transmission Line Model for Microstrip Patches, IEE Proc. 1985; 132:93–98.
9. Arun K. Bhattacharyya. Analaysis of circular patch antenna on electrically thick substrate, Computer Physics Communication. 1991; 68:485–95 Crossref