iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VI **Month of publication:** June 2020

DOI: http://doi.org/10.22214/ijraset.2020.6020

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VI June 2020- Available at www.ijraset.com

Analysis of Two Inverted F-Shaped Antenna System with Highly Integrated T-Shaped Decoupling Structure

R. Indhumathi[1], B. Aishwariyaa[2], B. Barkavi[3], C. Bhuvaneswari[4], S. Lavanya[5]
[1]*Assistant Professor, Department of ECE, K. Ramakrishnan college of Technology, Trichy, Tamilnadu.*
[2, 3, 4, 5]*Student, Department of ECE, K. Ramakrishnan college of Technology.*

Abstract: ***In communication systems, a small -shaped decoupling structure that can be highly integrated into a compact two-inverted-F-antenna(IFA) system is being used Each IFA is capable of operating in the 2.4 GHz and 5 GHz WLAN bands The height of the antenna is one of the deciding factor in antenna design It is inverted two times in F shaped antenna to ↑ gain and directivity In this project, we are going to propose two inverted F-shaped antenna The ultimate aim is to analyse the angle of degree and radiation pattern.Also, we propose the structure of antenna and gain impedance . The software tool which is used to analysis the performance is HFSS***

Keywords: Monolothic Microwave Integrated Circuit (MMIC)

I. INTRODUCTION

In this paper, we present a novel single-patch wide- band microstrip antenna: the T-shaped patch antenna. When to parallel slots are incorporated into the antenna patch, the bandwidth increases above 30%. Compared to the U-slot microstrip patch antenna, the T-shaped patch antenna is simpler in construction. By only adjusting the length, width, and position of the slots, one can obtain satisfactory performances. Some experimental results prove the validity of this design. The method of moments with the vector triangular basis function is used for analysis, as well as HP- HFSS software. The electric currents on the pi-shaped patch are calculated and graphically presented to explain the wide- band mechanism. Subsequently, a wide-band inverted T-shaped patch antenna with 30.3% bandwidth is designed to cover both 2.6and 4.5GHz. These ranges of frequencies are very desirable in modern wireless communications. Radiation patterns are also measured and compared with the numerical data.

Antenna technology is advancing day by day the small antenna size with good performance are in high demand. Many conventional antenna structures such as Yagi, Parabolic Reflector, Helical, Horn etc. have wider bandwidth and gain but large size of these antennas restrict their use in various applications, so these antennas cannot be used in the devices which are smaller in size and are used as an moving object. To meet this requirement of wireless communication, microstrip antennas are widely used which satisfies the requirements of the wireless communication system.

The microstrip patch antenna is employed for the recent deployment in wireless communications such as radar, space communication, satellite communication, microwave and mobile communication etc.because of its light weight, low volume, low profile planar configurations, inexpensive and easy to integrate with microwave integrated circuits. Over the past two decades, microstrip patch antenna received attention for communication due to its advantages. Microstrip patch antenna has also disadvantages are narrow bandwidth, excitation of surface waves, low gain and depleted radiation pattern. Intensifier research has been carried out to overcome the cons of patch antenna. Different techniques with different shaped patch antennas are applied to increase the bandwidth and overcome the limitations.

Major challenges for efficient wide-band antennas are broad impedance bandwidth (S11 < 10 dB), flat gain response and less variation in group delay over the allocated bandwidth. Printed patch antennas are suitable for wide-band applications due to their excellent mechanical and electrical characteristics, compatibility for integration with other RF systems and mass production.

Microstrip patch antennas are presently under concern for using in broadband communication systems due to their attractive characteristics, such as low profile, low cost, lightweight, wide frequency bandwidth, ease of fabrication, and easy integration with monolithic microwave integrated circuits. However, the limitations of the microstrip patch antennas are having narrow bandwidth, and for that reason the demand of the bandwidth enhancement is gradually rising in the practical applications[1]. In order to enhance its bandwidth, many approaches have been applied conventionally, such as using thick substrates with low dielectrics constant, impedance matching network, parasitic patches stacked on the top of the main patch slots loaded on the patch, high dielectric constant substrate, and adopting short-circuit pin.

©IJRASET: All Rights are Reserved

A rectangular slot antenna has been stated for dual frequency operation. A printed dipole antenna to cover dual band with t-slot arms has designed. In this paper, it has been reported a low cost microstrip dipole antenna for wireless communications[2]. A dual loop antenna for 2.4/5GHz wireless LAN. a monopole antenna with F has been stated in for 2.4/5.2GHz WLAN operations. A dual polarized antenna has been mentioned in for Ku-band application. Microstrip antennas on FR4 substrate material were discussed for UWB applications.

II. SYMMETRICAL F-SHAPED PATCH ANTENNA

Top views of the antenna and feeding parts of the proposed patch antenna are depicted in Fig. 1(a) and 1(b). One longitudinal slot and two transverse slots are etched on a rectangle patch to create a symmetrical i-shaped patch antenna, as shown in Fig. 1(a). This antenna is excited by a slot at the end of the SIW feeding network, as shown in Fig. 1(b). The slot is precisely under the longitudinal slot of the antenna. A matching via is used in the SIW to realize impedance matching between the feeding part and the antenna part[3]. The proposed antenna uses the two-layer Taconic TLY substrate with dielectric constant εr = 2.2 and thickness h1 = 0.508 mm for the feeding layer and h3 = 0.508 mm for the antenna layer.

The two layers are bonded together using Rogers 4450 with thickness h2 = 0.1 mm and dielectric constant ε□ = 3.4. A side view of the antenna is depicted in Fig. 1(c). The proposed antenna dimensions are given in Table I. The main design principle of the proposed patch antenna is summarized into three points, as follows.

1) The slot coupling is utilized to excite multiple TM modes. The resonance frequencies of desirable modes (i.e., TM10 and TM20) are tuned to be sufficiently close to each other to broaden the impedance bandwidth. The longitudinal slot on the patch not only increases the resonance frequency of the TM10 mode but also reduces the resonance frequency of the TM20 mode.

2) The current and the E-field of the TM20 mode are twisted using the longitudinal slot on the patch, so the antenna can achieve broadside radiation pattern based on both the TM10 and TM20 modes.

3) The undesirable modes (e.g., TM12) are suppressed by the two transverse slots on the patch. Then, stable radiation performance can be realized in a wide designated bandwidth.

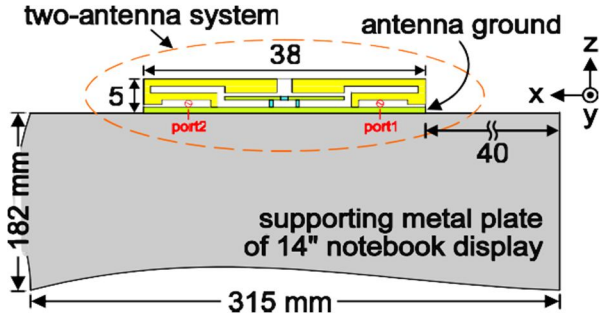


Figure 1 (a): Top view of Existing f shaped patch antenna

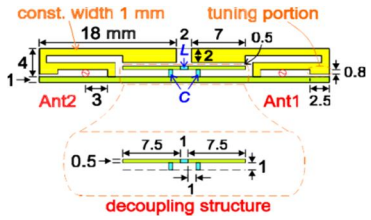


Figure 1 (b): Side view of the antenna part and feeding part

A. *Antenna Design*

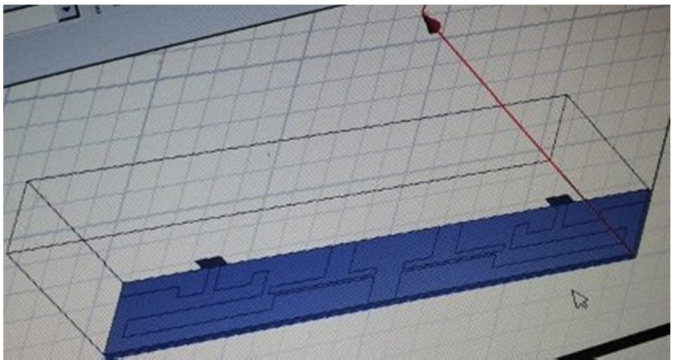
A major constituent of a slot antenna is a metal surface (mostlly a plan plate), with a slot or hole cut out. A folded antenna is a flat antenna with wide bandwidth and maximized at the broadside. It include with a folded slot as approximate circumference equal to one guide wavelength (an example of simple folded slot antenna). At the corner of shape we cut out the slit for the purpose of enhancing the bandwidth. T shapes folded slot cut on patch type antenna has width (w) and length(L).In this paper we used Roger RT/duroid 5880(tm) material with 2.2 dielectric constant and.4 mm thickness is used in substrate. This designing is simulated with Hfss 13 tool. In Fig. 2 we show the side view of antenna designing and figure 3 represent the Top view of antenna. Dimension of antenna is shown in below Ground size Length-56mm, Width -44mm. Substrate size length -56mm, width -44mm and height.4mm with dielectric constant 2.2. T shapes lower part slot length 35mm and width 4mm.upper part slot width20.8mm.

©IJRASET: All Rights are Reserved

III. PROPOSED T SHAPED MICROSTRIP PATCH ANTENNA

Normally pi shape antenna output 30-60GHZ .we are propose Tshaped output is above 60GHZ. Parameter are below 10DB transverse slot. TM10 wave, TM20 wave feeding port bonding layer SIW transition line is 40 mm. The simulated total loss of the SIW transition line, the SIW to theGCPW and the connector is less than 0.65 dB in the working bandwidth .Other modes exist but result in exotic radiation patterns and have little -if any- practical use

Parameter	Material/value
Dielectric Material	Copper
Dielectric Medium	Vaccum
Loss Tangent	1.0 e^{-4}
Height of the substrate	1.6 mm
Width of the patch	12.5 mm
Length of the patch	12.5 mm
Resonance Frequency Return loss	4.5 GHz -20DB



2 a) proposed block diagram

IV. SIMULATION RESULTS

The simulation of micro-strip patch antenna is done by using HFSS simulation software. The VSWR graph for a back to back T shaped slotted rectangular patch antenna is shown in figure 6. The . The VSWR for T shaped slotted antenna is 2.00db. The simulated radiation pattern in 3D are shown in figure 7.

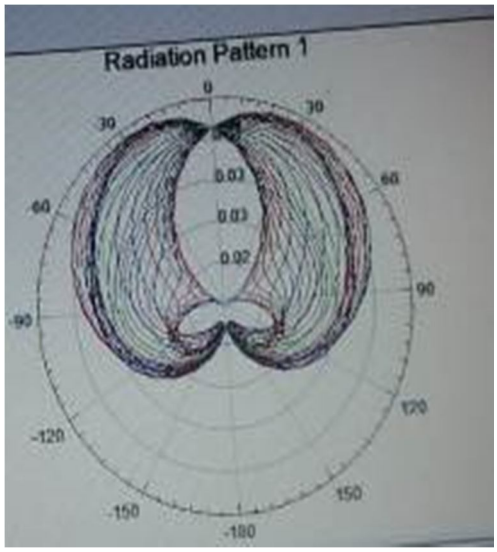


Figure 6: VSWR of the Proposed Rectangular Microstrip Patch Antenna with Back to Back T Shaped Slots

©IJRASET: All Rights are Reserved

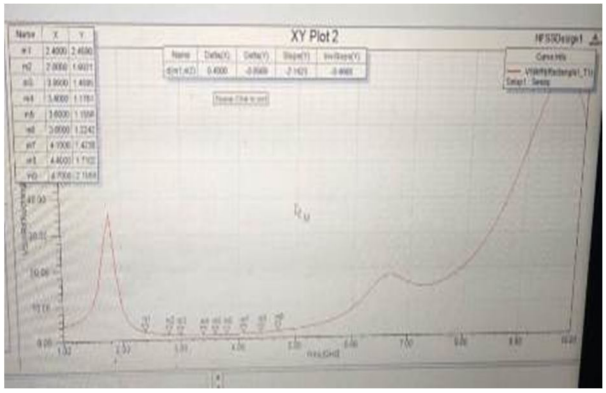


Figure 7: Radiation Pattern in 3D of the Proposed Rectangular Micro-strip Patch Antenna with Back to Back F Shaped Slots

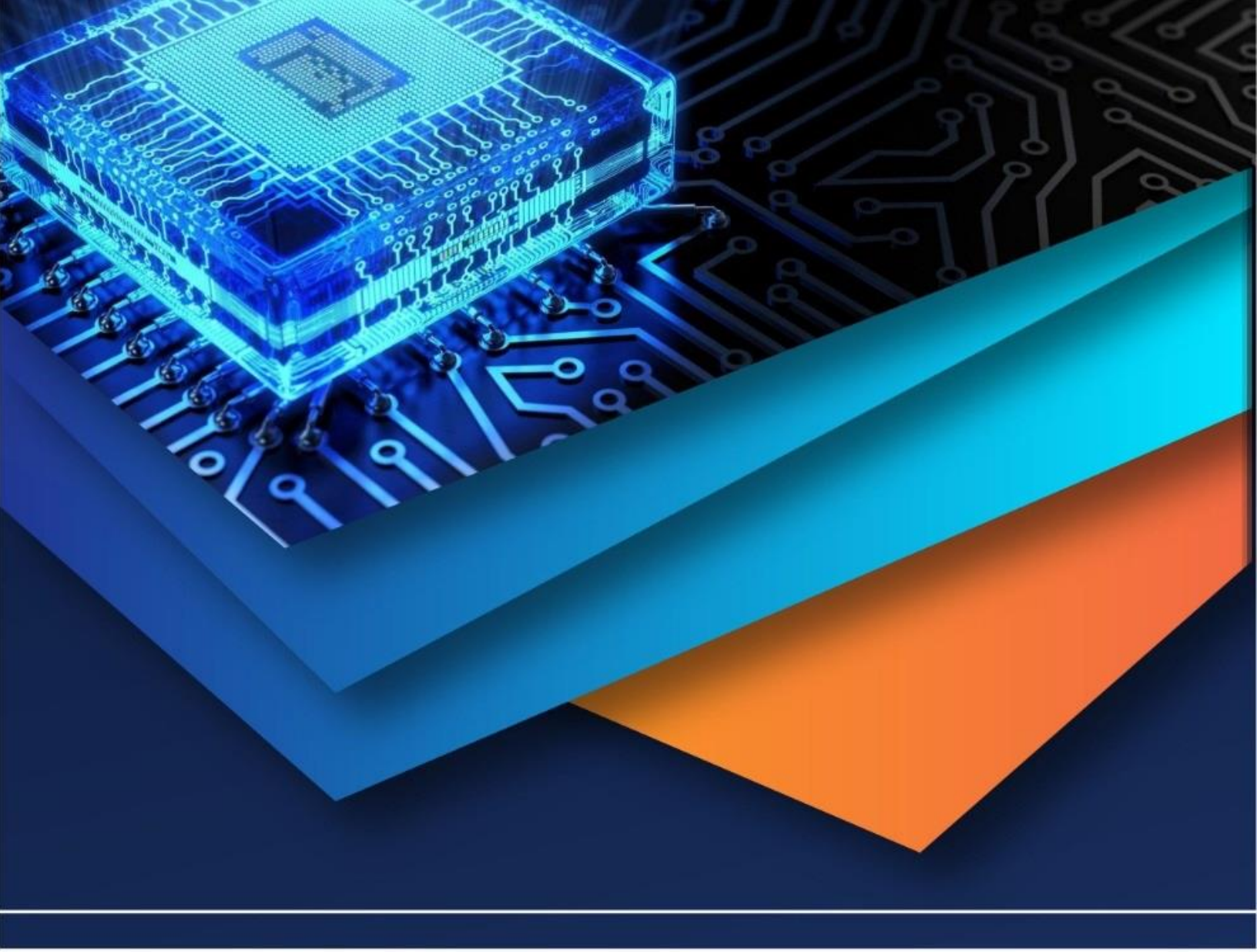
V. CONCUSION

We are propose new method t shape antenna . The height of the antenna is one of the deciding factor in antenna design It is inverted two times in F shaped antenna to ↑ gain and directivity In this project, we are going to propose two inverted F-shaped antenna .The ultimate aim is to analyse the angle of degree and radiation pattern. Also, we propose the structure of antenna and gain impedance. Antenna properties was improved structure was simple .easy to fabricate .Unwanted to removed .communication to be improved .

REFERENCES

[1] Antenna Theory, C. Balanis, Wiley, 2nd edition (1997), Chapter 14 ISBN0-471-59268-4.
[2] D.M. Pozar'' Microstrip antennaaperature coupled microstrip line,'' Electron.Lett., vol. 21, no 2pp49-50,Jan 1985.
[3] Carles Puente Baliadra, 'Jordi Romenand Angel "Cardama' A Small Fractal Antenna" IEEE Transactions on Antenna andpropogation,Vol.48 No.11,November 2000.
[4] C.P. Baliarda J. Romeu and A. Cardama, 'The Koach monopole: the small fractal antenna 'IEEE Tranasaction on Antenna and propogation, vol AP-IX,No, pp-17731781, Nov,2000.
[5] Suman lata 'Design and Simulation of Fractal FOLDED –SLOT Antenna for next generation mobile network' IJARCIS Vol 32003.
[6] Mircea V. Rusu and Roman Baican, 'Fractal Antenna Application' University of Bucharest, and Transivania University, Brasov, Romania.
[7] J. Anguera C. Puente, Boria and J. Soler 'Fractal-shaped antenna :A review,' in Wiley Encyclopedia of RF and Micro Engineering, vol2, 2005.
[8] D. Anagnostou M.T. Chrysomallis, J.C. Lyke and C.G. Christodoulou, 'A CPW Koach dipole slot Antenna' Proceeding
[9] IEEE Conference Wireless Communication Technology, Oct 1517, 2003.
[10] Puente and R Pous, ' the Fractal Design of Multiband and Low SideLobe Array' Transactions on Antenna and Propogation, Vol. 44, no 5, pp. 1996.
[11] K. Shreekant, Sambhav Jain, Shalini Sah, " Antenna Array using unit cell resonators", IEEE Transactions on Antennas and Propogations, 2017.
[12] Merih palandoken, Andre Grede, and Heino Henke, "Broadband Microstrip Antenna With Left-Handed Materials", IEEE Transactions on Antennas and Propogation, Vol 57, No. 2, February 2009
[13] HU Jun, YAN Chun-sheng, LIN Qing-Chun," A new patch antenna with metamaterial cover", Hu et al/ J Zheijang Univ SCIENCE A, 2006-7(1)-89-94
[14] L.-M. Si, X. Lv, "CPW-fed multi-band omni-directional planar microstrip antenna using composite metamaterial resonators for wireless communications", Progress in Electromagnetics Research, PIER 83, 133-146, 2008
[15] Zheng-Gao Dong, Shuang-Ying Lei, Qi Li, Ming-Xiang Xu, Hui Liu, Tao Li, Fu-Ming Wang, and Shi-Ning Zhu, "Non-left-handed transmission and bianisotropic effect in a π- shaped metallic metamaterial", Phys. Rev. B **75**, 075117 – Published 22 February 2007
[16] Chih-Chun Hsu, Ken-Huang Lin, and Hsin-Lung Su, "Implementation of Broadband Isolator Using Metamaterial- Inspired Resonators and a T-Shaped Branch for MIMO Antennas"**,** IEEE Transactions on Antennas and Propogation , Vol. 59, No. 10, October 2011
[17] D. Kim and M. Kim, "Narrow-beamwidth T-shaped monopole antenna fabricated from metamaterial wires", ELECTRONICS LETTERS, Vol. 44, No. 3, 31st January 2008
[18] Tayeb A. Denidni, Zibin Weng, and Mahmoud Niroo-Jazi, "Z-Shaped Dielectric Resonator Antenna for Ultrawideband Applications **",** IEEE Transactions on Antennas and Propogation, VOL. 58, NO. 12, December 2012
[19] Norberto Lopez, Cheng-Jung Lee, Ajay Gummalla, Macha Achour, "Compact Meta material Antenna array for Long term Evolution(LTE) handset Application", IEEE Transactions on Antennas and Propogation 2009
[20] S. Sajuyigbe, M. Ross, P.Geren, S.A. Cummer, M.H. Tanielian, D.R. Smith, "Wide Angle impedance matching metamaterials for waveguide-fed phased-array antennas", IET Microw Antennas Propogation, vol. 49, iss. 8, 1063-1072, 2010
[21] Li B., Wu B., Liang C.-H., "Study on High Gain circular waveguide array Antenna with Metamaterial Structure" Progress in Electromagnetics Research, PIER 60, 207-219,2006
[22] Maria Elena de Cos, Mohamed Mantash, Anne-Claude Tarot, Fernando Las-Heras, "Dual-band Coplanar waveguidefed smiling monopole antenna for wiFi and 4G long-term evolution applications" IET Microwaves, Antenna and Propogation, Vol. 7, iss 9, pp.777-782, 2013
[23] Chih-Yu Huang, En-Zo Yu, "A slot-monopole antenna for dual-band WLAN Applications", IEEE Antennas and Wireless Propogations Letters, Vol. 10, 2011

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)