International Research Journal of Engineering and Management Studies (IRJEMS)
Volume: 03 Issue: 03 | March -2019 e-ISSN: 2395-0126

DESIGN OF SINGLE BAND MICROSTRIP PATCH ANTENNA FOR RADAR APPLICATIONS

Bandi Saidaiah[1], Tummala YasaswiSowmya[2], Ponnapalli Bhargavi[3], Vemulapalli Rupa[4], Vallabhaneni Mallika[5]

Vasireddy Venkatadri Institute of Technology, Namburu, Guntur District, Andhra Pradesh

---

Abstract–*The study of microstrip patch antennas has made a great progress in recent years. Compared with conventional antennas,microstrip patch antennas have more advantages and better prospects. It is a popular printed resonant antenna for narrow-band microwave wireless links that require semihemispherical coverage. The rectangular and circular patches are the basics and most commonly used microstrip antennas. This Proposed paper, a single band microstrip patch antenna for Radar and Short Range applications is presented. This proposed antenna is suitable for the millimeter wave frequency. The single new band consist of new H slot and E slot loaded on the radiating patch with the 50-ohm microstrip line feeding used.This single band antenna is simulated on a fr-4 lossy dielectric substrate have relative permittivity 4.3, loss tangent 0.05 and height 1.6mm.The antenna is simulated by Electromagnetic simulation,computer software technology microwave studio.The simulated antenna shows return loss -25.338dB at 26.167Ghz mm wave.*

Key Words:*CST software, E and H slots, millimeter wave, radiating patch, single band microstrip patch antenna*

I. INTRODUCTION

With the advanced wireless technology, fast increasing therequirement for microstrip patch antenna to introduce the highstandard of data transfer and low cost of fabrication are madethe millimeter wave which is applicable for the commercial purpose.In this single band antenna designshows a new H slot and E slot loaded on the patch. The design antennas use the 50-ohm microstrip line feeding and simulated by the CST software.

II. ANTENNA STRUCTURE AND GEOMETRY

The geometry of the proposed single band microstrip patch
antenna designed at 26.167GHz shown in figure 1. A patch is workingas the antenna of main radiating element. The microstrip patchis delivered by the 50-ohm microstrip line. The antenna hasthe dimensions of 7mm x 7mm at 26.167 GHz for millimeter waveradar application. The antenna is simulated on a Fr-4 lossy dielectric substrate having relative permittivity 4.3, losstangent 0.05, and height 1.6 mm. The antenna is simulated using CST microwave studio.

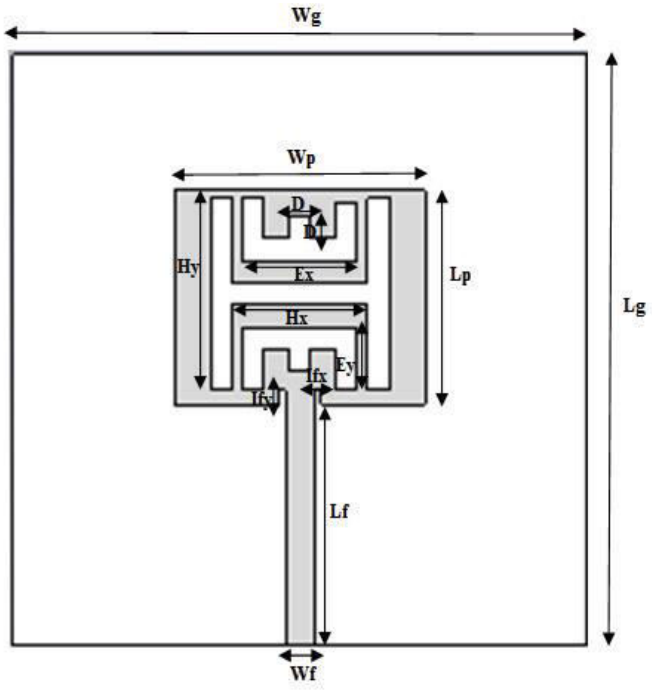

Fig-1: Structure of proposed single band antenna

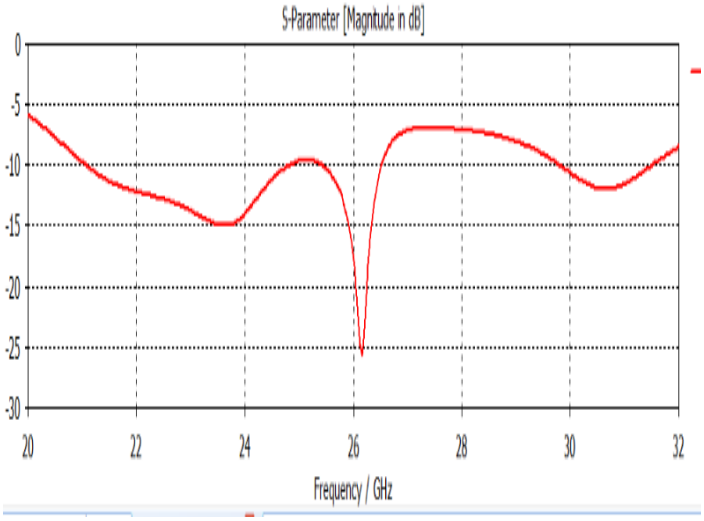

Fig-2:Reflection coefficient S11 versus frequency of proposed antenna

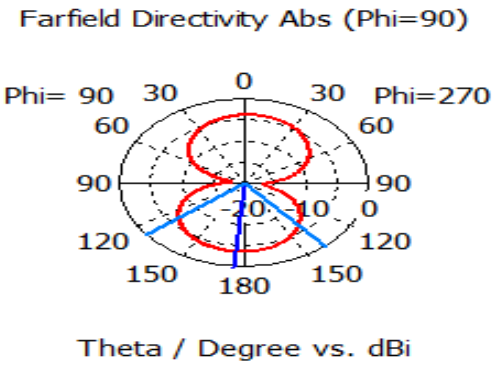

Fig-3:Radiation pattern of proposed single band antenna

Dimension of proposed antenna:

Parameters	Dimension(mm)
Ws	14
Ls	8
Wg	14
Lg	4.95
Wp	3.5
Lp	2.9
Wf	0.42
Lf	4.55
Ifx	0.2
Ify	0.2
Hx	2.4
Hy	2.5
Ex	1.5
Ey	1.35
D	0.3

The copper plate with the dimensions of 7mm x 7mm and a
thickness of 0.05mm is used as the ground plane. The H andE slot cut on the patch which is enhancement of impedancebandwidth. The length and width of the patch is 3.5 mm and2.9 mm. The length and width of the H slot is 2.4mm and2.5mm. The E slots have a length and width is 1.5 mm and1.35mm. The feed lines have a length and width is 0.4mm and3.25mm. The single band antenna has been designed at thework 26.167 GHz millimeter wave frequency.

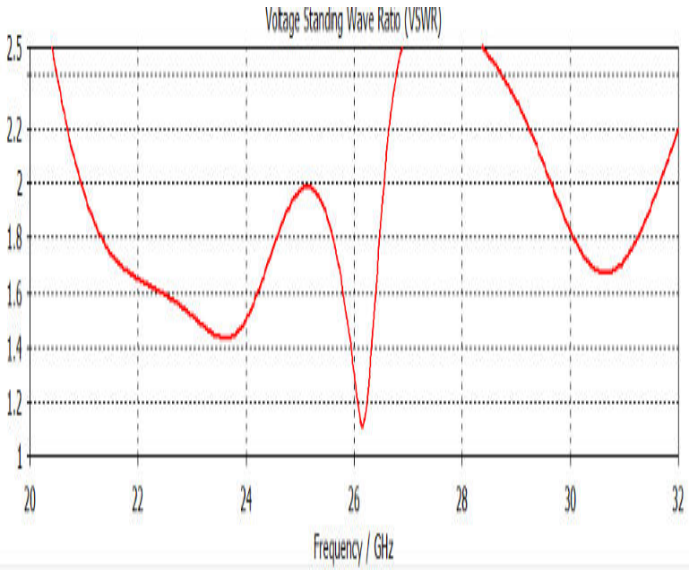

Fig-4:VSWR curve of proposed antenna

The figure shows the VSWR<2 at 26.167 GHz band which represent the good impedance matching for proposed single band antenna.

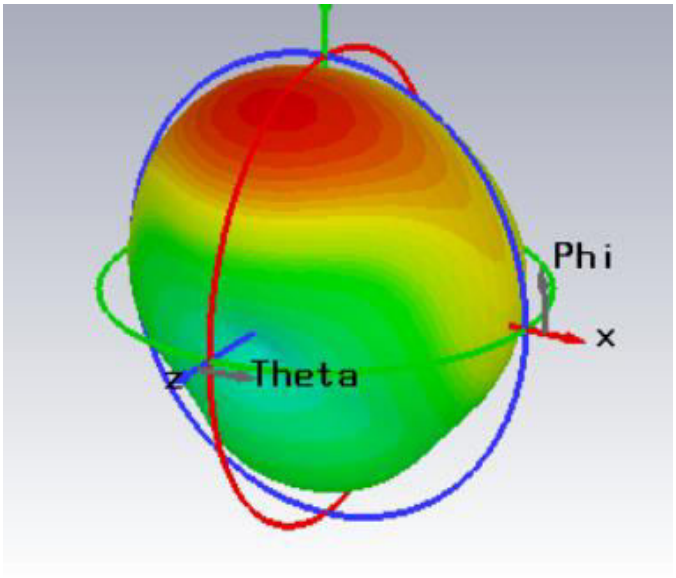

Fig-5:3D radiation pattern

III. SIMULATION RESULTS AND COMPARISION

The simulation of proposed antenna is carried out by CST Microwave commercial software programs. The simulatedresult of the return loss / reflection coefficient for single bandantenna are present. Its introduce the proposedsingle band antenna has its -10 dB bandwidth of themicrowave frequency and cover the 26.167 GHz millimeter wavefrequency.

Parameter	Proposed antenna	Reference antenna
Substrate material	Fr-4 lossy	RT Duriod 5880
Size	7mmX 7mm	8mmX8mm
Return loss	-25.338dB	-40.9dB
Impedance	S11≤-10dB	S11≤-10dB
Gain	5.49dB	5.48dB

IV. CONCLUSION

In this proposed paper, a single band slotted microstrip patchantenna are used for radar application is presented. Theproposed antenna is simple structure, low cost and small size.The small size of antenna operates the single band frequency.Due to cutting the H and E slot, enhancement of theimpedance bandwidth. This design result shows the centrefrequency at a 26.167GHz with a gain of 5.49dB. The proposed antenna is used in RADAR applications.

REFERENCES

[1] K. Gong, Z. N. Chen, S. Q, P. Chen and W. Hong, "substrate integrated waveguide cavity backed wide slot antenna for 60GHz band", IEEE Trans. Antennas propag., Vol.60, no.12 and pp.6023-6026, Dec 2012.
[2] K.L. Lau, K.-M. Luk and K.F. Lee, "Design of a circularly-polarized vertical patch antenna," IEEE Trans. Antennas Propag., vol. 54, no. 4, pp. 1332–1335, Apr., 2006.
[3] Qu and S.W, "Bandwidth Enhancement of Wide-Slot Antenna Fed byCPW and Micro strip Line", Bandwidth Enhancement of Wide-Slot Antenna Fed by CPW and Micro stripLine", Antennas and Wireless Propagation Letters, IEEE, pp15 – 17, Dec. 2006.
[4] Rafi, G. and L. Shafai, "Broadband micro strip patch antenna with V - slot," IEEE Proc. Microw. Antenna Propag, Vol. 151, No. 5, 435-440, October 2004.
[5] D.M. Pozar, D.H. Schaubert, 'Micro strip Antenna, The Analysis andDesign of Micro strip Antennas and Array'. New York, IEEE Press, 1995.
[6] M. S. Alam, M. T. Islam, N. Misran, J. S. Mandeep, "A Wideband Microstrip Patch Antenna for 60 GHz Wireless Applications," Electronics IR Electrotechnika, ISSN 1392- 1215, vol. 19, no. 9, 2013.
[7] C.A. Balanis, Antenna Theory; Analysis and Design, 3rd edition new work; Wiley; 2005.
[8] K. K. Sharma and Ravi Kumar Goyal, "H-Slotted Microstrip Patch Antenna at 60 GHz millimeter wave frequency band for 5G communication", IEEE conference at Chitkara University, Punjab on Communication System and Network Technologies(CSNT-2016), 05-07, March 2016.
[9] Kun Wang, Jonas Kornprobst and Thomas F. Eibert, "Microstrip fed broadband mmwave patch antenna for mobile applicati ons", 2016 IEEE International Symposium on Antennas and Propagation (APSURSI), Pages: 1637 - 1638, 2016.
[10] Amandeep Kaur Sidhu and Jagtar Singh Sivia, " Double U Slotted Microstrip Rectangular Patch Antenna", For GPS Applications International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT), 2016.