International Journal of advancement in electronics and computer engineering (IJAECE)
Volume 4, Issue 9, Jan. 2016, pp.588-590, ISSN 2278 -1412

Triband H shape Microstrip patch Antenna for S and C band Communication

Vipin Singh[1], Krishna Chauhan[2]
[1]*M.Tech Scholar, SIRT BHOPAL, vipinsinghbaghel@gmail.com, india;*
[2]*Faculty Scholar, SIRT BHOPAL, krishnachauh@gmail.com, india;*

Abstract *–A compact Tri band H-shape microstrip patch antenna is designed for S (2-4 GHz) band and C (4-8 GHz) band applications. The designed antenna has symmetrical properties and has been designed H shape structure on FR-4 substrate (€r = 4.3) with coaxial probe feed. We use calculation with Transmission line model for that antenna parameter. The antenna has overall dimensions of 37x36 mm2. Which gives the bandwidth of H-shape Microstrip patch antenna is of 1st band is 23.25%, 2nd band is 8% and 3rd band is 11.38%.and The Return loss is -44.39dB at 2.28 GHz, -21.35dB at 4.7 GHz and -12.81dB at 6.14 GHz. This antenna has been analyzed using IE3D electromagnetic solver.*

Keywords*: Tri bands, Microstrip patch Antenna, IE3D simulator, H-shape.*

I. Introduction

The fast advances of antenna in communications systems motivated the researchers to make low profile, small size, lightweight, and single-feed antennas. Such antennas were much desired to use in applications that need multi-frequencies into one piece of device [1]. Nowadays it is highly attractive to enable portable communication devices to transmit or receive signals wirelessly. For this purpose antenna is used as an important element in the RF system for receiving or transmitting the radio wave signals from and into the air as the medium. The main disadvantages of micro strip antenna are their narrow bandwidth. There are many efforts to improve the bandwidth of an antenna [2]. Alternatively, bandwidth can also improved by inserting a sufficient thickness. This allows the penetration of field lines in it. Such a technique requires a coaxial feed method that usually causes increased cross polarization in H-plane [3]. Many researchers have proposed different shapes of micro strip antenna for different applications [4]. Various slot shapes have been designed and proposed like E-shaped [5], H-shaped [6], C-shaped [7-8] and U-shaped [9]. The dual band H-shape antennas are used in satellite communication and radar system like secure communication, multi frequency communication, object detection system, speed test in vehicle and many more. Dual frequency configuration can be achieved by using different switch state for different frequency of radiation in advance. The C-band of microwave frequency range is used in satellite communications. This C-band commonly used in areas that are subject to tropical rainfall, since it is less susceptible to rain fades than Ku band. Its frequency range is 4-8 GHz.

II. Antenna Design

The In this section the antenna is designed for S band and C band applications.Fig.1 shows the dimensions of H-shape microstrip patch antenna. The antenna is designed on FR –4 substrate (€r = 4.3),that thickness/height is 1.5mm with relative permittivity and loss tangent of 4.3mm and 0.019 respectively. The antenna dimensions are calculated by some mathematical formula. Those formulas are given bellow.

Where, εreff = Effective dielectric constant
εr = Dielectric constant of substrate
h = Height of dielectric substrate
W = Width of the patch
The effective length (Leff) of the patch now becomes:
Leff=L+2 ΔL
For a given resonance frequency f0 the effective length is given as:Leff =

For efficient radiation, the width W is given as:W =

The Geometry of proposed antenna shows in Fig. 1

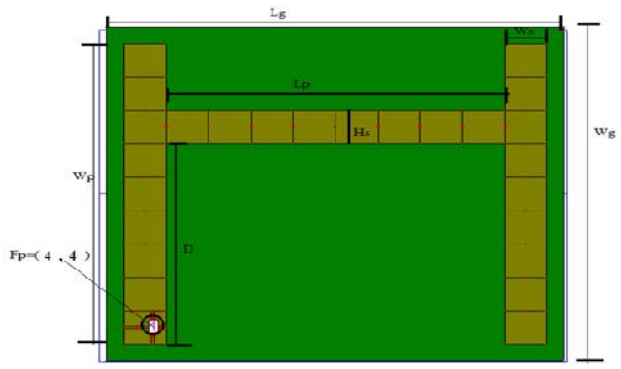

Fig.1 Geometry of proposed antenna.

The calculated antenna dimensions are given in the table no.1.

TABLE I

Parameter	Dimensions
Lp	29 mm
Wp	36 mm
Ws	4 mm
D	24 mm
Hs	4 mm
Lg	40 mm
Wg	40 mm

III. Results and Discussion

Fig.2 shows the simulated result of proposed antenna. The antenna is simulated by IE3D simulater software. The return loss verses frequency plot is obtained by the software. As given in the the fig. 2, the proposed antenna operates in three bands. One band is at 2.28 GHz and others is in 4.7 GHz,6.143 GHz. The Return loss is -44.39dB at 2.28 GHz, -21.35dB at 4.7 GHz and -12.81dB at 6.14 GHz. In this study bandwidth is obtained between the points where -10 dB lines cut the curve in Fig.1 and the bandwidth of 1st band is 23.25%, 2nd band is 8% and 3rd band is 11.38%.

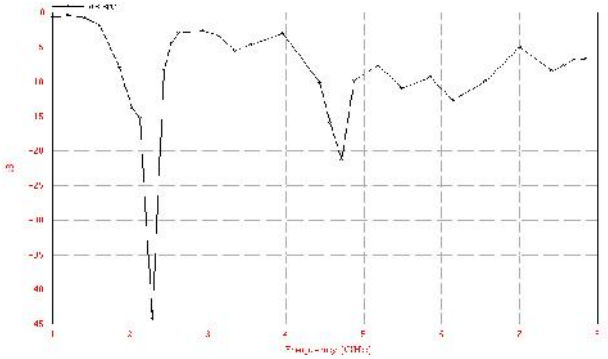

Fig. 2 Return loss verses frequency plot.

Fig.3 shows the Radiation pattern of H-shape microstrip patch antenna at different resonant frequencies in 3D. the radiation pattern shows that at 2.28 GHz is maximum at corner end and centre.

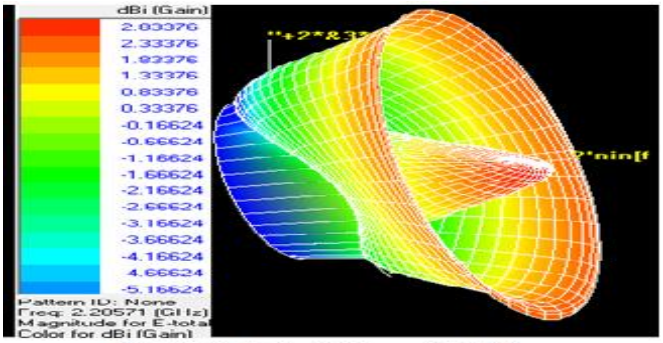

Fig. 3 (a) Radiation Pattern at 2.28 GHz

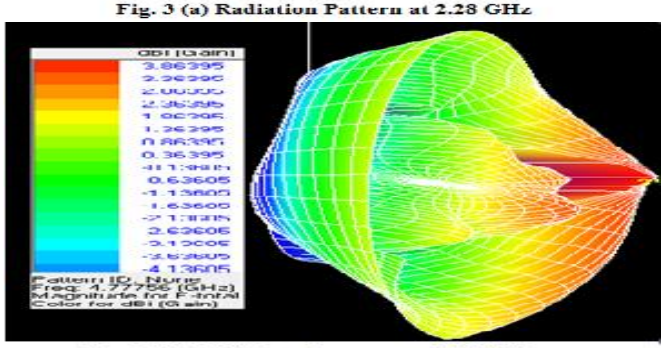

Fig. 3 (b) Radiation Pattern at 4.78 GHz

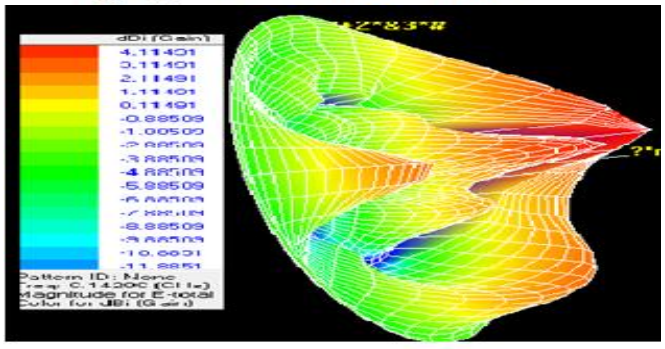

Fig. 3 (c) Radiation Pattern at 6.14 GHz

Fig.3 Radiation Pattern plot

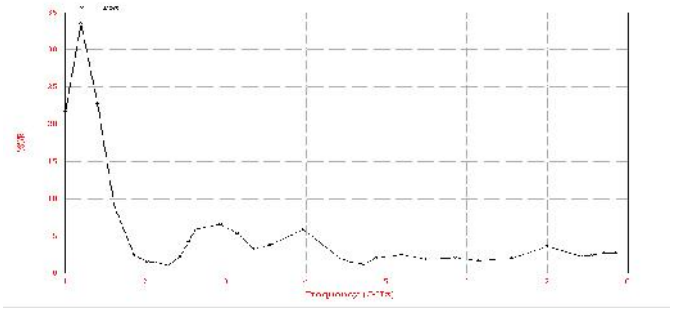

Fig. 4 VSWR plot.

Fig.4 shows the VSWR plot of H-shape microstrip patch antenna at different resonant frequencies.

Frequency	VSWR
2.28 GHz	1.012
4.714 GHz	1.187
6.143 GHz	1.593

Polarization of radiation represents the property of electromagnetic wave describing the electric field vector as the time varying direction. The measured polar plot of E-total is shown in fig.5

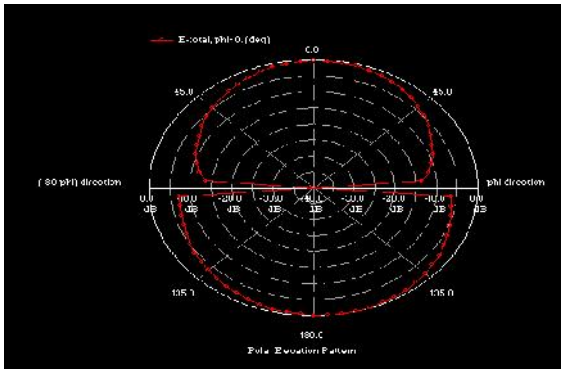

Fig. 5 Polar plot of E-Total of proposed antenna for phi = 0

the Smith Chart to be used for problems involving any characteristic impedance or system impedance, although by far the most commonly used is 50 ohm. Fig.6 shows the smith chart plot of proposed antenna, matching impedance 50 ohm at 2.28 GHz.

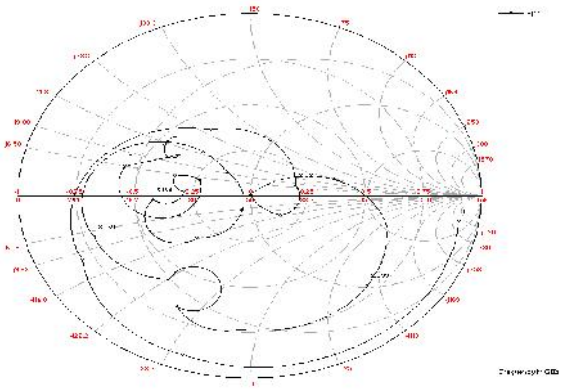

Fig. 6 Smith chart plot

IV. Conclusion

A compact Tri band H-shape microstrip patch antenna used for the DCS and WLAN applications..The Return loss is is -44.39dB at 2.28 GHz, -21.35dB at 4.7 GHz and -12.81dB at 6.14 GHz respectively. It is observed thst antenna offers improved characteristics at 2.28 GHz and its performance shown in the three bands. VSWR is 1.012 at 2.28 GHz. In future the experimental results will be taken into the account.

References

[1] M. Abu and M. K. A. Rahim "Triple Band Printed Dipole TAG Antenna for RFID" Progress In Electromagnetic Research C, Vol. 9, 2009.

[2] E. Chang. S.A. Long and W.F. Richards, "Experimental investigation of electrically thick rectangular patches antennas" IEEE Transaction on microstrip patch antennas and propagation. Vol. 43. No.6 1986.

[3] C. L. Mak. K. M. Luk and Y.L. Chow. "Experimental study of a microstrip patch antenna with an L shaped probe" IEEE Transaction on microstrip patch antennas and propagation. Vol. 48. No.5 2000.

[4] S.B. Yeap and Z>N. Chen. "Microstrip patch antennas with enhanced gain by partial substrate removal," IEEE Transaction on microstrip patch antennas and propagation. Vol. 58. No.9 2010.

[5] O. H. Izadi and M. Mehrparvar. " A compact slot antenna with nowel E-shaped coupling aperture." 5th international Symposium on Telicommunication. Pp 110-114 2010.

[6] K. I. Wong, H. C. Tung and T.W. Chiou, "Broadband dual polarized aperture- coupled patch antenna with modified H-shaped coupling slot. " IEEE Transaction on microstrip patch antennas and propagation. Vol. 50. No.2 20028.

[7] S.K. Padhi.,N.C.Karmakar., C.L. Law and S. Aditya. " A dual polarized aperture coupled circular patch antenna using a C-shaped coupling slot." IEEE Transaction on microstrip patch antennas and propagation. Vol. 51. No.12 2003.

[8] Nasimuddin and Z.N. Chen, "Aperture coupled asymmetrical C-shaped slot microstrip patch antenna for circular polarization."IET Microwave, antennas and propagation. Vol. 3. No.3 2009.

[9] Y. X. Guo, K. M. Luk, K.F. Lee and Y.L. Chow, "Double U slot Microstrip patch antenna." Electronics letter , . Vol. 34. No.19, 1998.

Author's Profile

Vipin Singh received B.E. from NIIST, affiliated to RGPV, Bhopal and currently pursuing M.Tech from SIRT Bhopal, affiliated to RGPV, Bhopal. His area of interests is antenna, Digital communication and WIMAX.

Krishna Chauhan received M.Tech. Her areas of interests are image processing, embedded system and communication. Presently she is associated with SIRT, Bhopal as an Assistant Professor in Department of Electronics and Communication.