International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org ||Volume 7 Issue 6 Ver V || June 2018 || PP 53-56

Design of Hybrid Dual Wide Band Antenna with Notch Band Characteristics

Rajeshwari Biradar[1] and S.N.Mulgi[2]
Research student, Department of PG Studies and Research in Applied Electronics, Gulbarga University, Kalaburagi-585106, Karnataka, INDIA [1]
Professor, Department of PG Studies and Research in Applied Electronics, Gulbarga University, Kalaburagi-585106, Karnataka, INDIA[2]
Corresponding Auther: Rajeshwari Biradar

Abstract : *In this article, a novel design of microstripline fed dual band microstrip antenna (MSA) with notch band characteristics is presented. By etching a slot on the radiating patch and by truncating the ground plane the notch-band characteristic is realized. The dual bands are obtained is the frequency range of 1.19 to 8.18 GHz which covers GSM (1.19- 1.54 GHz) and WiMAX (3.19-8.18 GHz) applications. The notch band helps in rejecting the unwanted signal interference between the two operating bands. The proposed antenna is simple in its geometry and fabricated using low cost FR4 substrate material. The simulated and experimental results are demonstrates they are good agreement with each other*
Keywords:*Hybrid slot antenna, Notch, Wide band, GSM and WiMAX applications.*

Date of Submission: 09-06-2018 Date of acceptance: 25-06-2018

I. Introduction

The recent explosion in the communication market has rectified in the emergence of a number of systems appearing at different frequencies, such as wireless local area network (WLAN), Global position Systems (GPS), WiMax etc. The antennas used for these applications are commonly installed separately [1-1]. In this paper, a single hybrid corner truncated monopole rectangular microstrip antenna (HCTRMSA) has been designed and fabricated to operate for both GSM and WiMax frequency ranges. The proposed antenna consists of a single feed monopole with corner truncated on bottom surface of the patch [4-7]. The ground plane has been modified in order to get wide impedance bandwidth. The slot is placed at the center of the radiating patch to achieve a notch band and dual wideband operation [8-12].The antenna is fabricated and tested successfully on vector network analyzer. The performance of the simulated result of the antenna shows a good agreement with measured one. The antenna gives omnidirectional radiation characteristics in its operating bands.

II. Antenna Design

The configuration of the hybrid corner truncated rectangular monopole microstrip antenna (HCTRMSA) is illustrated in Fig 1. The antenna is designed and fabricated on a substrate having dielectric constant of 4.2, loss tangent of 0.02 and substrate thickness 1.6mm. The antenna is termed as hybrid because the rectangular and triangular geometry are designed for the same resonant frequency and are combined together to form a HCTRMSA. On the radiating patch a square type slot is inserted at its center. The antenna is excited through a simple 50Ω microstripline feeding having a width of 3.17 mm and length of 24 mm. A square cut type slot is designed mainly to achieve first band. The appearance and location of notch band is depends on the slot truncated on the ground plane which is placed slightly below the radiating patch. The parameters of the proposed antenna were obtained by using Ansoft's High Frequency Structure Simulator (HFSS) tool and final optimized design parameters of the proposed antenna is as shown in Table. 1. The top and bottom view photography of HCTRMSA is as shown in Fig. 2.

Table: I Antenna Parameters Hctrmsa

Parameters	Dimensions in mm
W	40
L	60
Tl	1.94
sl	5.68
L1	0.7
Wf	3.17
Lf	24
L g	19
g	0.5
l	3
w	5
u	17 (with an angle of 45 degree)

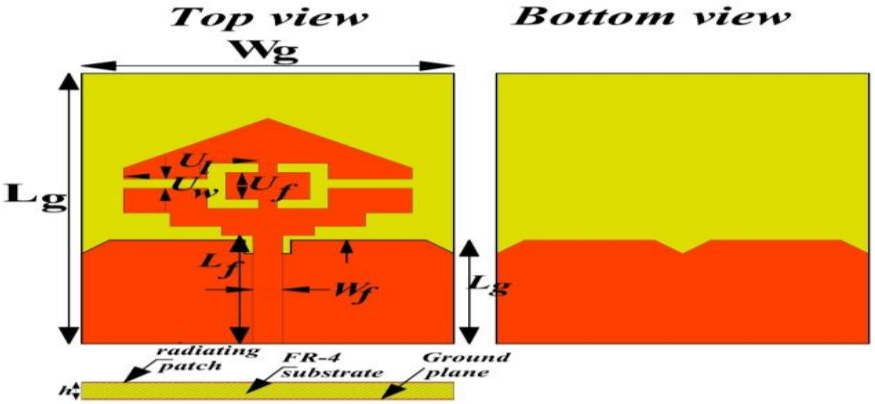

Fig. 1 Top view geometry of proposed antenna

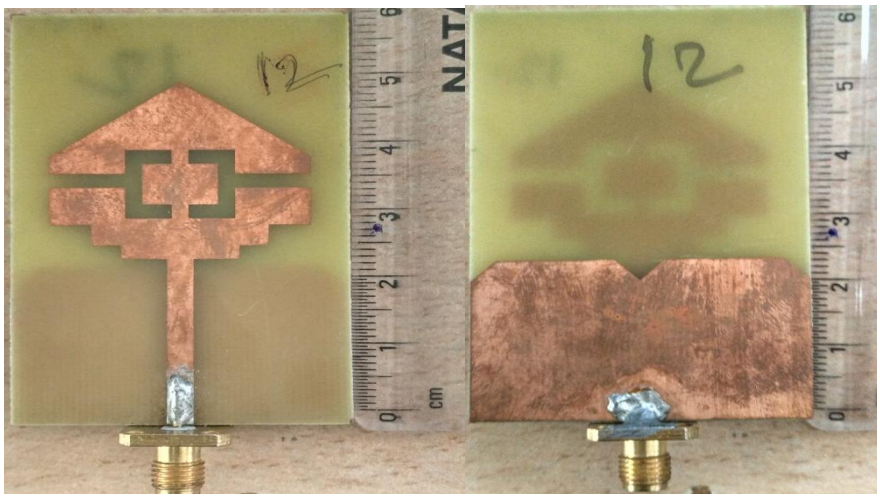

Fig. 2 Photograph of the proposed antenna (a) Top view (b) Bottom view

III. Result And Discussion

The variation of return loss versus frequency of HCTRMSA is as shown in Fig.3. From this figure it is seen that, the antenna operates in the frequency range from 1.19 to 8.18 GHz. In this range two operating band are appearing one from 1.19 – 1.54 GHz and second from 3.19 – 8.18 GHz. The magnitude of first bandwidth is about 20.95% (1.19-1.54 GHz) which is useful for GSM applications. The magnitude of impedance bandwidth of second operating band is 133.06% (3.19-8.18GHz) which is useful for WiMAX application. In between these two bands a notch band is existing from 1.19-3.5 GHz useful for rejecting unwanted signal interference. The simulated result of HCTRMSA is also shown in Fig. 3. The experimental and simulated results are in good agreement with each other. Hence by controlling the dimensions of antenna parameters such as slot on the radiating patch, truncation on the ground plane the operating bandwidth and length of notch band can be modified.

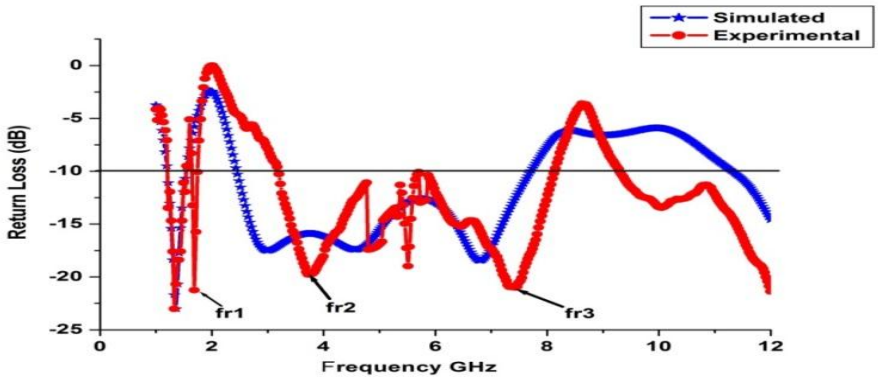

Fig.3 Variation of return loss versus frequency of HCTRMSA

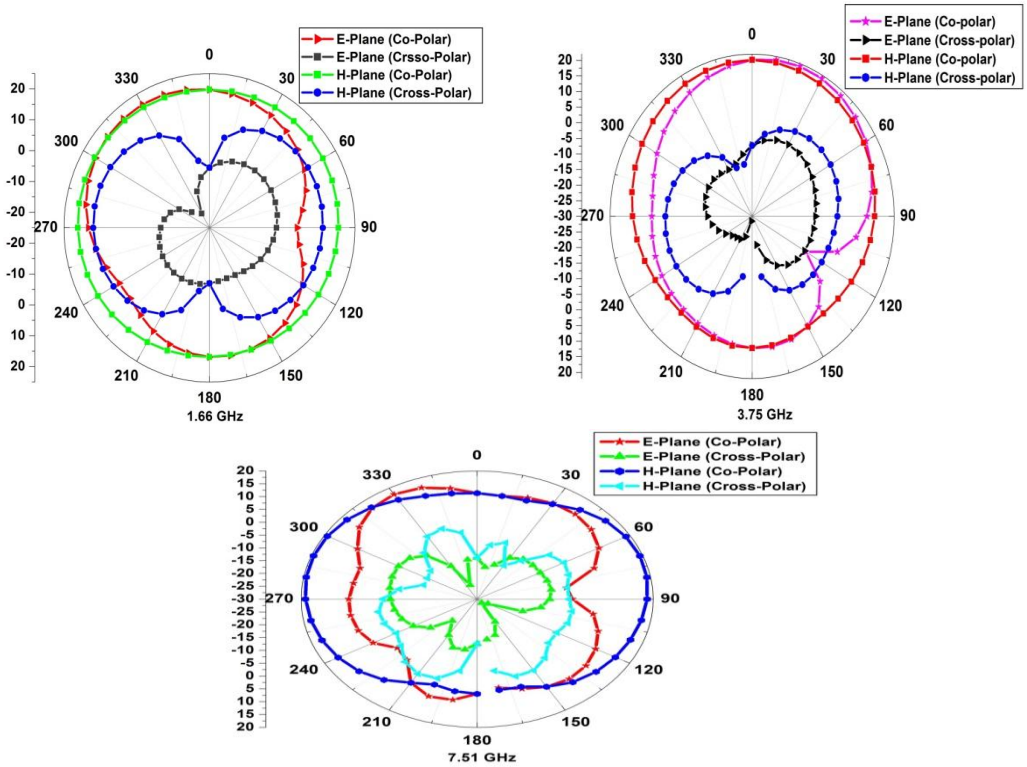

Fig.4 Typical E and H-plane radiation patterns of HCTRMSA measured at (a) 1.66 GHz (b) 3.76 GHz (c) 7.61 GHz

Figure 4 shows the typical radiation patterns of HCTRMSA, measured at 1.66, 3.75 and 7.51GHz respectively. From these figure, it is observed that, the antenna are omnidirectional in nature. Figure 5 shows the simulated peak gain of HCTRMSA. A 4.8 dB gain is achieved by this antenna in its operating bands.

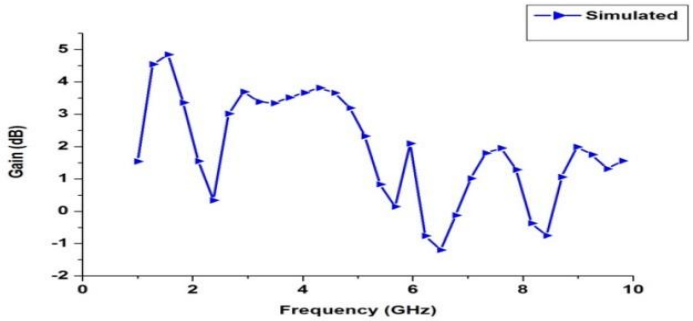

Fig. 5 Variation of gain verses frequency of HCTRMSA

IV. Conclusion

From the detailed study, it is observed that, the proposed HCTRMSA resonates for dual band appearing from 1.19 to 8.18 GHz, with a notch band characteristics. The magnitude of first operating band is 20.95% whereas the magnitude of second band about 133.06%. The 4.8dB gainis found in its operating band. The proposed antenna is simple in its geometry, construction and use low cost substrate material. This antenna can be used successfully for GSM and WiMAX applications.

Acknowledgement

The authors would like to thank the authorities of Dept. of Science and Tech. (DST), Govt. of India, New Delhi, forsanctioningtheVectorNetworkAnalyzerundertheFISTProjecttothe DepartmentofApplied Electronics, Gulbarga University, Kalaburagi.

References

[1]. Constantine A. Balanis,Antenna Theory Analysis and Design, john Willey, New York, 1997.
[2]. I.J. Bahl and Bharatia, "Microstrip Antennas,Dedham", MA: Artech House. New Delhi. 1981.
[3]. Waterhouse. R.B. and Shuley. N.V: "Dual frequency Microstrip Rectangular Patches", Electron Lett. 28 (7). 1992. Pp.606-607.
[4]. G.Kumar and K.P.ray, "Broadband Microstrip Antennas", MA: Artech House.Norwood. (2003)
[5]. K.P.Ray and Deepti Das Krishna, "Compact Dual Band Suspended Semicircular Microstrip Antenna with Half Slot" Microwave and Optical Technology Letters. 48, Oct (2006), pp. 2021-2024.
[6]. I.J. Bahl and Bharatia, Microstrip Antennas, Artech House. New Delhi, (1980).
[7]. R.B. Waterhouse, "Broadband Stacked Shorted Patch" Electronic Lett, 35, (1999), pp. 98-100.
[8]. Kin-Lu Wong.Jian-Yi Wu and Chun-Kun Wu. "A Circularly Polarized Patch-loaded Square-Slot Antenna", Microwave and optical Technology letter. 23. No.6 (1999). 363-365.
[9]. A. Buffi. R. Caso. M.R. pino. P. Nepa and G. manara Single Feed Circularly Polarized Aperture Coupled Square Ring Slot Microstrip Antenna Electronics Lett.46. No 4. (2010).
[10]. Jia-Yi Size, Kin-Lu Wong, Slotted Rectangular Microstrip Antenna for Bandwidth Enhancement", IEEE.Trans Antennas and Propgat 48(8). 2000, pp.1149-1152.
[11]. Wen-Shyang Chen-Kun Wu: Ken-Lu Wong, "Novel Compact Circularly Polarized Square Microstrip antennas" IEEE. Transctions on Antennas and Propagation, 49(3), pp.340-342.
[12]. Girish Kumar and K.P.Ray.Broadband Microstrip Antennas. Artech House. Boston. London. 2003.

Rajeshwar Biradar received her M.Sc. degree in Department of Applied Electronics, from Gulbarga University, Gulbarga in the year 2002 and M. Phil degree from Vinayak Mission University, from Salem in the year 2007. Presently she is pursuing for Ph. D degree under the guidance of Dr. S. N. Mulgi, Professor in the Department of P. G. Studies and Research in Applied Electronics, Gulbarga University, Kalaburgi, Her fields of interest include Microwave Electronics.

Dr. S. N. Mulgi received his M.Sc., M.Phil. and Ph.D. degrees in Applied Electronics, from Gulbarga University Gulbarga in the year 1986, 1989 and 2004 respectively. He is working as a Professor in Department of P. G. Studies and Research in Applied Electronics, Gulbarga University, Kalaburagi. He is an active researcher in the field of Microwave Electronics. He has published more than Eighty five reputed peer reviewed International Journals and more than 30 in National Journals. He has presented several papers in International and National Conferences.

Rajeshwari Biradar "Design of Hybrid Dual Wide Band Antenna with Notch Band Characteristics "International Journal of Engineering Science Invention (IJESI), vol. 07, no. 06, 2018, pp 53-56