A SWITCHABLE MONOPOLE UWB ANTENNA FOR COGNITIVE RADIO APPLICATION

[1]Pooja Chaudhary, [2]Sudhanshu Verma
[1]student, [2]faculty
[1]Department of Electronics and Communication Engineering
[1]Madan Mohan Malaviya University of Technology Gorakhpur,India

Abstract: This paper introduces a switchable frequency recongifurable antenna fed by microstrip feedline used for cognitive radio application. The proposed antenna consist of rectangular patch along with a small radiating rectangular patch that gives the UWB band and used as a sensing antenna. Further some rectangular slot are placed over the UWB antenna structure parellely. By placing multiple switch in between three slots we can reconfigure the different band. The length,width and thickness of antenna is 15mm,15mm and 0.8mm. Simulated result provides the different notches in between 5-7GHz used for WLAN and Satellite communication application. All results are simulated using the HFSS v.13.

IndexTerms **- Rectangular Slot, Switch, UWB antenna, Cognitive Radio, WLAN**

I. INTRODUCTION

As we know that bandwidth is a finite resource of communication we can not increase beyond a certain point. In recent wireless communication, licensed spectrum is vacant due to inefficacious use of bandwidth. Using the cognitive radio technology we can sense the radio environment and reconfigure the different band so it can be used in a better way. In cognitive radio technology, we need a UWB antenna for sensing the radio environment and one NB i.e. narrow band antenna for reconfiguring the different band for different application[2].

Basically there are three techniques that are used in the recent time for cognitive radio application. First technique uses the one seperate antenna for sensing the radio environment and one other antenna for band notching. Second technique uses single port band notched UWB/NB antenna. This technique uses the switching mechanism. By using the different type of switch like ideal switch, PIN diode, varicap diode, RF MEMS etc. Third technique uses the dual port UWB/NB antenna over a single substrate[2].

The ultra wide band (UWB) antenna assigned by the Federal Communication Commission from 3 - 11 GHz i.e. used for the communication purposes[1]. Proposed monopole antenna is used in 5-7GHz range for the WLAN and satellite application.

The compact monopole antenna having the dimension of 15*15(in mm) and thickness of 0.8mm. Rectangular slot are used to generate the notch. Adding switch in between them we can generate the different bands that are useful for the WLAN and satellite application.

II. ANTENNA DESIGN AND STRUCTURE

For cognitive radio application we need a UWB antenna and narrow band antenna. UWB band antenna provides the 3-11GHz geometry of this type of antenna shown in Fig.1 [1].

The proposed antenna geometry is shown in Fig.2 having length and width of 15mm ,15mm respectively and thickness of 0.8mm FR-4 Substrate having dielectric constant of 1.6 and permittivity of 4.4. Proposed antenna having a feedline length and width of 7mm and 2mm respectively. A rectangular patch of 6.5 mm and 10mm over the substrate and also a rectangular patch of length and width of 5mm and 2mm repectively is used for generating the UWB band antenna[1]. For generating the different notch Different rectangular slot are made over the rectangular patch.

By inserting the five switch in between the three rectangular slot we can reconfigure the different band in between 5-7GHz. Here an ideal switch is used basically a rectangular strip of different sizes.

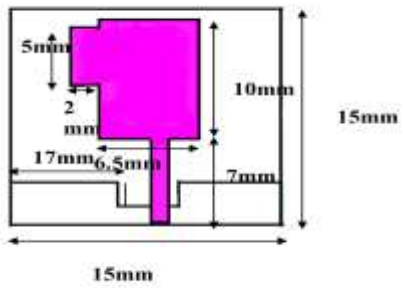


Fig.1 Geometry of UWB antenna[1]

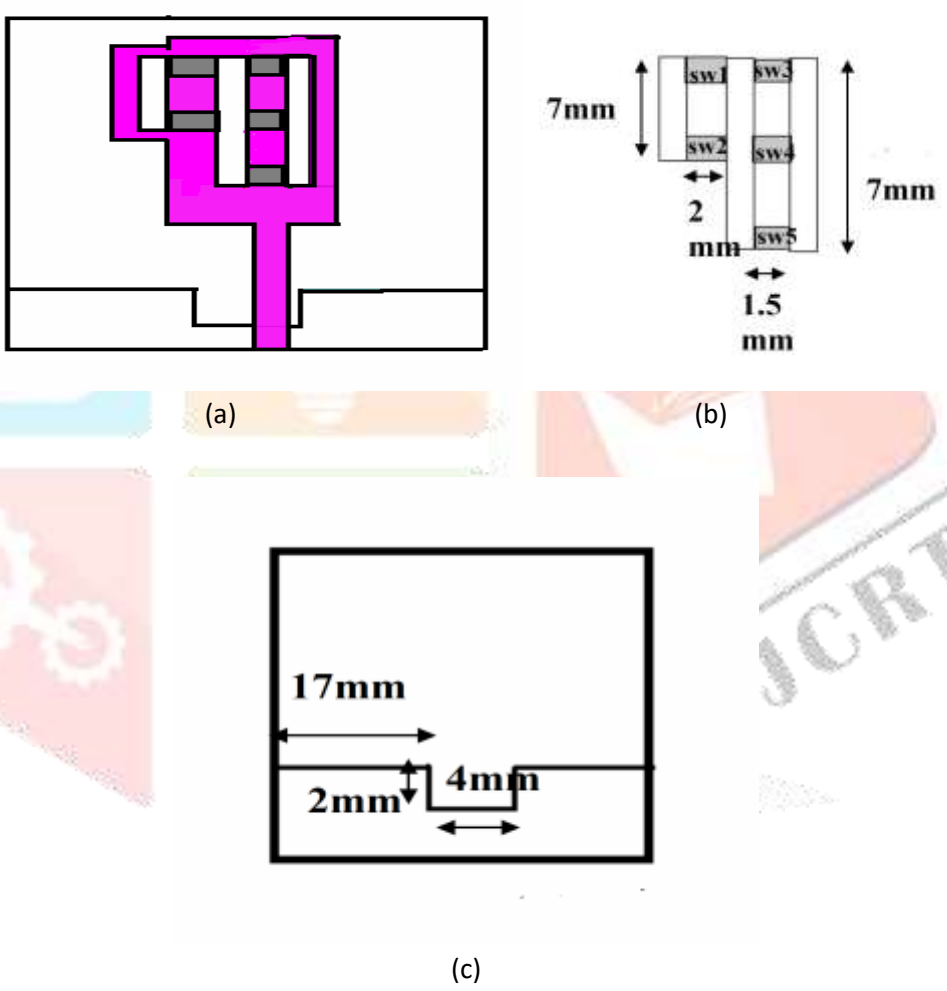


Fig.2 Geometry of proposed antenna (a) and (b) Front view (c) Back view

III. RESULT AND DISCUSSION

Combination of different position of switch we can simulate different result of proposed antenna like Reflection coefficient and Radiation pattern.

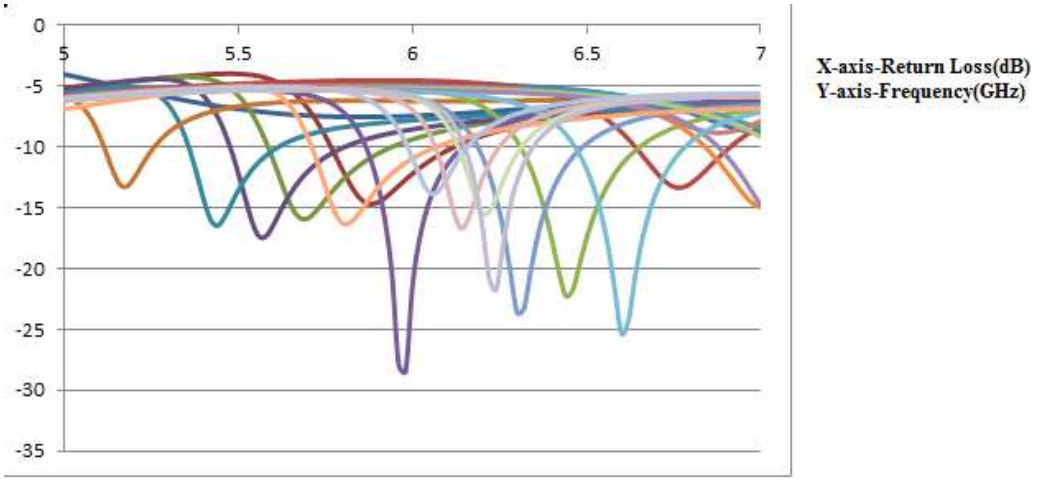
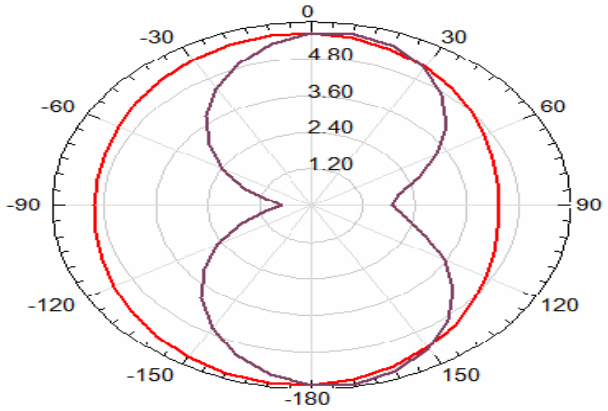
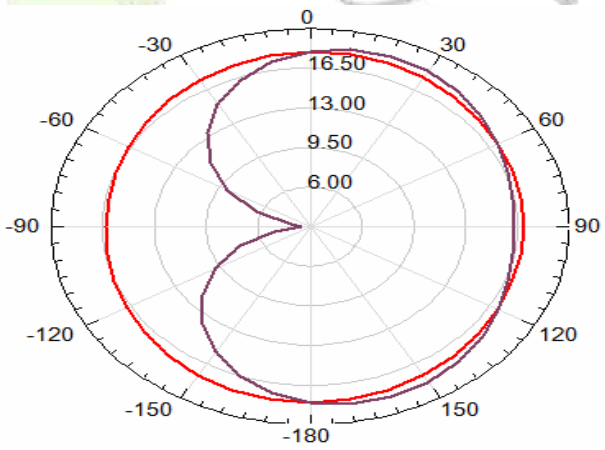


Fig.3 simulated reflection coefficient of proposed antenna

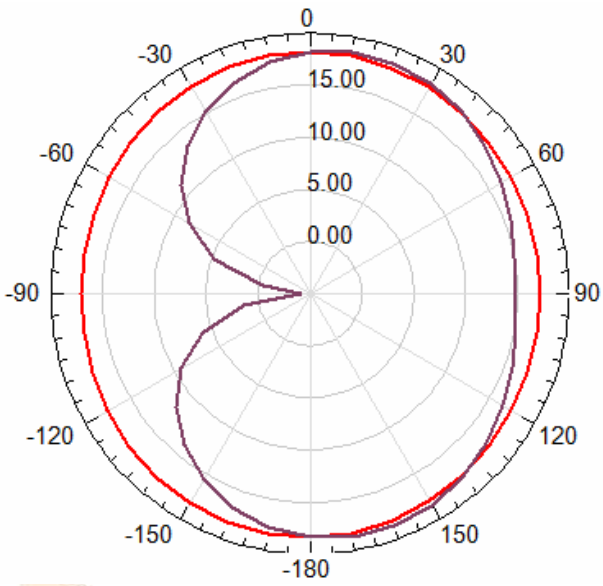
In Fig.3 different notch is generate between 5-7GHz by combination of different switch.



(a)



(b)



(c)

Fig.4. Simulated radiation pattern E-H field of proposed antenna (a) at 5.5GHz (b) at 6.5GHz (c) at 7GHz

Above result shows the different simulated radiation patter ate different frequency like 5.5GHz, 6.5GHz and 7GHz respectively. These results are simulated using the HFSS V.13.

IV. CONCLUSION

The compact monopole proposed antenna provides a different notch by adding the different rectangular slot and switch. Basically switching mechanism provides the reconfiguration between 5-7 GHz. These bands are used for the application of WLAN and satellite communication application.

Acknowledgment

The authors acknowledge the support provided by the Madan Mohan Malaviya University of Technology Gorakhpur, India. This paper done under the supervision of Dr. Sudhanshu Verma (Assistant professor of Department of Electronics and Communication Engineering).

References

[1]. Vahid Sharbatia, Pejman Rezaeia, Mohammad M. Fakharian & Ehsan Beiranvanda"Switchable Band-Notched UWB Antenna for Cognitive Radio Applications"

[2]. Anveshkumar Nella[1], Abhay Suresh Gandhi[1] "A Survey on Planar Antenna Designs for Cognitive Radio Applications"

[3]. Tawk, J. Constantine, K. Avery, and C. G. Christodoulou, “Implementation of a cognitive radio front-end using rotatable controlledreconfigurable antennas,” IEEE Trans. Antennas Propag., Vol. 59, no. 1, pp. 1773-8, 2011.

[4]. A. A. Kalteh, G. R. DadashZadeh, M. Naser-Moghadasi, and B.S. Virdee,“Ultra-wideband circular slot antenna with reconfigurable notch band function,” IET Microw., Antennas Propag., Vol. 6, no. 1, pp.108-2, 2012.

[5]FCC Spectrum Policy Task Force, “Report of the spectrum efficiencyworking group,” FCC, Tech. Rep., 2002.

[6] N. Telzhensky, and Y. Leviatan, "Novel method of UWB antenna optimizationfor specified input signal forms by means of genetic algorithm,"IEEE Trans. Antennas Propag., Vol. 54, no. 8, pp. 2216-25,2006.

[7] B. Sanz-Izquierdo, P. R. Young, Q. Bai, and J. C. Batchelor, "CompactUWB monopole for multilayer applications," Electron. Lett., Vol. 42,no. 1, pp. 5-7, 2006.

[8] T. G. Ma, and S. K. Jeng, "Planar miniature tapered-slot-fed annular slot antennas for ultra-wideband radios," IEEE Trans. Antennas Propag., Vol. 53, pp. 1194-202, 2005.

[9] V. Sharbati, P. Rezaei, and A. Kordinejad "A new design of reconfigurable microstrip antenna for cognitive radio application," in Proceeding of the 5th Iranian Conference on Electrical and Electronic Engineering, 2013, pp. 153-4.

[10] V. Sharbati, P. Rezaei, A. Shahzadi, and M. M. Fakharian, "A planarUWB antenna based on MB-OFDM applications with switchable dualband-notched for cognitive radio systems," Int. J. Microw. WirelessTechnol., 2014.doi:10.1017/S1759078714001317.

[11] M. M. Fakharian, and P. Rezaei, "Parametric study of UC-PBG structurein terms of simultaneous AMC and EBG properties and its applications in proximity-coupled fractal patch antenna," Int. J. Eng.Trans. A, Vol. 25, pp. 347-54, 2012.

[12] M. M. Fakharian, P. Rezaei, and A. A. Orouji, "Microstrip antenna with a reconfigurable dumbbell-shaped defected ground plane for DCS-1800 and PCS-1900," IEEE Int. Symp. Antennas Propag. Soc., pp.
576-7, 2013.

[13] M. M. Fakharian, P. Rezaei, "Very compact palmate leaf-shaped CPW-Fed monopole antenna for UWB applications," Microw. Opt. Technol. Lett., Vol. 56, pp. 1612-6, 2014