RECONFIGURABLE BAND NOTCHED UWB CIRCULAR MONO-POLE ANTENNA USING INVERTED U- SHAPED SLOT

[1]Peram. Venkateswarlu, [2]K.vijayachandra, [3]P.Teja
[1]student , [2] Research scholar, JNTUK, [3] student
[1]Prakasam engineering college, III B.tech ECE, Kandukur, A.P, India

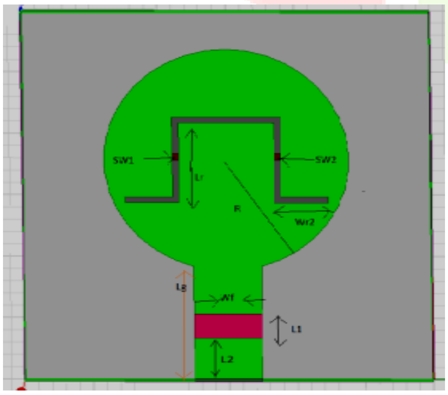
Abstract: To lead the assessment of communication systems, the designing new antennas are prudent to produce new parameters to achieve all characteristics like small size and versatile in nature. The micro strip reconfigurable UWB and small band width antenna is introduced in this proposal. The UWB is a radio technology it is low power consumption, large data rate transmission .it is a one type of micro strip antenna, it is useful for WIMAX applications, it poses many wide band frequencies from 2 to 10GHz frequency range .The proposed inverted u shape antenna consisting of a limited defected bottom surface and 9*1.5mm length and width patch is arranged to produced wide band of frequency from 4.27GHz to 8.7GHz. in this proposal has a one small band of frequency is generated by the switches of inverted U-shape , arranged in the rectangular shape. In this shape is placed to reduced disturbance with WIMAX (World Wide Interoperability for Microwave) applications from 2.98GHz to 3.96GHz. The reconfigurable narrow band and UWB characteristics are produced by using PIN diode placed on the surface of inverted square-shaped slot. The reconfiguration is achieved for this proposed antenna by placing the two ideal PIN switches. The designed antenna is operated in four different conditions, which is produced by controlling the PIN diodes ON/OFF. For this proposed antenna has VSWR < 2. This micro strip antenna designing has been simulated using HFSS ANSYS 16.1 software.

Keywords: **Reconfigurable antenna, UWB antenna, inverted U-shape slot, antenna radiation patterns, switches**

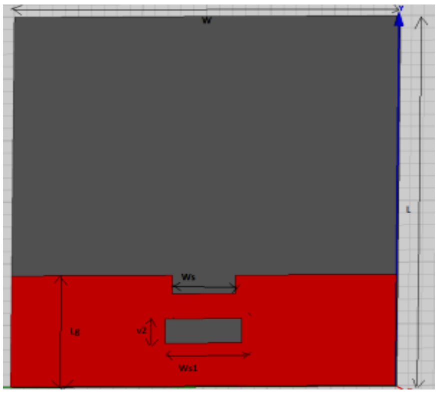
I. INTRODUCTION

The ultra-wideband is used for transmit the data long distance communication. Ultra-wide band is also called 'pulse radio' international telecommunication union and FCC define it transmit the signal band width exceed 20% of arithmetic centre frequency .The communication system has more receptions it enables limited–distances 10^9 bits per second communication system. Every square in wide band system has ultra wide band. In this proposed antenna is a one type of micro strip antenna .Now a day's micro strip antennas are more preferred because of small size, light weight, low cost and easy to design. All most all micro strip antennas have radiation produced above surface side and other side place a ground. Several Researchers are done for producing wide band width antennas, it is produced the to achieve the characteristics of ultra wide band system for small shape, and radiation in all directions. WiMAX is also works in this range between 2GHz - 11GHz. In this proposed antenna produce notched frequency it allows limited frequency range by controlling the PIN diodes the frequency range will be altered.

In this paper, the proposed antenna has produce band notch and ultra wide band frequency ranges. The notch frequency is produced 2.98-4.93GHz and uwb occurs at 5.6GHz to 8.7GHz,depending on switching conditions it's altered. The reconfiguration is produced by arranging two switching diodes paced in inverted U –shaped on the above the surface of circular slot. The commercial HFSS (High Frequency Structure Simulation) using 16.1 ANSYS software.



1 (1).2D Front view



(2). Bottom side view.

Fig.1 Design inverted U-Shape UWB Antenna

II. PROPOSED ANTENNA DESIGN

The proposed micros trip antenna with more band width shown in F.1(1),(2). In This antenna designed by using Rogers RT/duriod 5880(tm) of 0.8mm thickness, relative permeability 1. The dimensions of praposal antenna are in Table. 1. Antenna printed on 30*30mm Rogers RT/duriod 5880(tm). The notch frequency is shown in Fig.1 (1). By placing defected ground circular polarisation occurs this Antenna shown Fig.1.(b) and diode is placed on the surface of patch . Results for the measured and simulated VSWR are shown Fig.3 .The VSWR of this micro strip antenna is less than 2, in between 2.98GHz to 8.7GHz, the notch frequency is in between 2.98GHz to 4.93GHz and wide band from 5.1GHz to 8.71GHz.

Table.1.

The dimensions of micro strip antenna.

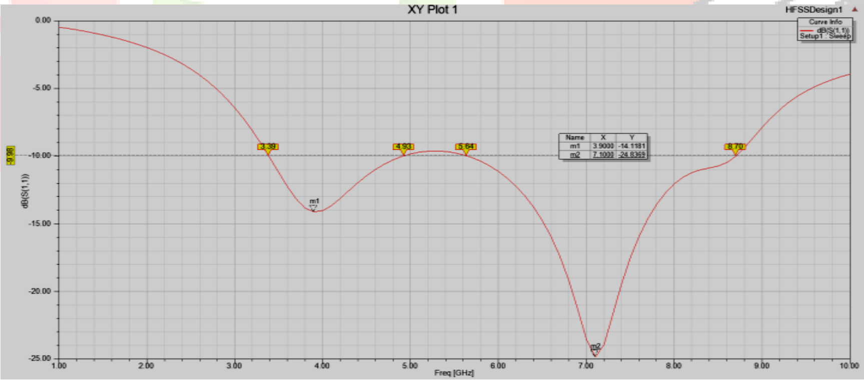
The dimensions of proposed antenna in mm							
parameter	l	w	Lg	Ws	wf	L1	L2
Dimension(mm)	30	30	9	5	5	1.5	3.5
parameter	Ws1	Wr	Lr	R	V2	Wr2	
Dimension(mm)	6	8	6	9	2	4	

III. ANTENNA WITH IDEAL SWITCHS

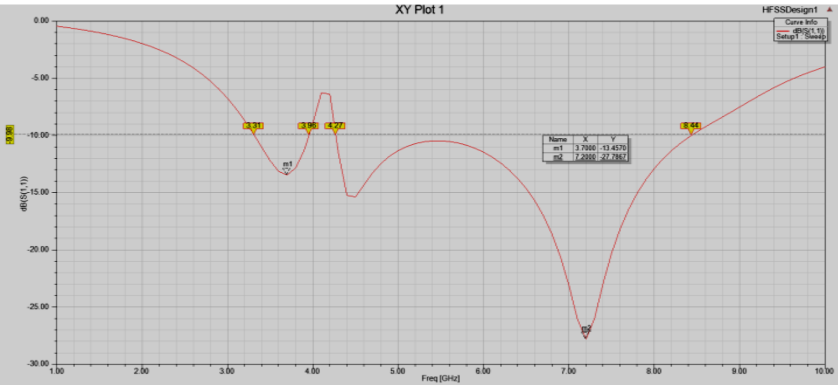
The radiating patch consists of two switches ST1 and ST2. The diodes are controlled by the following ways two diodes are in 'ON' state means short circuiting the inverted U shape . Also, the 'OFF' state means the inverted u shape is open. The pin diodes ST1 and ST2 are containing size of 0.5 × 0.5 mm. The two PIN diodes are operated in four modes of operation. The first condition is the ST1 and ST2 'ON', the next condition ST1 'OFF' and ST2 'ON', the next condition is ST1 'ON' and ST2 'OFF' and the last condition is ST1 'OFF' and ST2 'OFF'. The return loss of the proposed micro strip antenna with changing switching conditions is shown in Fig.2.If the switches ST1 ,ST2 both are in 'OFF', the antenna produce band notch from 2.91GHz to 3.13GHz and wide band occur 3.71GHz to 8.7GHz. in next condition, when the ST1 'ON and ST2 'OFF' the band notch occurs at 3.31GHz to 3.96GHz wide band from 4.6Ghz to 8.44GHz. If ST1 and ST2 both are 'ON' ,The single band occurs at 3.39GHz to 4.93GHz and ultra wide band occurs at 5.64GHz to 8.7GHz and if anyone of switch 'ON' the single band occurs at 3.35GHz to 4.11 and ultra wide band occurs at 4.45GHz to 8.11GHz. By observing the above results proposed micro strip antenna has reconfigurable antenna, and it is useful in cognitive radio applications.

IV.EXPERIMENTAL RESULTS AND IT'S DISCUSSION

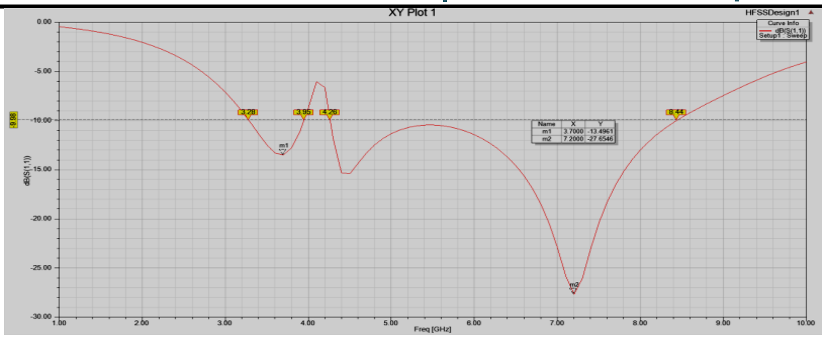
The surface current flow of this micro strip antenna is at 3.71GHz. When ST1 'OFF'& ST2 'OFF'. When ST1&ST2 are 'ON', it is not radiate as in normal conditions by changing the switches ON/OFF this Antenna work as reconfigurable UWB Antenna. The results, simulated SR of simulated wide band antenna is observed in F.3. For this antenna VSWR is 1.5. Return loss is used to find the impedance matching, it depend on value of S11. A perfect impedance match is indicated by a return loss greater than 10dB.When the switches ST1,ST2 are 'ON' then return loss occurs maximum at 3.9and 7.1GHz,wide band and narrow band respectively.



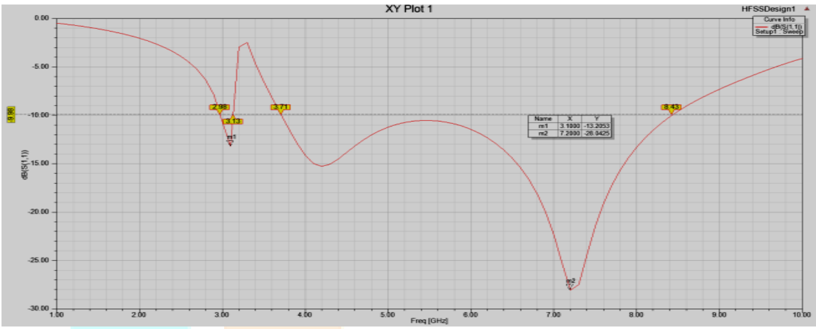
(a). ST1,ST2 are 'ON'



(b).ST1 'ON',ST2 'OFF.

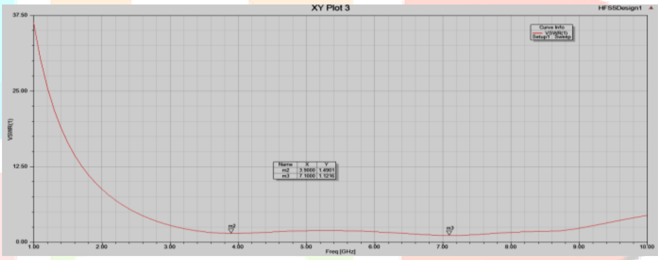


(c).ST1 ‘OFF’,ST2 ‘ON’.

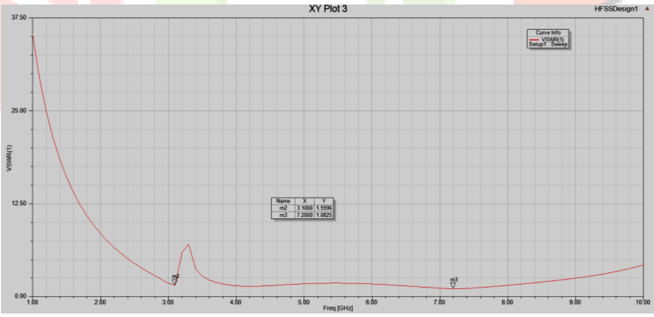


(d). ST1 , ST2 are ‘OFF’

Fig . 2. Return Loses curve of UWB Antenna

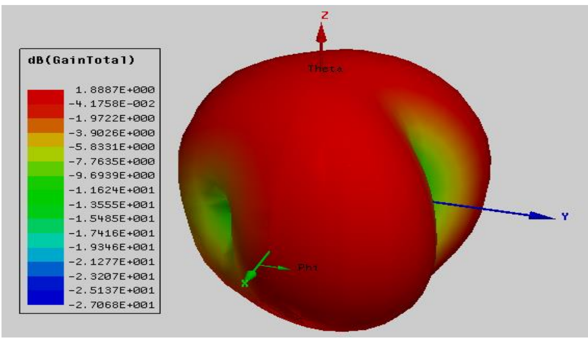


(a).ST1,ST2 are ‘ON’



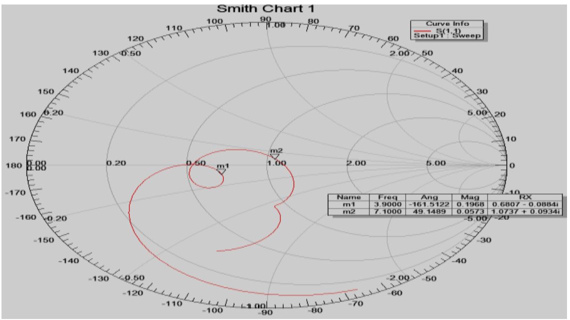
(b). ST1 , ST2 are ‘OFF’

Fig.3. Simulated VSWR curve of UWB Antenna



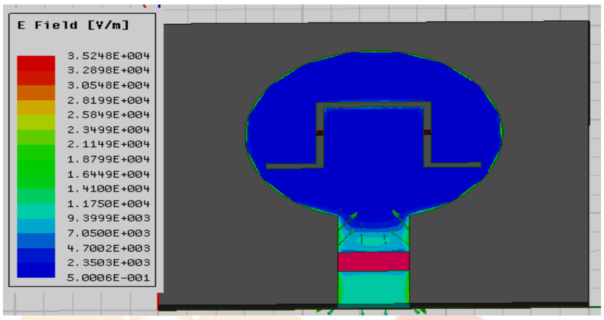
(a). ST1 ‘ON’, ST2 ‘ON’

Fig.4. Simulated 3D Radiation Pattern



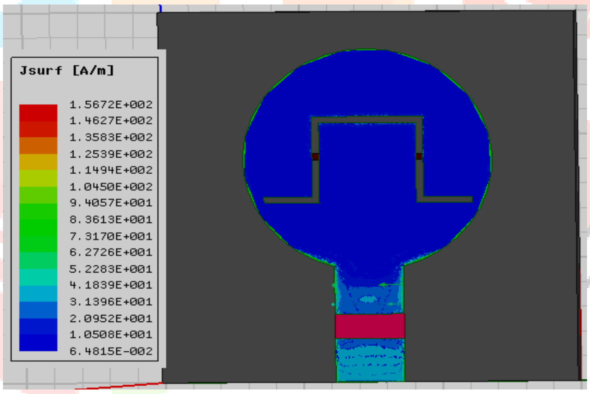
(a). ST1 ‘ON’,ST2 ‘OFF’.

Fig5. Simulated Radiation Pattern



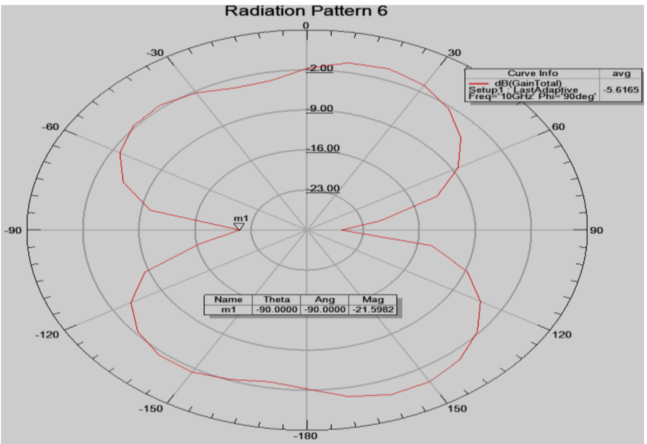
(a).ST1 ‘ON’, ST2 ‘ON’

Fig.6. Simulated Electric field Distribon



(a). ST1 ‘OFF’, ST2 ‘OFF’

Fig.7. Simulated Surface Current distributions of proposed Antenna.



(a).ST 1‘ON’, ST2 ‘OFF’

Fig.8 .Two dimensional Radiation pattern . Orientation of electric field vector is

E=AθEθ COS(wt) + AøEø COS(wt+α) For circular polarisation α=±π/2 and Eθ=Eø.

If ST1 'ON',ST2 'OFF' ,The loss are occurs at 3.7 and 7.2GHz. ST1 'OFF and ST2 'ON' it occurs at 3.7 and 7.2GHz,ST1 and ST2 are 'OFF' 3.1 and 7.2GHz respectively .A gain of 3dB indicates antenna practically working. In this gain of antenna maximum at 2.01dB, when ST1andST2 are 'OFF'. The higher the VSWR, indicate the greater the impedance mismatch between antenna and receiver minimum VSWR occurs at 7.2GHz is 1.08 when ST1 'ON' and ST2 'OFF'. The electric field determines the polarisation or orientation of the radio wave, the designed antenna maximum Electric field strength is 5.16V/m. The maximum current distribution occurs, when both switches are 'ON" 1.67A/m. If both the switches are ON /OFF the polarisation is circular and any one is OFF it converted into both liner and circular polarisation.

	ST1'ON', ST2'ON'	**ST1'ON', ST2'OFF'**	**ST1 'OFF' ,ST2'ON'**	**ST1 'OFF', ST2'OFF'**
Gain(dB)	1.8	1.4	1.47	2
E-Field(V/m)	3.5	3.66	4.36	5.16
Band width(narrow/uwb	1.54, 3.06	0.65, 4.17	0.7, 4.18	0.15, 4.72
Return Loses(GHz)(narrow/uwb)	4,7	3.8,7.2	3.8,7.2	3.2,7.2
J-Field(A/m)	1.67	1.19	1.42	1.56
VSWR	1.12	1.08	1.08	1.08

Table.2.final results.

V. CONCLUSION

In this paper, a comprehensive study of UWB antenna including design, simulation and characterization is presented. A reconfigurable band-notched UWB antenna has been introduced. Several parameters were taken into consideration in analysing the strengths and weakness in potential antenna designs including band width; radiation pattern, directivity and gain, return loss, E-field and J-field. The antenna is operated in frequency band from 2.98GHz to 8.7GHz. The proposed antenna produce notch band and wide band, is produced using switching inverted U-shaped placed on radiating circular patch. The frequency reconfiguration is achieved controlling the two diodes conditions. This micro strip antenna produce a VSWR <2.

VI. REFERENCES

[1].Micro strip, GP ramesh, a rajan communications and signal processing (iccsp), 2014 international conference …

[2].Micro strip by Ramesh Garge, prakash bhartia, inder bahl.

[3] samita pahadsingh , sudhakar sahu by "planar UWB integrated with multi narrow band dielectric resonator antenna''.

[4] "A compact Planer UWB Antenna with Band-Notched Characteristics,"by, A. Abdel-alla , H. F. A. Hamed,A. A. Ibrahim, M. Alla El-Din,E. Yahia, 2014 International Conference on Engineering and Technology (ICET), pp. 10-11 Oct. 2014.

[5] " MEMS-switched reconfigurable antennas" by W.G Weedon,W.J .Pane,and G.M rebeiz propagation society symposim and proceeding of antennas ,vol.3,pp,654-657

[6] "A Noel Reconfigurable broad band antenna for cognitive radio Applications " seyyedehelnaz Ershaid ,Ahmed H,Hao Xin and Xiaoju department of computer Engineerig united states..

[7]. "Compact ultra-wideband antennas with reconfigurable notched bands", A.G. Wang, W. Leng, , G.H. Zhao B. Chen, *Electron. Lett.*, no. 19, vol. 48, pp. 1175-1176, 2012.

[8]."magnetically tunable ferrite loaded SIW antenna" L.r.tan,C.Y.Wang,and R .X. Wu.IEEE Antennas wireless propagation Letters.,vol 12.273-275,2013.

[9]. "A Compact UWB Antenna with Sharp Band-notched Characteristic and Controllable Notched Bandwidth" Qing-Xin Chu, Tian-Gui Huang,, *Electron. Lett.*, vol. 47, no. 15, pp. 838-839, 2011.

[10]. "Equivalent model for the phase dynamics of a metamaterial inspired patch antenna", Antonello Andreone, Gianpaolo Papari, *Journal of Applied Physics*, vol. 119, pp. 084505, 2016, ISSN 0021-8979