Scientific Journal of Impact Factor(SJIF): 3.134

e-ISSN(O): 2348-4470
p-ISSN(P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 2, Issue 6, June -2015

Frequency Reconfigurable Microstrip Patch Slot Antenna for MultibandWireless Application

Punam S. Shinde[1], Prof.Vikas U. Deshmukh[2]

[1]*Electronics and Telecommunication Department, VPCOEBaramati,*
[2]*Electronics and Telecommunication Department, VPCOE Baramati,*

Abstract-*Frequency Reconfigurable Microstrip Patch Switchable to slot Antenna is proposed. The Antenna is capable of frequency switching at three different frequency bands between 2.4GHz to 2.8GHz. One PIN Diode Switch is positioned in the Slot to achieved Frequency Reconfigurability. Simulated Results are Demonstrate the Performance of the Antenna. Reconfigurable antenna is an alternative to Multiband Antenna. Reconfigurability in antenna allows us for spectrum reallocation in multi-band communication systems therefore reducing the number and size of antenna in a system. Reconfigurable antennas are designed to support multiband and wideband wireless applications in different frequency bands.*

Keywords-*Reconfigurability, Microstrip Patch Antenna, Microstrip Patch Antenna,RFPIN Diode.*

I. INTRODUCTION

A wireless communication system is more attracted toward multifunctionality. This multifunctionality provides users with options of connecting to different kinds of wireless services for different purposes at different times. SoIt is very important to develop single radiating element which is having a capabilities of performing different functions and multi-band operation in order to minimize the antennas weight and area. Reconfigurable antenna is used for to reduce the number of antenna necessary for Multiband function, but they can also be designed to work in complex systems such as emerging applications include software defined radio, cognitive radio, MIMO systems [1]. Reconfigurability can be achieved using slot configuration in the microstrip rectangular patch antenna with switching devices are connected inside the slot with on & off State working [2]. Switching devices such as PIN diodes, MEMS switches and optical switches are used for switching purposes [1].Antenna Parameters Such as Frequency , Radiation Pattern and Polarization are Reconfigure in order to fulfill current or Future demand [3]. This paper provides detail information about Frequency reconfigurable antenna.

Therefore, in this paper frequency ReconfigurableMicrostrip Patch Switchable to slot Antenna with Three Frequencies is introduced [3]. The Antenna Consists of a Microstrip Patch and Slot in Upper side of the Substrate. The Antenna is Capable of Reconfigure at Three different Frequencies using one PIN Diode Switch. The Size of Antenna is Relatively Small with a Dimension of 87*64 mm.Section I gives the Information about frequency reconfigurable antenna. Section II introduces the Design procedure of frequency reconfigurable antenna. This section provides the geometry of frequency reconfigurable antenna. Section IIIpresents Simulation of ReconfigurableAntenna. Section IV includes the Result for different Parameters of Antenna.Section V shows the fabricated antenna results. SectionVIconcludesthepaper.

II. DESIGN AND CONFIGURATION

In this Section, the Structure of the proposed antenna is described. Fig. 1 shows the geometry of proposed Antenna.The antenna is fabricated on a FR4 Substrate with a Thickness of 1.5mm. The Patch Size is 39*28.2mm. The length of inset feed is a=6.4 with awidth of 1.5mm. One C Slot is Place on the Patch with a Width of 2mm.The Switch S1 is placed at the middle of the Slot .By changing the effective length of the slot three different Resonating frequency band are produced.When Diode is Switched ON the Antenna is resonating at 2.4GHz and 2.57 GHz Frequency band. When Switched is OFF then Antenna is Resonating at 2.57 GHz and 2.8GHz Frequency band. RF PIN Diode BAR50-02 is used as the switch in the simulation and Measurement.

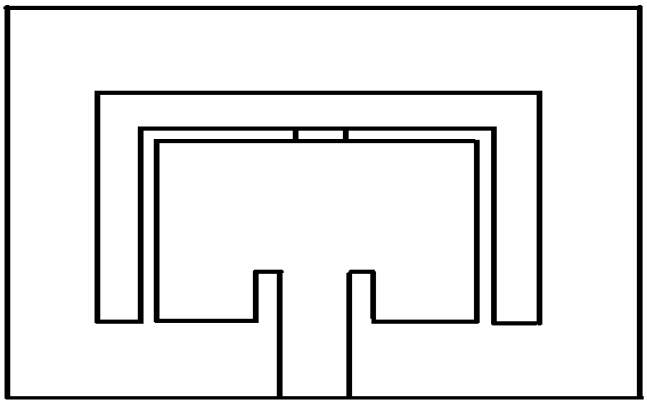

Fig.1. Geometry of proposed antenna

III. SIMULATION

High Frequency Structure Simulator [HFSS] Software is used to simulate the proposed antenna. Fig.2 Shows the Simulation of Frequency Reconfigurable Antenna by using Single Switch. By using the previous Dimension we have create the geometry of proposed antenna. After completing the geometry we have checked the different parameters of antenna. Here PIN Diode switch is placed in middle of the slot and according to the switch condition antenna will operate at different operating frequencies. In this Microstrip feed line technique is used for to give excitation to the antenna. Instead of Single switch we can used the double switch to increase the frequency band of operation.

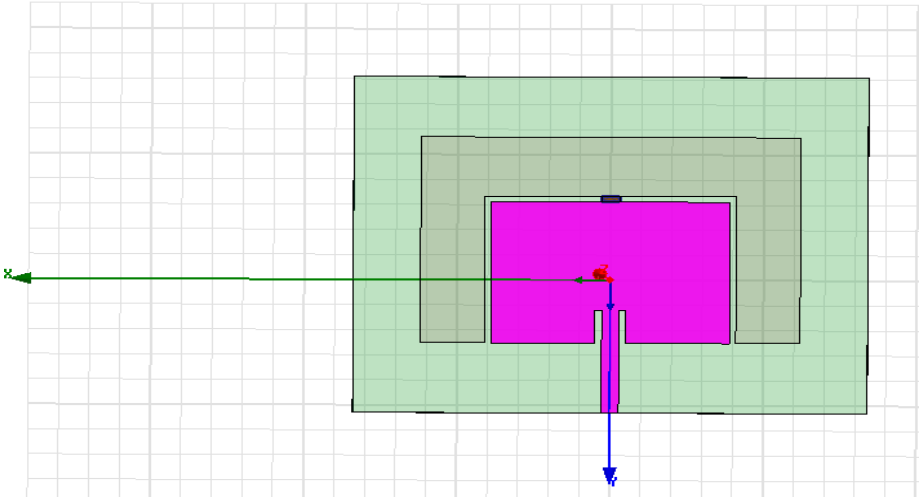

Fig.2. Simulation of Reconfigurable Antenna

IV.RESULTS

4.1. S parameter

S parameter is the graph of S11 parameter vs. Frequency, In S parameter we check the return losses. Here we got a return loss which is less than -10db.This is the situation when switch is in OFF condition we got two resonating Frequencies at 2.4GHz and 2.57 GHz. Both are having the return loss which is less than -10db. Fig.3.Shows this Condition means when switch is OFF.

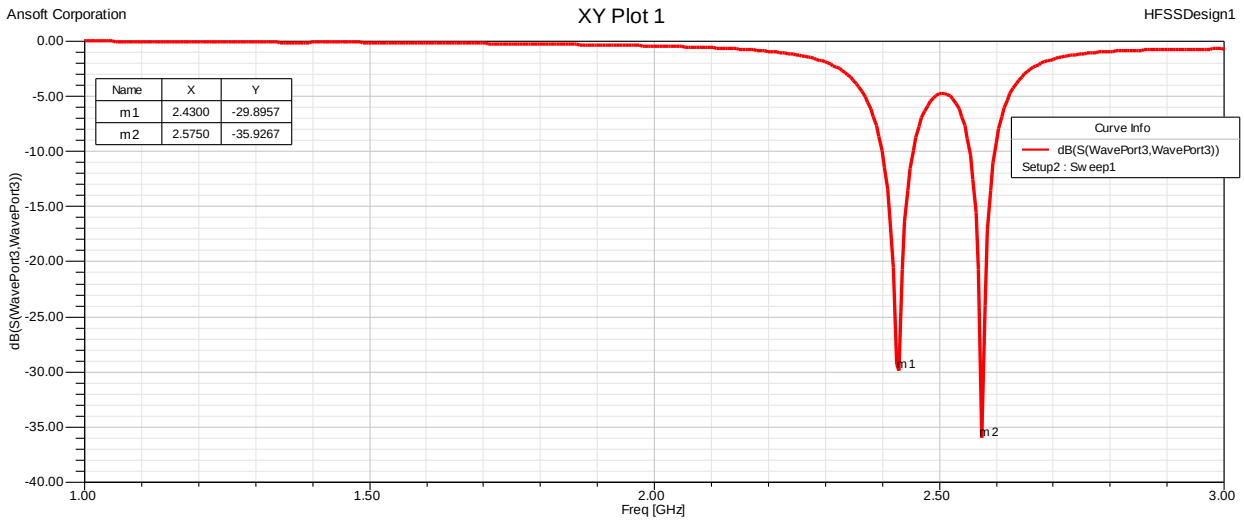

Fig.3. S11 Parameter vs. Frequency plot [Switch is OFF]

Now the next situation where switch is in ON condition, atthat time we got Two Resonating Frequencies at 2.57 GHz and 2.8GHz with return losses are less than -10db.Fig.4 Shows the graph of S Parameters when switch is in ONcondition.

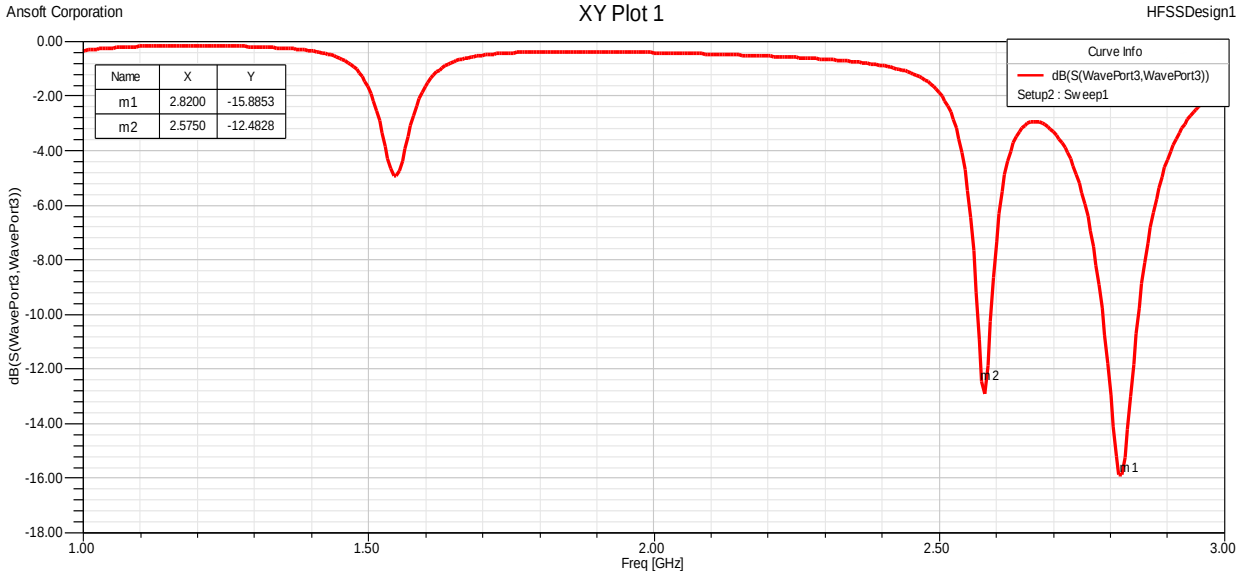

Fig.4. S11 Parameter vs. Frequency plot [Switch is ON]

4.2 VSWR (Voltage Standing Wave Ratio)

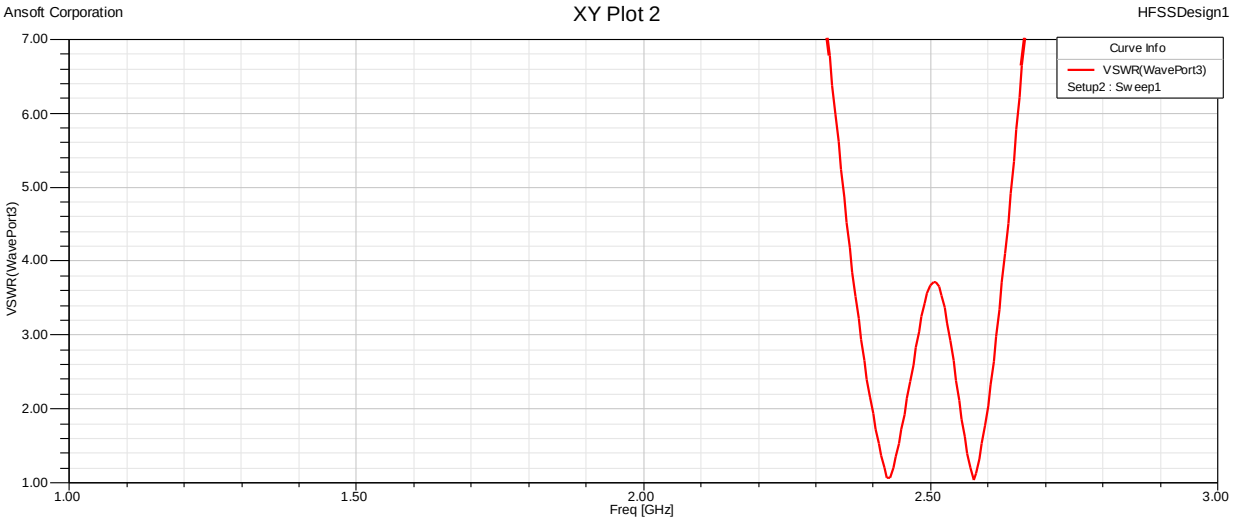

Fig 5. VSWR vs. Frequency plot [Switch is OFF]

The Idle value for VSWR is 1 Means there is no reflection so here I got value of VSWR is 1.2 when switch is in ON condition. Fig.5. Shows the graph of VSWR vs. Frequency Plot When Switch is OFF, so here is small reflection of waves from load to generator. Fig.6.the shows the graph of VSWR vs. Frequency Plot When Switch is ON and that time VSWR is 1.6.

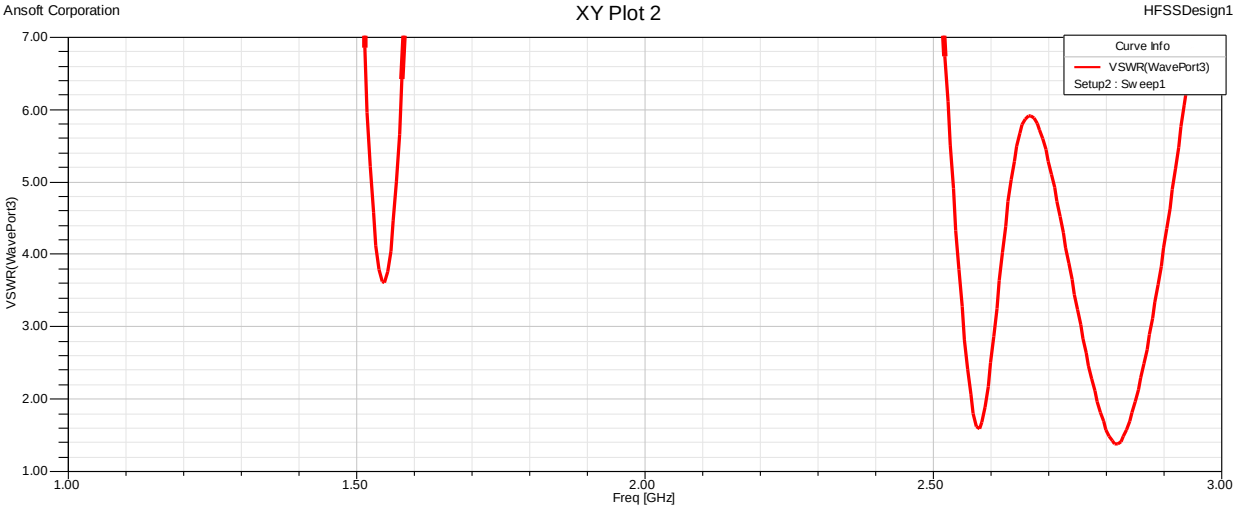

Fig 6. VSWR vs. Frequency plot [Switch is ON]

4.3. Radiation Pattern

Fig.7. shows the Radiation Pattern of Reconfigurable Antenna and Both the situation having same radiation Pattern

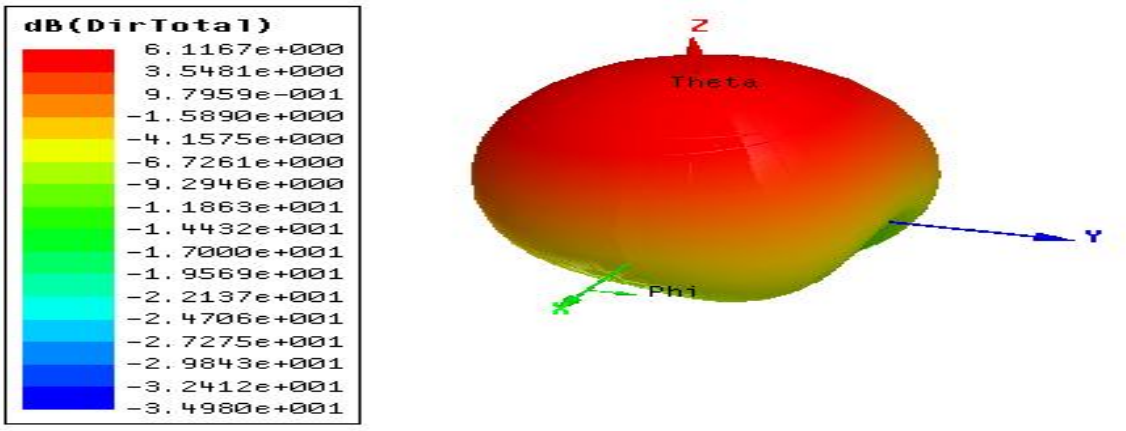

Fig.7. Radiation Pattern

V. MEASURED RESULTS

When switch is in ON Condition

5.1. S parameter

I have measured Return loss of Fabricated Antenna on Network Analyzer and I got the Results which is shown in Fig.7. I got two Resonating Frequencies i.e 2.49GHz and 2.89GHz with a return loss -15.85dB & -37.45dB respectively.

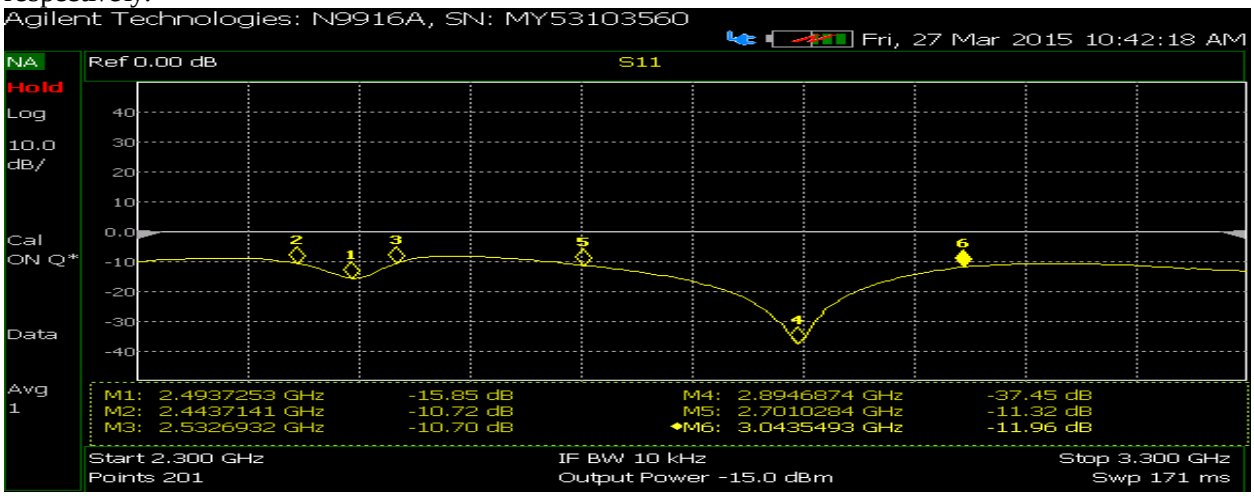

Fig.8. S11 Parameter vs. Frequency plot [Switch is ON]

5.1 VSWR (Voltage Standing Wave Ratio):

For both the resonating frequencies VSWR value is less than 2

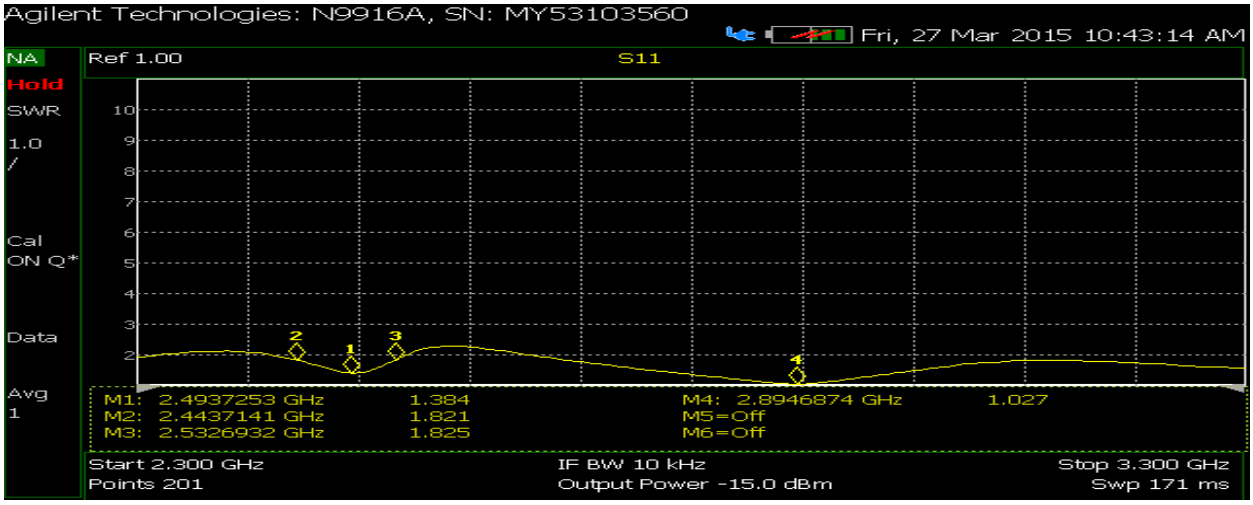

Fig 9. VSWR vs. Frequency plot [Switch is ON]

When switch is in OFF Condition

5.3. S parameter

The measured Return loss of Fabricated Antenna on Network Analyzer for switch is in OFF condition shown in Fig.9. In this condition I got two Resonating Frequencies i.e. 2.42GHz and 2.56GHz with a return loss -15.06dB & -41.72dB respectively.

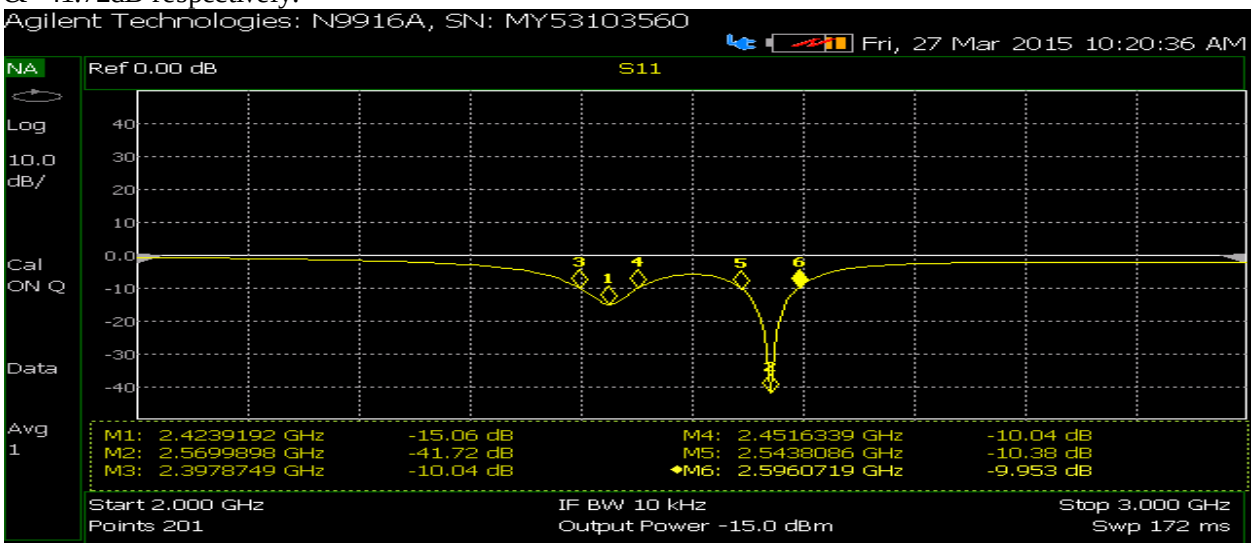

Fig.9. S11 Parameter vs. Frequency plot [Switch is OFF]

5.2 VSWR (Voltage Standing Wave Ratio):

For both the resonating frequencies VSWR value is less than 2

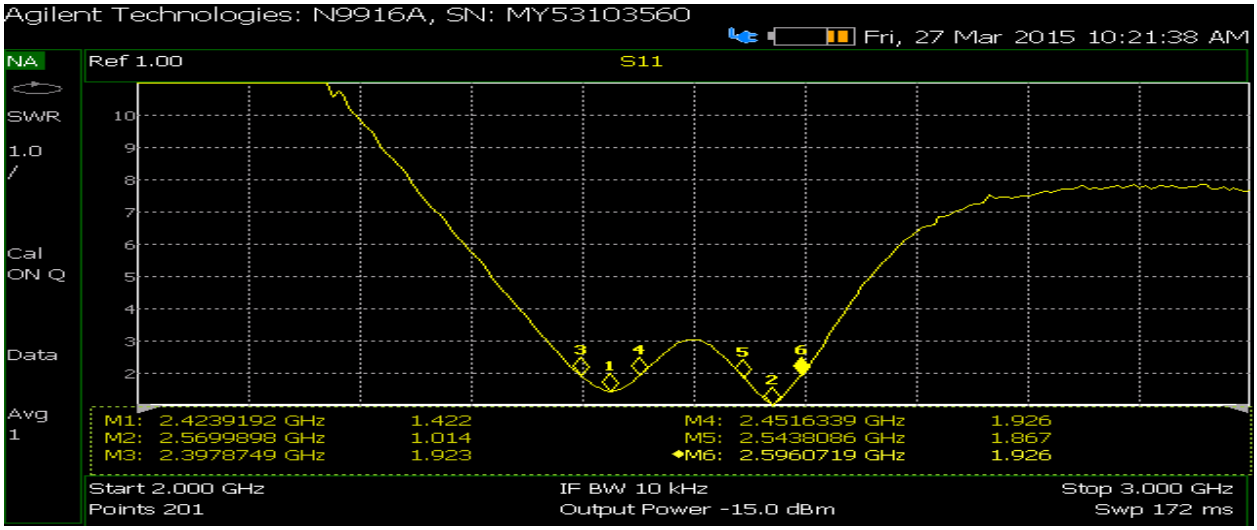

Fig 10. VSWR vs. Frequency plot [Switch is OFF]

Comparison of Simulated and Measured parameters

Table 1: Comparison of Simulated and Measured parameters when switch is in OFF state

Sr.No.	Parameters	Simulated Results	Measured Results
1	Operating frequencies	2.4GHz and 2.57GHz	2.4GHz and 2.57GHz
2	Return Loss	-29.89dB and -35.92dB	-15.06dB and -41.72dB
3	VSWR	1.02 and 1.03	1.422 and 1.01
4	Bandwidth	50MHz and 50MHz	60MHz and 50MHz

Comparison of Simulated and Measured parameters

Table 1: Comparison of Simulated and Measured parameters when switch is in ON state

Sr.No.	Parameters	Simulated Results	Measured Results
1	Operating frequencies	2.57GHz and 2.84GHz	2.49GHz and 2.89GHz
2	Return Loss	-29.89dB and -35.92dB	-12.89dB and -15.76dB
3	VSWR	1.02 and 1.03	1.59 and 1.38
4	Bandwidth	50MHz and 90MHz	60MHz and 300MHz

V. CONCLUSION

A Frequency Reconfigurable Microstrip Patch Switchable to slot antenna has been presented. The proposed antenna is capable to reconfigure up to three different frequency bands. Frequency Reconfiguration is achieved by using single PIN Diode switch. This shows that the proposed antenna is suitable for Multiband operation.

REFERENCES

[1] Sonia Sharma, Monish Gupta, C.C.Tripathi"Reconfigurable Antennae: A Review", IJECT Vol.2, Issue 3, Sept. 2011 \\
2] Dimitriosperoulis, Kamal Saraland and Linda P.B.Katehi presents "Design of Reconfigurable Slot antennas" *IEEE Transactions on Antennas and Propagation, Vol. 53, N).2, FEBRUARY 2005*.
[3]Huda A. Majid, Mohamad K. A. Rahim*,Mohamad R. Hamid, and Muhammad F. Ismail "Frequency RecongurableMicrostrip Patch-Slot Antenna with Directional Radiation Pattern". *Progress In Electromagnetics Research, Vol. 144, 319-328, 2014*
[4]A.Sheta and F.Mahmoud,"A Widely Tunable Compact Patch Antenna," IEEE Antennas Wireless Propag, Lett, vol, 7, pp.40-42, 2008
[5] Pradeepkumar,NehaThakur,AmanSanghi "Micro strip Patch Antenna for 2.4 GHZ Wireless Applications" *International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 8- August 2013*.
[6] GovardhaniImmadi, M.S.R.S Tejaswi, "Design of coaxial fed microstrip patch antenna for 2.4 GHz Bluetooth Applications", *Journal of emerging trends in computing and information sciences*, Vol.2, pp 686-690, 2011.
[7]AbdelnasserEldek, AbubakerAbdallah, Mahmoud Manzou "Reconfigurable Microstrip Double-Dipole Antennas for Personal Wireless Communications,"Wireless Engineering and Technology, 2011, 2, 60-69, April 2011 \\
[8]S. V. Shynu, G. Augustin, C. K. Aanandan, P. Mohanan, and K. Vasudevan"Design of Compact reconfigurable dual frequency microstrip antenna using varactor diodes", *Progress In Electromagnetics Research*, PIER 60, 197–205, 2006 \\
.

