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Circularly Polarized Patch Antenna with Frequency Reconfiguration

Kalluri Eswaramma[1], Dr. Ch. Venugopal Reddy[1]

UG Student, Dept. of ECE, Rise Krishna Sai Prakasam Group of Institutions, Ongole, Andhra Pradesh, India[1]

Professor & HOD, Dept. of ECE, Rise Krishna Sai Prakasam Group of Institutions, Ongole, Andhra Pradesh, India[2]

ABSTRACT: A Novel Frequency Reconfigurable Micro strip Patch Antenna was presented. The proposed antenna consists of a rectangular patch etched with rectangular ring slot. 6 pairs of varactor diodes are introduced and are placed symmetrically to bridge the gap between rectangular patch and ring slot. This construction allows independent control of antenna resonant frequency and polarization, while maintaining good impendence matching. Exciting the antenna by single co-axial probe feed, the two orthogonal resonant modes (TM01 and TM10) of the patch antenna are simultaneously excited. By changing the capacitance values of the varactor diodes the resonant frequencies of two orthogonal modes can be simultaneously changed. By introducing a specific difference between the length and width of the rectangular ring slot, good CP performances can be obtained over a broad band frequency tuning range. The measured results indicate continuously tuneable CP operating frequencies from 2.2 to 2.5 GHZ and stable radiation patterns can be achieved.

KEYWORDS: Microstrip antenna , slotted antenna , varactor diode , cognitive radio ,frequency reconfigure

I.INTRODUCTION

Due to extensive rise in demand for authentic wireless communication, requirement for effective use of electromagnetic spectrum is escalating. Traditional broadband antennas are unable to gratify these expectations. Reconfigurable antennas had exhibited cogent potent in the area because of its minimum prize and flexibility[1].These antennas have capability to reconfigure it's attributes like frequency, bandwidth, polarization etc., in today's world reconfigurable antennas gained a lot of inquisitiveness due to instigation of future wireless communication areas such as cognitive radio which engages with sensing and reconfiguring microstrip antennas[2]. Reconfigurable antennas also have upper hand in producing good radiation pattern with better bandwidth

Beside all the advantages of reconfigurable antennas frequency reconfigurable antennas to bring down the size of front end system and permit prefiltering at the receiver therefore it assists many wireless applications in a single terminal system[3].

If we look into the past background of reconfigurable antennas, it was first come into sight in 1930. In 1970's for satellite communications, a pattern reconfigurable antenna was designed[4]-[6]. The postulated antenna in the paper is proficient to reconfigurable seven different beam angles. In general, effective length of radiator is a paramount in governing the resonance of antennas like Dipole antenna, Monopole antenna, loop antenna, slot antenna and Microstrip antenna. It also plays a vital role in deciding operating frequency from these; we come to a conclusion that by controlling the effective length, we can attain reconfiguration in frequencies.

In general, switches are used to vary the effective length of the antenna. There are different switching mechanisms used in the reconfigurable antennas for providing different frequencies. Electronic switching mechanisms use pin diodes, FETS, and RFMEMS as their switches. For frequency switching, even though RFMEMS has a numerous advantages, Pin Diodes are used as they are beneficial to analyzers because of its acceptable performance, minimum prize and flexibility in fabrication[7]-[8].

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II.DESIGN

The designed antenna possess a patched microstrip antenna and slotted microstrip antenna. The slotted microstrip antenna is placed at above the ground plane . Twelve switches are positioned in the slot.

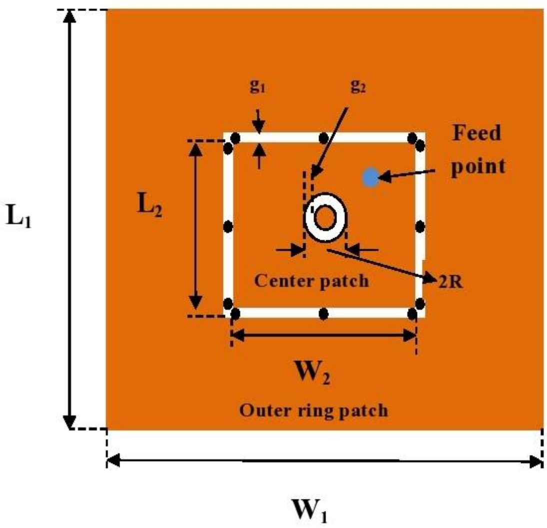

Figure1. Structure of proposed antenna

Here varactor diodes act as switch. When the varactor diode is on state, it will be equivalence to a series combination of capacitor and resister of capacitance 0.6pf and resistance 0.8ohm respectively and in off state it will be equal to a series combination of capacitor of capacitance 0.6pf and parallel combination of resister and capacitor of resistance 10kohm and capacitance 0.35ph respectively. Through the switching action, we can vary the effective length of slot antenna and thereby we can produce five different bands of reconfigurable frequencies. The design of the described antenna begins with the construction of patched microstrip antenna. Fig. 1 illustrates the structure and design of antenna with a slot placed at ground plane. The substrate of the antenna is designed with RT/Duroid 5880 and has relative permittivity and thickness of about 2.2 and 3.17mm respectively.

The design of the described antenna begins with the construction of patched microstrip antenna. Fig. 1 illustrates the structure and design of antenna with a ring slot placed inside the patch. The substrate of the antenna is designed with RT/Duroid 5880 and has permittivity and thickness of about 2.2 and 3.17mm respectively. For matching the impedance between the patch and the transmission line, we use coaxial feed. Best return losses at desired frequencies are obtained by having proper impedance matching. Optimization of the position of slot and feed produces the best return losses. By inserting the slot in the ground plane of the patched microstrip antenna, the slot resembles the radiator and the patch resembles the feeding network.

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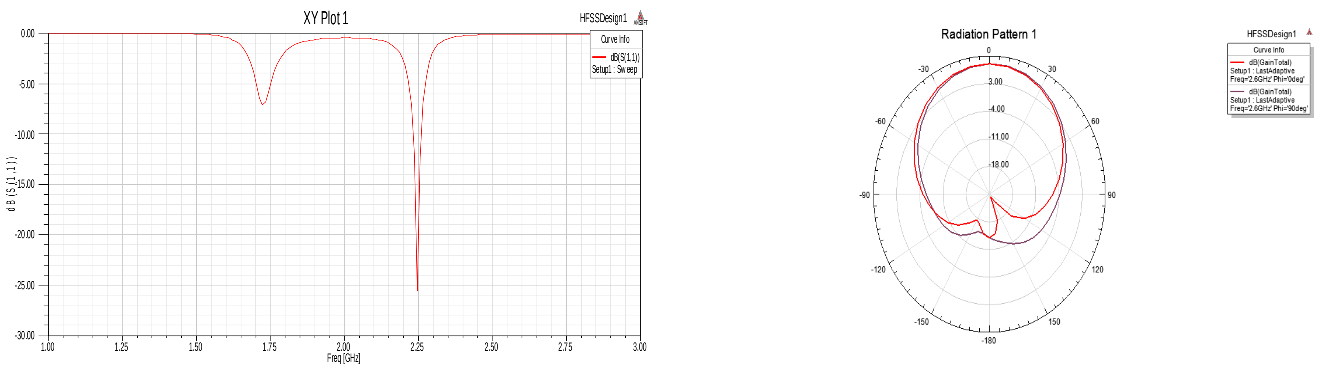
Table 1. Dimensions of desired antenna

parameter	Dimensions (mm)
L_1	51.4
L_2	20.40
W_1	48.6
W_2	19
g_1	1
g_2	1
R	3
r	0.3
h	3.17

The dimensions of the proposed the antenna is given the above table.

III.RESULT

The return losses which are simulated are shown in the figure below and we have all return losses less than 10 db at bands of all frequencies.



(a) (b)

Figure2: simulated results of proposed antenna at 2.25 GHz (a) Reflection coefficient (b) Radiation pattern

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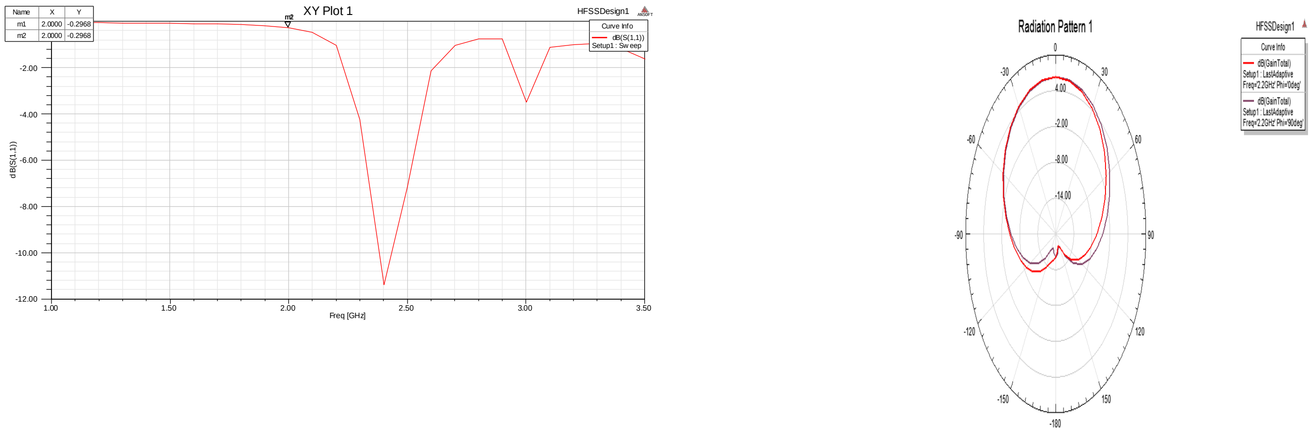
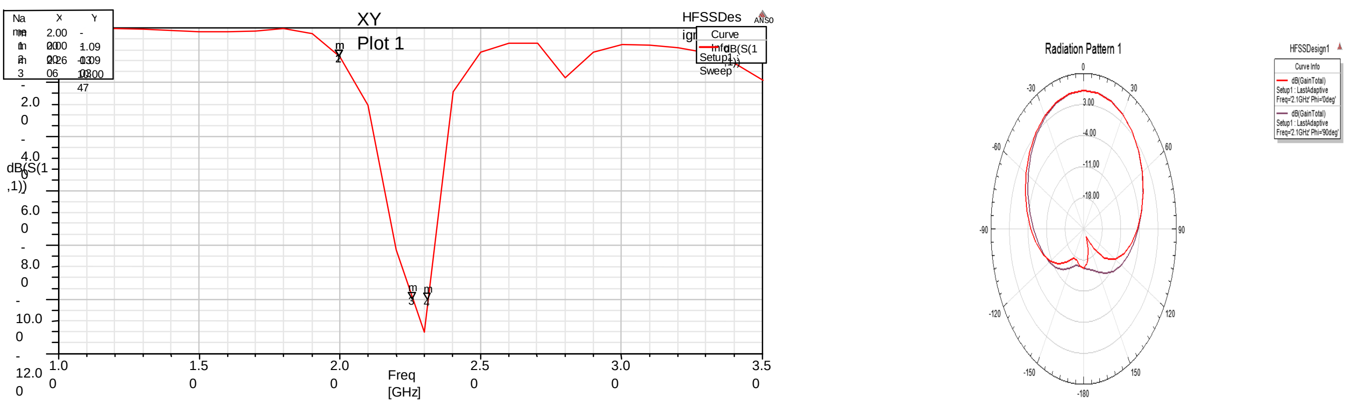


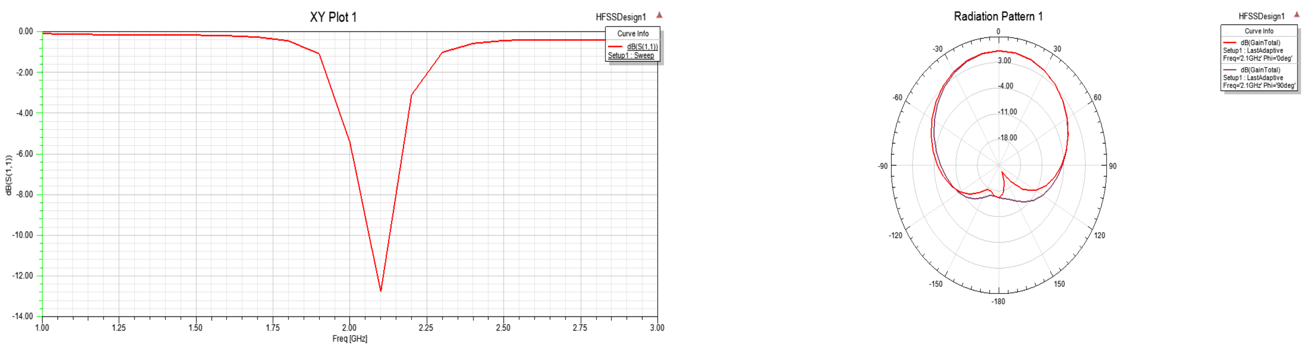
(a) (b)

Figure3: simulated results of proposed antenna at 2.4 GHz (a) Reflection coefficient (b) Radiation pattern



(a) (b)

Figure4: simulated results of proposed antenna at 2.3 GHz (a) Reflection coefficient (b) Radiation pattern



(a) (b)

Figure5: simulated results of proposed antenna at 2.2 GHz (a) Reflection coefficient (b) Radiation pattern

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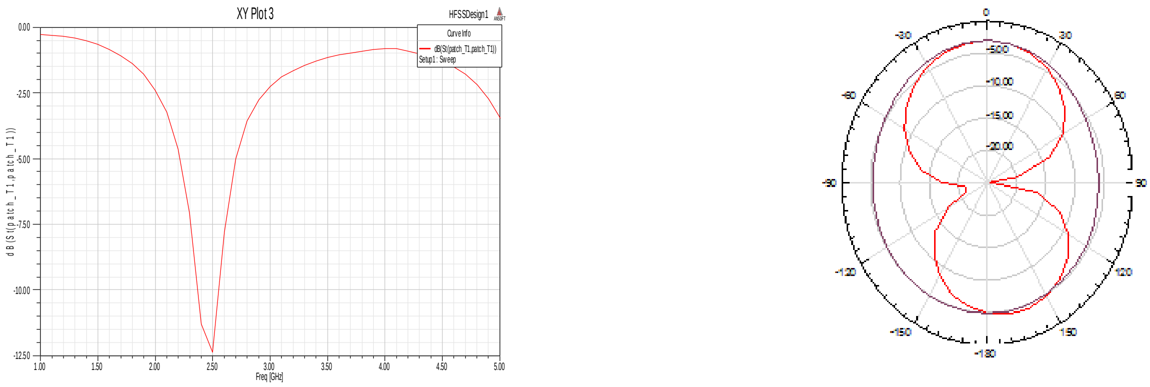

(a) (b)

Figure6: simulated results of proposed antenna at 2.5 GHz (a) Reflection coefficient (b) Radiation pattern

From the simulated result we can confirm that the design antenna has the capability to operate from 2.2GHz to 2.5 GHz with seven different frequency reconfigurable bands. The reflection coefficients and radiation patterns which were simulated at 5 different frequency bands are illustrated in figure2 to 6.

IV.CONCLUSION

The reconfigurable frequency patched microstrip antenna has been designed and simulated. It was observed that six different bands of frequencies can be reconfigurable using twelve switches. The antenna is relatively small and return losses which were obtained are good.

REFERENCES

[1] H. A. Majid, M. K. A. Rahim, M. R. Hamid, and M. F. Ismail,"A Compact Frequency Reconfigurable Narrowband Microstrip Slot Antenna," IEEE antennas and wireless propagation letters, vol. 11, pp.616-619, 2012.

[2] J. R. Kelly, P. S. Hall, "Reconfigurable Slot Antenna for Cognitive Radio Application," IEEE Antennas and Propagation Society International Symposium, vol. 8, pp. 978-982, June 2009.

[3] Haupt R. L. , M. Lanagan, "Reconfigurable antennas, " IEEE Antennas and Propagation Magazine, Vol. 55, No. 1, pp. 49-61, 2013.

[4] Pourziad, A., S. Nikmehr, H. Veladi, "A novel multi-state integrated RF MEMS switch for recon¯gurable antennas applications," Progress In Electromagnetics Research, Vol. 139, pp. 389-406, 2013.

[5] Madi, M. A. , M. Al-Husseini, A. Ramadan, K. Y. Kabalan, A. El-Hajj, "A Reconfigurable cedar-shaped microstrip antenna for wireless applications, " Progress In Electromagnetics Research, Vol. 25, pp. 209-221, 2012.

[6] Xia, Y. Q., J. Luo, D. J. Edwards, "Novel miniature printed monopole antenna with dual tunable band-notched characteristics for UWB applications, " Journal of Electromagnetic Waves and Applications, Vol. 24, No. 13, pp. 1783-1793, 2010.

[7] Hamzah, S. A., M. Esa, and M. K. H. Ismail, "Novel active Reconfigurable fractal dipole antenna using RF PIN diodes, " International Symposium on Antennas and Propagation, pp. 5-8, 2011.

[8] C. A. Balanis, Antenna Theory Analysis and Design, 3rd ed. New York, NY, USA: Wiley, 2005.

BIOGRAPHY

Kalluri Eswaramma is pursuing M.tech in D.E.C.S, Dept. of ECE, Rise Krishna Sai Prakasam Group Of Institutions, Ongole, Andhra Pradesh, India

Dr.CH.Venugopal Reddy is working as Professor&HOD in the department of ECE, Rise krishna Sai Prakasam Group of institutions, Ongole, affiliated to JNTU Kakinada, A.P. Has more than 18 years of teaching experience. He got his B.Tech(ECE) from K.S.R.M. Engg College, Kadapa, A.P, affiliated to S.V University, Tirupathi, A.P. M.E (Commn.Sys) from Dr. M.G.R Engg College, Chennai, T.N affiliated to Anna University, Chennai. He done Ph.D in the area of Digital Image Water Marking, Acharya Nagarjuna University(ANU), Guntur. He has a good No. of research publications in his credit. His research interests are in the areas of Image Processing, Signal Processing and Communications.