International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353 Volume 24 Issue 5 – APRIL 2017.

DESIGN OF RECONFIGURABLE MICRO STRIP PATCH ANTENNA BY USING DIODES AND SWITCHES

J.NAVARAJAN[1], L.ASHOK KUMAR[2],ACHUTA YOGESH[3], T.MOHAN4
Associate Professor1, 2, ECE, Panimalar Institute of Technology,Chennai.
Final Year U.G Student3, 4,ECE, PanimalarInstitute ofTechnology,Chennai.

Abstract--- **dynamically their frequency and radiation pattern. This reconfiguration mechanism are lies inside the antenna for easy to integrate with switching devices and control circuits.This antenna is designed by using the FR4 material which has dielectric constant 4.4 and thickness of about 1.6mm.The dimensions of the antenna is 35mm*25mm and it operates at a frequency range from 2.4GHz to 8GHz,This antenna uses the microstrip feed.Antenna is designed by using ADS(Advanced Designed System).**

Keywords--- **Reconfigurable antenna, Return loss, Gain, Directivity. ADS**

I. INTRODUCTION

An antenna is an electrical device which converts electric power into radio waves and vice-versa. It is usually used with a radio transmitter or radio receiver.Antennas demonstrate reciprocity property which means it maintains same characteristics regardless transmitting or receiving [9]. For better performance of antenna, a thick dielectric substrate having low dielectric constant is desirable for providing better efficiency, bandwidth and radiation.

Microstrip antennas contain radiating patch on one side of dielectric substrate which has a ground plane on other side. Microstrip patch is a single layer design, which generally has four parts (patch, ground plane, substrate, feeding). The length of the patch determines the operating frequency whereas the width controls the input impedance.Patch width regulates the bandwidth as well as the radiation pattern of the antenna. Microstrip patch antenna is advantages because of its small size, low profile, and light weight.Feeding can be given to microstrippatch antenna in various ways like inset feed, microstrip line feed, coaxial feed and coupled feed. Microstrip line feed is preferred due to its advantage that it is one of easier methods to fabricate as feed can be imprinted on the same substrate to provide a planar structure. A conducting strip is connected directly to the edge of microstrip patch. This conducting strip is smaller in width as compared to the patch.

II. FEEDING TECHNIQUES

Feeding to an antenna can be given in several ways as microstrip line feed, insetfeed, coaxial feed. In Microstrip line feedtechnique; a conducting strip is connected directly to the edge of the microstrip patch.This type of feeding has an advantage of providing planar structure. In inset feed technique, the width of the conducting strip is small as compared to the patch. The purpose of the inset cut in the patch is to match the impedance. Coaxial feed is a very common technique. The inner conductor of the coaxial cable extends through the dielectric and is soldered to the radiating metal patch, in which the outer conductor is connected to the ground plane. The main aim of this feeding is to enhance the gain, provides narrow bandwidth and impedance matching.

III. RECONFIGURABLE MICRO STRIP PATCH ANTENNA

A Microstrip antenna means an antenna fabricated using microstrip techniques.An individual microstrip antenna consists of a patch of metal foil of various shapes.The most common type of microstrip antenna is the patch antenna.Some path antennas do not use dielectric substrate and instead are made of metal path mounted above a ground plane using dielectric spacers

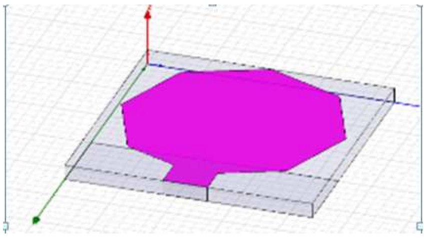


Fig.1. Basic Patch Antenna

Microstrip antennas are relatively inexpensive to manufacture and design because of the simple 2-dimensional physical geometry. They are usually employed at UHF and higher frequencies because the size of the antenna is directly tied to the wavelength at the resonant frequency. A single patch antenna provides a maximum directive gain of around 6-9 dBi. An advantage of patch antennasis the ability to have polarization diversity. Patch antennas can easily be designed to have linear and circular polarizations.

IV. ANTENNA DESIGN

For designing of the antenna the width and length are calculated using the formulas:

$$\text{Width} = \frac{c}{2f_0\sqrt{\frac{\varepsilon_r+1}{2}}} \quad \text{----------- (1)}$$

$$\text{Length} = \frac{c}{2f_0\sqrt{\varepsilon_{eff}}} - 0.824h\left\{\frac{(\varepsilon_{eff}+0.3)\left(\frac{W}{h}+0.264\right)}{(\varepsilon_{eff}-0.258)\left(\frac{W}{h}+0.8\right)}\right\} \quad \text{--(2)}$$

$$\varepsilon_{eff} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\left(\frac{1}{\sqrt{1+12\left(\frac{h}{w}\right)}}\right) \text{------------ (3)}$$

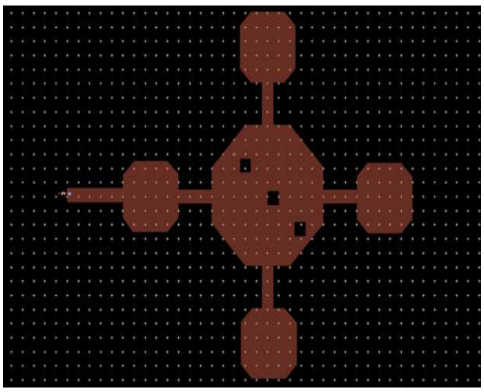


Fig. 2. Designed Reconfigurable Antenna

Where

f_0=resonant frequency

ε_r=dielectric constant

w =width of the antenna

h=thickness of dielectric substrate

The width and length of the designed reconfigurable patch antenna are 35mm and 25mm.The basic design of patch antenna is in the form of hexagonal structure.In first iterationthe outputs of gain, directivity, efficiency and returnloss was low.In second iteration the structure of the antenna is developed with one substrate.In that,the values of gain,directivity,etc. was improved.

Furtherin third iteration one more substrate was included for getting good gain, return loss etc..

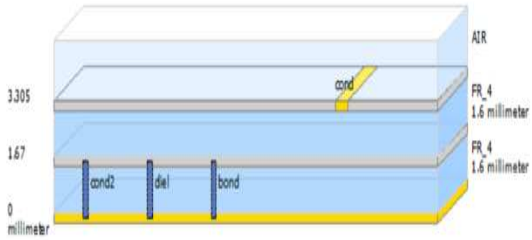


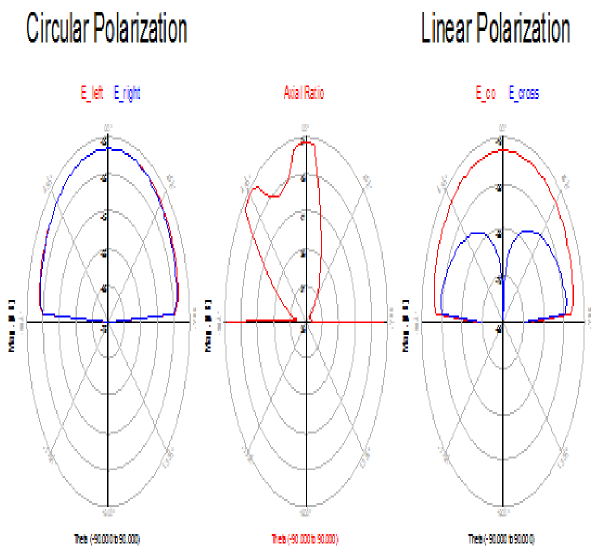
Fig.3.Dielectric Substrate

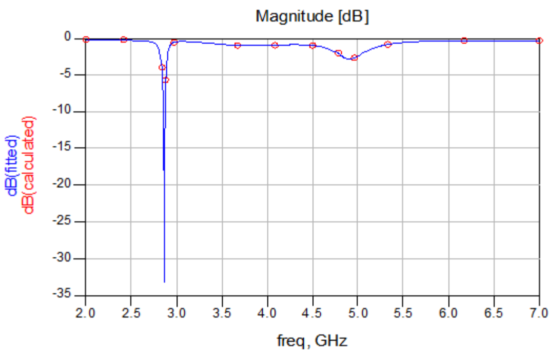
V. RESULTSAND DISCUSSIONS

The return loss is another method of expressing the mismatch of devices. It is the measure of The effectiveness of an antenna to deliver power from source to antenna.

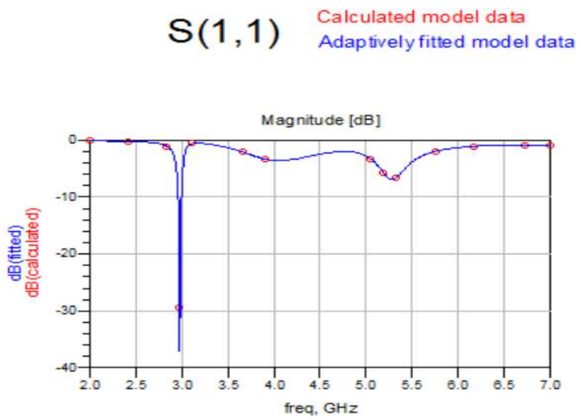
First iteration:-In first iteration the values of gain, return loss and directivity was minimum.

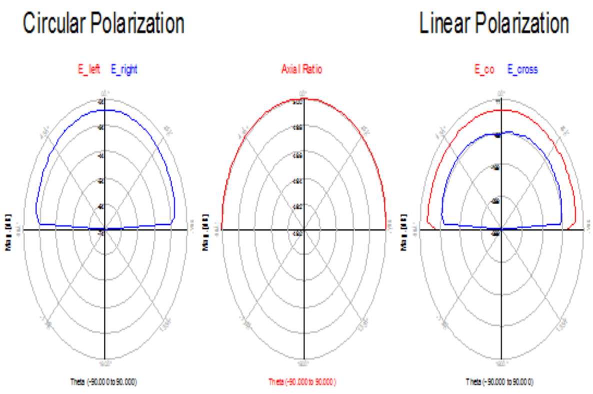
Second iteration:- In this, some improvement was occurred shown in below fig.





Third iteration:- In this, an additional substrate is added for improving antenna parameters.





VI. TABULATION

Table 1:

ITERATION	RETURN LOSS	GAIN	DIRECTIVITY
First	-28db	-0.428	4.731
Second	-32db	1.219	6.064
Third	-37db	1.816	6.289

VII. CONCLUSION

During the last few years there has been increasing demand in modern telecommunication system of antennas with wide, multiple bandwidths, high gain and smaller dimensions than conventionally possible. Also there is a need of that type of radiator that can switch from one application to another upon request. This has initiated the research in new antenna fields ie.. reconfigurable antennas.

The antenna is first simulated and tested without using switches i.e. simple microstrip patch antenna which shows some changes in the results with similar trend in both simulated and measured S11 Parameter. Then switches are used to achieve reconfiguration and antennas with switches is designed and simulated.

REFERENCES

[1] L. Ge and K. M. Luk, “A band-reconfigurable antenna based on directeddipole,” IEEE Trans. Antennas Propagat., vol. 62, no. 1, pp. 64–71, Jan. 2014.

[2] L. Ge and K. M. Luk, “A magneto-electric dipole for unidirectional UWBcommunications,” IEEE Trans. Antennas Propagat., vol. 61, no. 11, pp. 5762–5765, Nov. 2013.

[3] Y. Tawk, J. Costantine, S. Hemmady,G. Balakrishnan, K. Avery, andC. G. Christodoulou, BDemonstrationof a cognitiveradio front-end using anoptically pumped reconfigurable antennasystem (OPRAS),[IEEE Trans. Antennas Propag., vol. 60, no. 2, pp. 1075–1083,Feb. 2012.

[4] M.Jusoh, M. F. B. Jamlos, M. R. Kamarudin, T. Sabapathy, M. I. Jais, and M. A. Jamlos (2013), A fabrication of intelligent spiral reconfigurable beam forming antenna for 2.35-2.39 GHz applications and path loss measurements, Progress In Electromagnetics Research,138,pp.115-131.

[5] S. N. Yang, C. N. Zhang, H. K. Pan, A. E. Fathy, and V. K. Nair, "Frequency-Reconfigurable Antennas for Multiradio Wireless Platforms," IEEE Microwave Magazine.

[6] Kagan Topalli, Emre Erdil, Ozlem Aydin Civi, ―Reconfigurable Antenna Structures Using MEMS Technology", Department of Electronics engineering, Turkey, Department of Information Technology, Turkey.

[7] B.S Sandeep and S.Sreenath kashyap,‖design and simulation of Microstrip Patch Array Antenna for Wireless Communication at 2.4GHz‖ International Journal of Scientific and Engineering research.

[8] J. Costantine, Y. Tawk, CG. Christodoulou, S. B. Barbin A Star Shaped Reconfigurable Patch Antenna,in Proc. IEEE IMWS, Guadalajara, Mexico.

This antenna can be used in ultra wide band, medical and wireless applications with different frequency ranges.

AUTHORS BIOGRAPHY:-

J.Navarajan received M.E degree from Sathyabama University in 2010 and B.E from Anna University in 2005.He has totally 11 years of teaching experience.He is the life member of ISTE and Broadcasting Engineering Society (BES(I)).He has published several papers in International/National Journals and Conferences,He is currently working as an Associate Professor,Department of ECE in Panimalar Institute of Technology,Chennai.He has written the Book RF and Microwave Engineering,Embedded and Real time systems.His areas of interest are Image Processing, Microwaves and Embedded Systems.

L.Ashok kumar received M.Tech degree from Sathyabama University in 2009 and B.E from Anna University in 2005.He has totally 12 years of teaching experience.He is the life member of ISTE and Society of EMC Engineers (SEMEC). He has published several papers in International/National Journals and Conferences;He is currently working as an Associate Professor,Department of ECE in Panimalar Institute of Technology,Chennai.His areas of interest are Image Processing and wireless communications.

Achuta Yogesh,final year UG Student, Electronics and Communication Engineering(ECE),Panimalar Institute of Technology,Chennai.

Mohan.T,final year UG Student,Electronics and CommunicationEngineering(ECE),Panimalar Institute of Technology,Chennai.