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A Review on Microstrip Patch Antenna with Specific Structure i.e. Circular Patch with Multiple Fused Rectangular Slot

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Abstract:** This paper gives brief over view of the basic features of the* **Microstrip patch antenna with specific structure i.e. circular patch with multiple fused rectangular slot** ***and then most significantly its development in the recent years The accessibility and enlargement in development of economical, less weight, highly reliable antennas are required for wireless communication, it poses new challenges for the design of antenna in wireless communication. The micro strip patch antenna (MPA) used for these communications, because they will provide high frequency and less bandwidth. This paper presents review of design and simulation of Microstrip patch antenna with specific structure i.e. circular patch with multiple fused rectangular slot. We will also review comparison over conventional circular patch antenna near resonance frequency at 2.4 GHz.
Keywords: Microstrip Patch Antenna (MPA), specific structure, Patch

I. INTRODUCTION

A Microstrip patch antenna consists of a very thin patch that is very small fraction of a wavelength fabricated over conducting ground plane. There is dielectric between the patch and the ground plane. The patch conductor is generally made up with copper and can be of any shape but for simplification of the analysis, in this project circular patch will be used. One of the important parameters is relative permittivity of the substrate that is used. It is so because the relative permittivity is used to enhance the fringing fields. Microstrip patch antennas primarily radiates because of the fringing fields, this is the field between the edges of the patch and the ground plane. For better antenna performance, a thick dielectric substrate with a low dielectric constant is preferred since it provides better efficiency, larger bandwidth, and good radiation. However, the drawback is a larger antenna size. Thus, design and simulation of Microstrip patch antenna with specific structure i.e. circular patch with multiple fused rectangular slot, substrate with large dielectric constants is used that is less efficient and also have narrower bandwidth. Hence a compromise must be reached between antenna performance and antenna dimension. Here I am presenting the optimized structure of circular patch with multiple fused rectangular slot which performance will be compared with general circular shape structure.

II. PROPOSED STRUCTURE

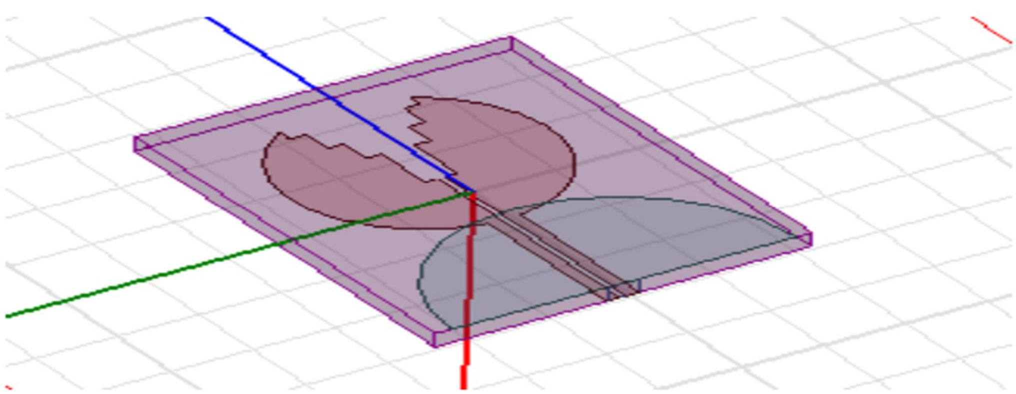


Fig 1. Microstrip patch antenna with specific structure i.e. circular patch with multiple fused rectangular slot

III. DESIGN

Step 1:Determine the width of the microstrip patch antenna by equation(1)

$$W=\frac{\lambda o}{fo\sqrt{(\varepsilon r+1)/2}} \quad (1)$$

Step 2: Determine effective dielectric constant, Ɛreff, using equation (2)

$$\varepsilon reff=\frac{(\varepsilon r+1)}{2}+\frac{(\varepsilon r-1)}{2}\left[1+12\frac{h}{w}\right]^{-\frac{1}{2}} \quad (2)$$

Step 3: Calculate the length extension ΔL,by using equation (3)

$$\frac{\Delta L}{h}=0.412\frac{(\varepsilon reff+0.3)(\frac{w}{h}+0.264)}{(\varepsilon reff-0.258)(\frac{w}{h}+0.8)} \quad (3)$$

Step 4: The patch length of the microstrip antenna is calculated by using equation (4)

$$L=\frac{\lambda o}{fo\sqrt{\varepsilon reff}}-2\Delta L \quad (4)$$

Where the effective length(Leff) of the patch

$$Leff=\frac{\lambda o}{fo\sqrt{\varepsilon reff}} \quad (5)$$

Step 5: The dimensions of ground is determine by

$$Lg=6h+L$$

$$Wg=6h+W$$

IV. LITERATURE SURVEY

S NO.	Auther & year	Contribution	Technique Used	Remark
1.	M T Islam, N Misran, T C Take, AUG 2009	Design a inverted E- shape microstrip antenna for IMT 2000 band.	Particle swarm optimization is used for optimize parameter of antenna,which is develop in MATLAB. IE3D software use for simulation and graphmatica use for curve fitting	*Bandwidth improve up to 15% as compare to initial antenna. *Effect of resonance frequency, gain, directivity, return loss not mentioned in this paper.
2.	Y. Choukiker, D Mishra & R K Mishra DEC 2009	Design a dual band microstrip antenna for resonance frequency 2.4GHz and 3.08GHz.	Particle swarm optimization is used to optimize geometry parameter for efficient performance of the antenna. IE3D software used for simulation of antenna.	*return loss obtain at 2.4GHz is -43.95 db and at 3.08GHz is -27.4db.bandwidth is 33.54MHz. *bandwidth is low and return loss is high are drawback of this antenna.
3.	Renu Nagpal, Dhaliwal B.P.Garg, d singh Dhaliwal DEC 2013	Calculate the parameter of rectangular using parallel particle swarm optimization.	Parallel particle swarm optimization(ppso) technique used to solved the computationally demanding optimization problem. ppso is used to develop standard equation for the calculation of accurate resonance frequency for rectangular microstrip patch antenna	*Result of parallel particle swarm optimization (ppso) is more accurate and closed to experimental value than particle swarm optimization (pso).
4.	Vivek Rajpoot, D K Srivastava, A K Sourabh OCT 2014	Design a microstrip antenna for Bluetooth and increase in bandwidth.	Basic antenna design from cutting the slot of I shaped. For simulation IE3D software and for curve	*resonance frequency obtain at 2.4GHz abd band width increase by 25% in compared to initial antenna.

			fitting graphmatica is used. Optimization is done by pso program coded in MATLAB.	*gain, directivity, bandwidth, return loss are not calculated in this paper.
5.	N Feiz, F Mohajeri, Davoud Zari 2014	Performance of microstrip antenna improved by using metamaterial stracture.	Metamaterial is design nearly zero reflective index and use as substrate of a microstrip antenna. Pso is used to optimize the structure of metamaterial to decrease the return loss. Actual position of feed is determine by pso for influence the radiation efficiency. A unit cell structure is simulation by HFSS and MATELAB .	*improvement of gain 4.5db and return loss desrease.
6.	Fortaki, Tarek; Amir, Mounir; Benkouda, Siham, Abdelkrim 2015	Design a rectangular microstrip antenna for bandwith and resonance frequency and bandwidth by using particle swarm optimization (pso)and method of moments (mom).	Problem is formulated in forms of integral equation. Then after pso is used to optimized the antenna parameter.	*resonance frequency result obtain accurate and very nearest to experimental result. *calculating time very less as compare to classical methods of moments.
7.	Anindita Das, Mihir Narayan Mohanty & R K Mishra OCT 2015	Bandwidth improve by design of H slot microstrip antenna.	Antenna is excited by microstrip feed line and rectangular patch placed upon the substrate. Simulation of antenna is done by HFSS software and optimize parameter are found by pso.	*bandwidth improve by 50%. *pso reduce time in the standard design of patched antenna. *by used of antenna resonated at near to central frequency.
8.	S.Dey,S Ray,A Sinha 2016	Design a rectangular gap coupled microstrip antenna for resonance frequency using particle swarm optimization.	Optimization of resonant frequency of microstrip antenna by particle swarm optimization. Parameter taken for optimization are patch lengh, patch width and patch gap	*resonance frequency evaluated by optimization process which is same as desire value so this is a efficient method . *Gap couple microstrip antenna Provide high bandwidth so most

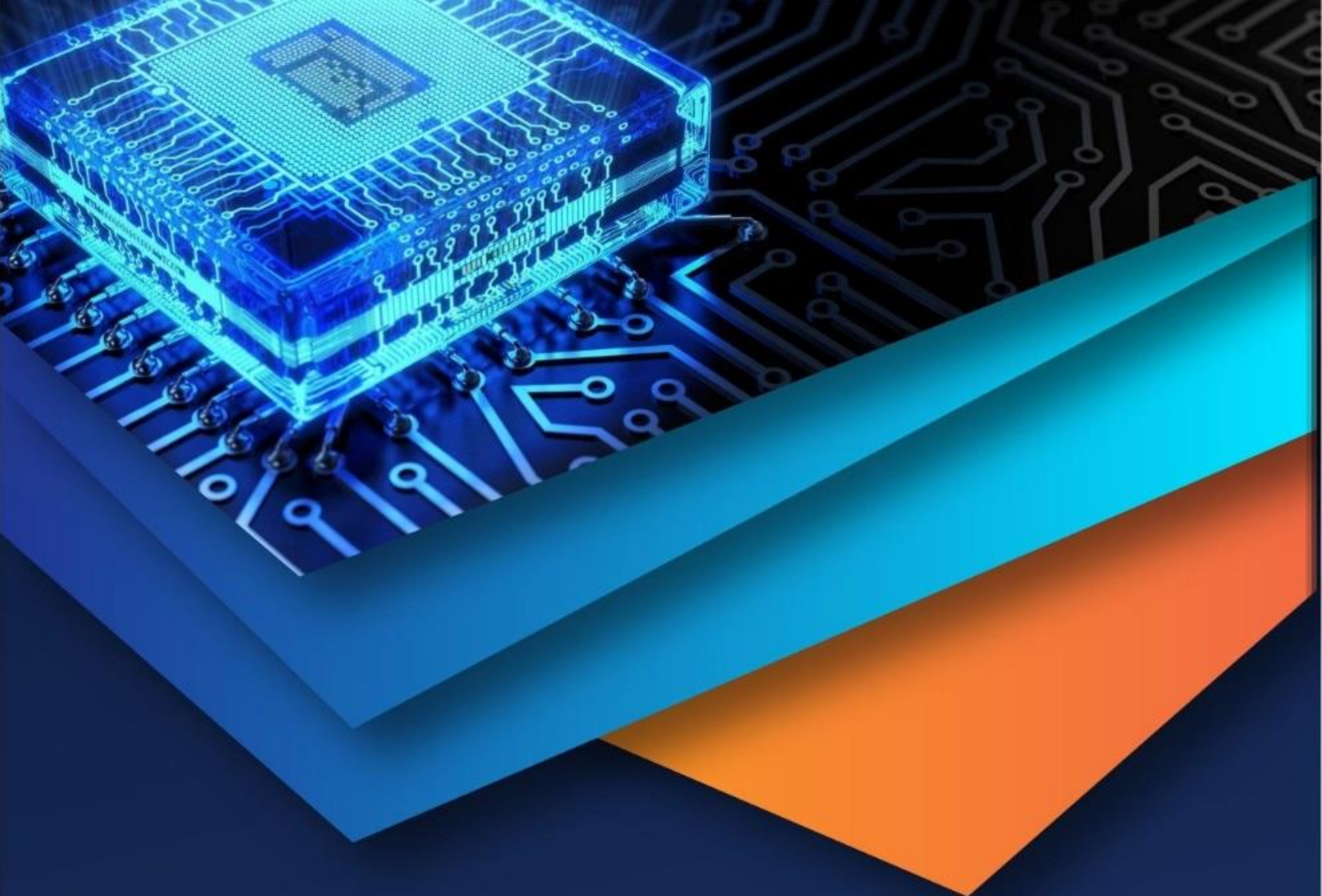
V. CONCLUSION

In this review paper show the primary characteristics of microstrip patch antenna, different technique uses in design, different shape of patch taken, different feeding technique and different type of substrate use in the design of this antenna for reducing size and weight and increasing bandwidth, gain etc. microstrip antenna useful in wireless communication, RADER, WLAN, etc. due to their small weight and size in this project, work will be completed in two parts. In first part a Microstrip antennas will be designed using HFSS simulation with conventional circular patch structure. After that Microstrip patch antenna with specific structure i.e. circular patch with multiple fused rectangular slot will be simulated. Performance characteristics of both the shape will be analysed carefully. Initially, microstrip patch antenna will be designed to operate at resonance frequency. After that in second part a simple and efficient technique of feeding microstrip line feed will be used for an impedance matching for improve performance of the antennas. In third part using different methodology /technique Microstrip patch antenna with specific structure (circular patch with multiple fused rectangular slot) dimension and parameter will be enhanced without impacting the performance.

In this work we will optimize the basic characteristic of microstrip patch antenna using different technique in design, different shape of patch, different feeding technique and different type of substrate use in the design for reducing size and weight and increasing bandwidth, gain etc. Microstrip antenna is useful in wireless communication, RADAR, WLAN etc due to their small size, weight, specific structural compatibility and flexibility. Number of parameters such as bandwidth, return loss, VSWR, Radiation pattern, can be improved by changing the parameters such as operating frequency, type of substrate dimensions, feeding techniques etc.

REFERENCES

[1] A.BALANIS, Antenna Theory Third Edition, Analysis and Design4
[2] Kennedy, J., Eberhart, R.C.: Particle swarm optimization. Proc. IEEE Int. Conf.
[3] “Tayeb al et., has design a broadband microstrip patch antenna for wireless application. Antenna Technology and Applied Electromagnetic, 1998. ANTEM vol1 1998.
[4] M.Jamshidifar,al et, a new approach to enhance the bandwidth of a novel miniaturized fractal microstrip patch antenna published by IEEE in Antenna Technology and Applied Electromagnetic [ANTEM 2005],
[5] Abas Sabouni, Optimization of microstrip patch antenna using generic algorithm method, publish by IEEE, ANTEM 2005
[6] Chopara Bandana, Design and optimization of microstrip patch antenna with defected ground structure and circular slot on the patch, publish by Int. Journal of Applied Sciences and Engineering Research, Vol. 2, Issue 4, 2013
[7] S. Kohli, S S Dhillon, “optimization of multiband microstrip patch antenna for wireless application, publisher IEEE 27-29 sep 2013 5th International Conference
[8] Ajay kumar, D.K Srivastava, Dwejendra Arya design bandwidth of microstrip antenna improve by using mushroom type EBG structure publish by IEEE international conference (IMPACT) 2013
[9] Tandel Tejal, et al, L- Slot Rectangular Microstrip Patch Antenna for WLAN Application. IJLTEMAS, Volume IV, Issue XII, December 2015
[10] Arief B. Santiko et al, design and realization multi layer parasitic for gain enhancement of microstrip patch antenna ,IEEE, intelligent technology and Application.
[11] S Samundra ,et al, design a rectangular microstrip patch antenna array for c band scatterometer and MBI. publice by IEEE, INDICON 2016.
[12] Xiaosheng Geo, et al.Design dual band Embedded inverted T-slot circular microstrip patch antenna



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