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Design of Micro Strip Patch Antenna

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Mr.G.V.Ramanaiah, Associate Professor,
Department of ECE, PSCMR College of Engineering & Technology, AP, INDIA.
Email: gvr.m.tech@gmail.com

ABSTRACT: A basic micro strip patch antenna comprises of metallic patch and ground between which is a dielectric medium called the substrate. Micro strip patch antennas are utilized for correspondence purposes particularly in military and common applications. In this paper a basic micro strip patch antenna is planned in HFSS to operate at Different frequencies.
Keywords: G*ain, Radiation pattern, Beam width, VSWR, Directivity.*

I. INTRODUCTION: Microstrip antennas are utilized for number of remote applications, for example, WLAN [1][2], Wi-Fi [3], Bluetooth [4] and numerous different applications. A straightforward microstrip patch antenna comprises of a leading patch and ground plane between them is a dielectric medium called the substrate having a specific estimation of dielectric steady. The measurements of a patch are littler when contrasted with the substrate and ground. Measurements of a microstrip patch antenna rely on upon the resonant frequency and estimation of the dielectric steady.

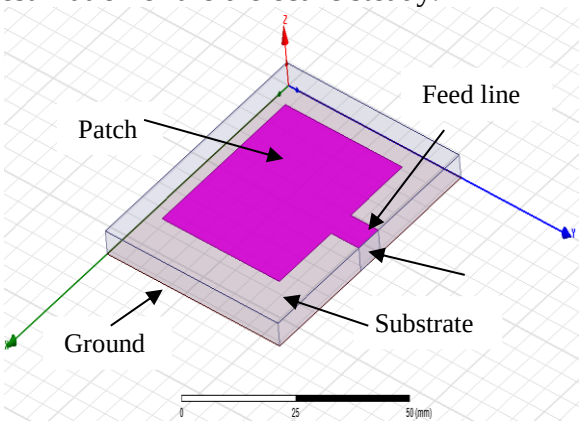

Figure 1

II. DESIGNING: For outlining of a microstrip patch antenna, it is need to choose the resonant frequency and a dielectric medium for which antenna is to be composed. The parameters to be computed are as under. Width (W): The width of the patch is computed utilizing the accompanying condition [3][5][6][8]

$$w = \frac{c_o}{2f_o}\sqrt{\frac{2}{\varepsilon_r+1}} \qquad \text{------ (1)}$$

Where, w = Width of the patch C= Velocity of light ε_r = estimation of the dielectric substrate.

Effective refractive index: The successful refractive list estimation of a patch is an essential parameter in the planning strategy of a microstrip patch antenna. The radiations going from the patch towards the ground go through air and som Source ı the substrate (called as fringing). Both the air and the substrates have distinctive dielectric values, accordingly with a specific end goal to record this we discover the estimation of compelling dielectric consistent. The estimation of the

viable dielectric consistent (εr) is computed utilizing the accompanying condition [3][5][6][8]:

$$\mathcal{E}_{reff} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\,[1+12\frac{h}{w}]^{\frac{-1}{2}} \text{ ------- (2)}$$

Take w/h>1

Length: Because of fringing, electrically the extent of the antenna is expanded by a measure of (ΔL). Accordingly, the genuine increment long (ΔL) of the patch is to be ascertained utilizing the accompanying condition [5][3][6][8]:

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

Where h=thickness of the substrate. The length (L) of the patch is presently to be computed utilizing the beneath said condition [3] [5] [6][8]:

$$L = \frac{c_0}{2f_0\sqrt{\mathcal{E}_{reff}}} - 2\Delta L ------(4)$$

Where C_0 velocity of light, ΔL incremental length of the patch and f_0 is the resonance frequency.

Width and Length of ground plane: the dimensions of a patch are ready now. The length (L_g) and the width (W_g) of a ground plane are calculated using the following equations.

$W_g = 6h + w$ ----- (5)

$L_g = 6h + L$ ----- (6)

The length and width of a substrate is same as that of the ground plane. There are different methods for feeding the microstrip patch antenna, for example, Microstrip Line Feeding method, coaxial feeding method, Aperture Coupling etc. But mostly coaxial feeding method is used. The design of the patch antenna is shown in figure 1.

III. RESULT ANALYSIS: With the help of the above-mentioned equations, a square microstrip patch antenna is designed at different resonant frequencies as shown in figure 2. The substrate material used in this design is FR4_epoxy having dielectric constant of 4.4. The figure2 shows the S-parameter of the antenna. The return loss of the antenna is minimum at 9.0 GHz.

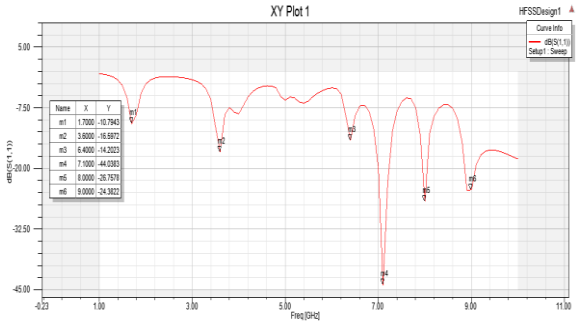

Figure 2

The width (W) and length (L) of the patch at a different resonant frequency is found to be 38 mm while the height of the substrate is 3 mm. For ground plane, the length (Lg) and width (Wg) of the ground plane is calculated to be 56 mm (Lg= Wg because patch is square). For feeding the microstrip patch antenna, Microstrip Line Feeding method is used. The simulation is carried out in HFSS software. The following figure3 shows the rE total of the antenna in the farfield.

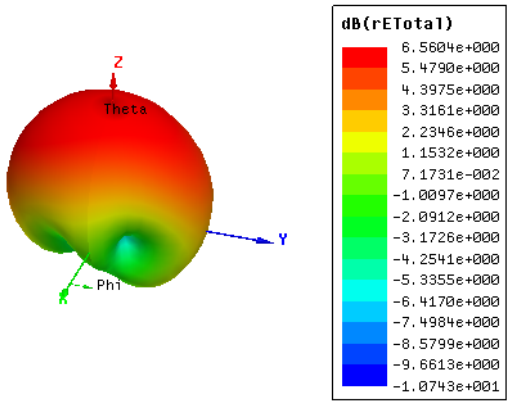

Figure 3

The direction of the maximum gain of the antenna is above the patch (i-e, in the direction of theta), while minor lobes are on the opposite side.

The Voltage Standing Wave Ratio (VSWR) versus frequency graph of the designed antenna is as shown in figure4. The VSWR is minimum i.e 1.0863 at 8 GHz.

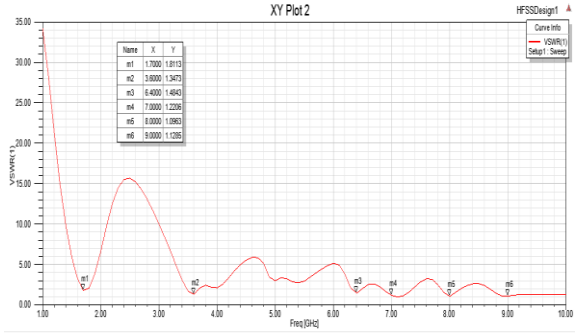

Figure 4

IV.CONCLUSION: A microstrip patch antenna which operates at different frequencies is successfully designed. It is

simple to design and implement Microstrip patch antenna due to its sensitivity at high gain.

References

[1]. Chandan Kumar Ghosh and Susanta Kumar Parui "Design, Analysis and Optimization of A Slotted Microstrip Patch Antenna Array at Frequency 5.25 GHz for WLAN-SDMA System" International Journal on Electrical Engineering and Informatics - Volume 2, Number 2, 2010

[2]. Jaswinder Kaur, Rajesh Khanna "Co-axial Fed Rectangular Microstrip Patch Antenna for 5.2 GHz WLAN Application" Universal Journal of Electrical and Electronic Engineering 1(3):94-98, 2013 DOI: 10.13189/ujeee.2013.010306 http://www.hrpub.org

[3]. J. G. Vera-Dimas, M. Tecpoyotl-Torres, P. Vargas-Chable, J. A. Damián-Morales J. Escobedo-Alatorre and S. Koshevaya "Individual Patch Antenna and Antenna Patch Array for Wi-Fi Communication" Center for Research of Engineering and

Applied Sciences (CIICAp), Autonomous University of Morelos State (UAEM), 62209, Av. Universidad No.1001, Col Chamilpa, Cuernavaca, Morelos, México.

[4]. AlakMajumder "Design of an H-shaped Microstrip Patch Antenna for Bluetooth Applications" International Journal of Innovation and Applied Studies ISSN 2028-9324 Vol. 3 No. 4 Aug. 2013, pp. 987-994 © 2013 Innovative Space of Scientific Research Journals http://www.issr-journals.org/ijias/

[5]. Ramna, Amandeep Singh Sappal "DESIGN of RECTANGULAR MICROSTRIP PATCH ANTENNA USING PARTICLE SWARM OPTIMIZATION "International Journal of Advanced Research in Computer and Communication EngineeringVol. 2, Issue 7, July 2013

[6]. Md. MarufAhamed, Kishore Bhowmik, Abdulla Al Suman "Analysis And Design of Rectangular Microstrip Patch Antenna On Different Resonant Frequencies For Pervasive Wireless Communication" INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 1, ISSUE 5, JUNE 2012

[7].Sukhbir Kumar, Hitender Gupta"Design and Study of Compact and Wideband Microstrip U-Slot Patch Antenna for Wi-Max Application" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN: 2278-2834,p- ISSN: 2278-8735. Volume 5, Issue 2 (Mar. - Apr. 2013), PP 45-48 www.iosrjournals.org

[8] Muhammad Aamir Afridi "Microstrip Patch Antenna − Designing at 2.4 GHz Frequency" Biological and Chemical

ABOUT AUTHOR:

Mr.G.V.Ramanaiah is working as Associate Professor of ECE, at PSCMR College of Engineering&Technology, Vijayawada-1.AP.INDIA.