WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design of Rectangular Microstrip patch Antenna for Wireless Communication

[1]Arkadeep Bhowal, [2]Audrija Banerjee, [3] Rupam Pal, [4] Subhadip Bera, [5] Arpita Santra

[1,2,3,4,5] Dept of Electronics & Communication, Narula Institute of Technology, Agarpara.

[1]arkadeepbhowal14@gmail.com, [2]audrijabanerjee44@gmail.com, [3] rupampal2082003@gmail.com, [4]subhadipbera287@gmail.com, [5]arpita.santra@nit.ac.in

ABSTRACT:

Advancements in technology are ongoing. Researchers are exploring new dimensions for the benefit of the world. Due to the sudden outbreak of the Novel Coronavirus, researchers are working hard to find solutions in an easier way. This work aims to find a new approach towards wireless communication through the design and simulation study of a Microstrip Patch Antenna. The simulation has been carried out using the High-Frequency Structure Simulator (HFSS) Software. The simulated results of S11, VSWR, Radiation Pattern, and gain of the proposed antenna have been analyzed for application in wireless communication.

Keywords: **Micro Strip Patch Antenna, VSWR, S11, Radiation Pattern.**

I. INTRODUCTION

Microstrip patch antennas (MPAs) are a type of internal antenna commonly used at microwave frequencies. Each individual microstrip antenna consists of a metal foil patch of various shapes placed on the surface of a printed circuit board (PCB), with a metal foil ground plane on the other side of the board. Over the last four decades, microstrip patch antennas have been extensively researched and developed, becoming popular among antenna designers and finding applications in wireless communication systems, both in the military and commercial sectors. The use of microstrip antennas represents a significant achievement in wireless communication technology, meeting the needs of the latest generation of wireless communication innovations.

Microstrip antennas are widely used in various systems due to their many advantages [1], such as being lightweight, having a flat structure, and being very cost-effective [2]. Broadband applications that can perform various tasks and wireless devices have become an essential part of our daily communication [3]. The microstrip antenna meets most of the requirements for mobile and satellite equipment, and many commercial needs are met by its use.

II.ANTENNA DESIGN AND ANALYSIS

The first step in designing the microstrip antenna is to select the operating frequency and the proper substrate. The operating frequency of the antenna must be carefully chosen to ensure it operates within the desired frequency band. In this design, the working frequency is chosen to be 2.45GHz. The next step in the antenna design is to choose the appropriate substrate. The height and dielectric constant of the substrate depend on the electromagnetic characteristics of the antenna. For this design, the dielectric material chosen is Duroid. A high dielectric constant substrate helps reduce the dimensions of the antenna, as the dimensions are inversely proportional to the dielectric constant. The feeding method used is the microstrip feedline.

II. RESULT ANALYSIS

After the simulation study the following observations are found which leads to the applications in the wireless communication.

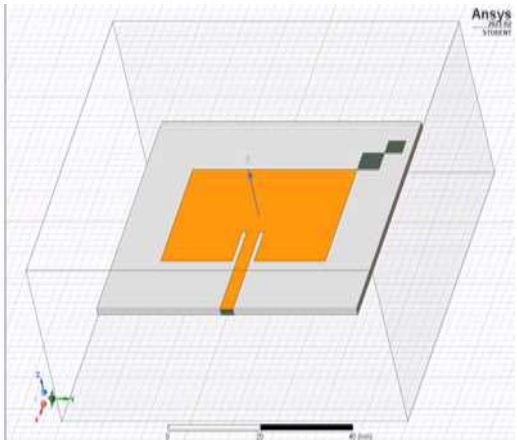

Fig 1- Antenna Design in HFSS

The Figure 1 is the schematic of the designed antenna in HFSS platform.

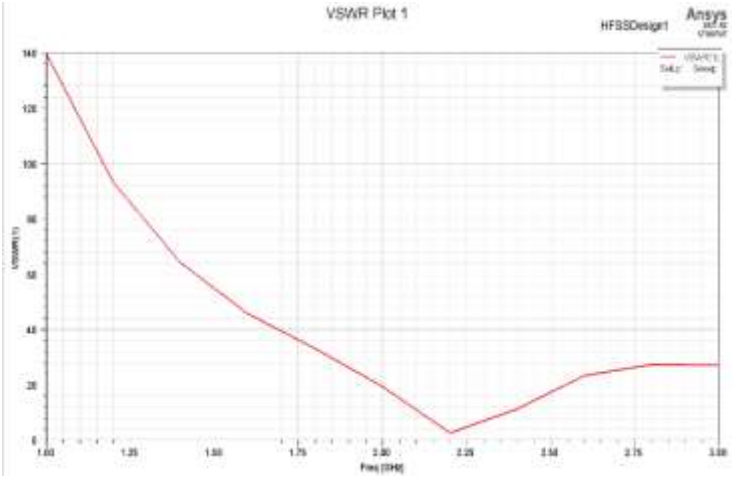

Fig 2- VSWR graph

Figure 2 represents the VSWR vs Frequency plot for the simulated antenna and found to be showing desirable results at the resonance frequency of 2.24GHz.

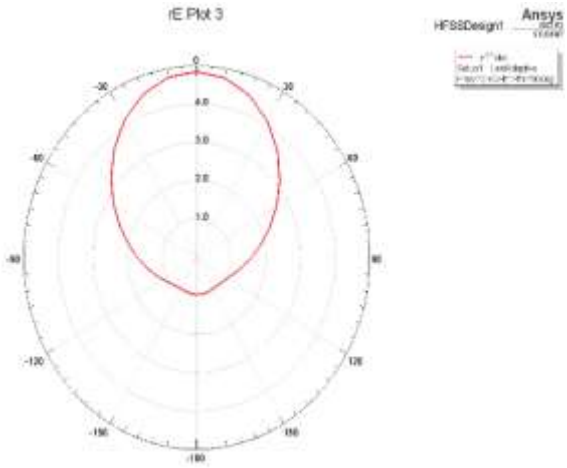

Fig 3- radiation pattern

The Figure 3 is the radiation pattern plot of the simulated antenna in HFSS platform which is also showing acceptable results.

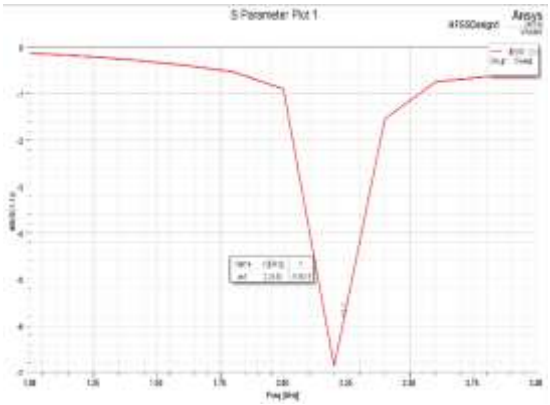

Fig 4- S parameter vs frequency plot

The Figure 4 is the S11 vs frequency plot of the simulated antenna in HFSS platform which is also showing acceptable results at the resonance frequency.

IV.CONCLUSION

The design and simulation of the microstrip patch array antenna have been successfully completed and analyzed using Ansoft/Ansys HFSS. Our future work will focus on fabricating this patch array antenna. The design has been validated in all aspects of the antenna. The antenna's bandwidth is improved through proper impedance matching using a stub feedline at the source point. The good bandwidth and high return loss make it suitable for various wireless applications. This simple antenna could be valuable for wideband wireless applications.

V. REFERENCES

[1] Collin, R.E.: 'Field theory of guided waves' (McGraw Hill Book Company, Inc., USA, 1960)

[2] Bahl, I.J., Bhartia, P.: 'Microstrip antennas' (Artech House, Inc., MA, USA, 1980)

[3] Harrington, R.F.: 'Time harmonic electromagnetic fields' (McGraw-Hill, Inc., USA, 1961)

[4] Lee, K.M., Luk, K.M.: 'Microstrip patch antennas' (Imperial College Press, London, 2011)

[5] 'Ansoft high-frequency structure simulator (HFSS) v. 13.0' (Ansoft Corporation, PA, USA)

[6] James, J.R., Hall, P.S.: 'Hand book of microstrip antennas' (Peter Peregrinus Ltd, London, UK, 1989), Vols. 1 and 2.

[7] Balanis, C.A.: 'Advanced engineering electromagnetics' (John Wiley & Sons, Inc., USA, 1989)