e-ISSN:2582 - 7219

INTERNATIONAL JOURNAL

OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 5, Issue 6, June 2022

INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.54

9710 583 466 9710 583 466 ijmrset@gmail.com www.ijmrset.com

International Journal Of Multidisciplinary Research In Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.54|

| Volume 5, Issue 6, June 2022 |

| DOI:10.15680/IJMRSET.2022.0506072 |

Designing a Microstrip Patch Antenna Operating At a Frequency of 10GHz

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ABSTRACT: This paper presents a thin microstrip patch antenna for the next generation 5g device. It The proposed patch antenna has a compact structure comprising an appropriate soil plane. Used by handheld devices. The antenna vibrates at 10 GHz and covers 5G frequency bands. Radiation patches and power supply transmission line technology is used to adjust 50Ω Microstrip feed line. Antenna is developed with FR4 materials with dielectric consistency 4.4, 0.02 tangent loss and 1.6 mm density. In this paper, the shape of the antenna and Various parameters such as return loss plot, gain plot, radiation pattern plot, VSWR plot,etc. Presented and discussed. The results are simulated and analyzed by HFSS. Comparison Different antenna shapes for the same frequency. Microstrip patch antennas find some Applications in wireless communication. For example, satellite communication is required Circularly polarized radiation pattern that can be achieved with either a square or a circle Patch the microstrip antenna. Circular polarization with GPS (Global Positioning Satellite) system A microstrip antenna is used. They are very compact sizes and for them Positioning

KEYWORDS: microstrip, VSWR plot, low profile microstrip patch antenna

I. INTRODUCTION

Network speed and increase in large demand Mobile communication capacity, many countries, America, China, European Union, including Japan Making Korea, Largecale Research Fifth generation (5G) Development effort to switch wirelessly Broadband Technology . Some of these countries The region identified their own 5G radio standards, This is 100 times fast than the fastest 4G available LTE Standard , with faster data requirements Transfer beyond 4G standards. From the increase. The idea of using frequency assignment challenge, millimeter WAVE (MM Wave) frequency is supported by the government. Industry and science . 5G technology showed this Necessity of an antenna that has never seen a function in the user Terminal. For example, to ensure optimally Bandwidth and wireless experience without interruption Network device, beamforming technology that leads this Signal Distribution D. H. Radiation pattern to the location of Recipients are one of them. Also, development New applications for mobile phones have enhanced the need Larger bandwidth and faster data transmission. Necessity Create some designer challenges to become wise Balance of MIRM Technology Design Problems Wave antenna and commercial standard (small size, low cost, Radiation efficiency, directivity, broadband performance, And so on). Microstrip patch antenna (MPA) with the arrangement of radiating element and feed cooplan The network is a good choice to obtain functional elements Suitable for 5G applications with production volume Relying on complexity and performance performance High frequency standard (D. Millimeter wave) antenna, Like directivity and bandwidth on dielectric board Physical and electrical parameters are much more sensitive Low frequency antenna . Therefore, it is important Select the board with the most appropriate size and function. These millimeter wave antennas International Telecommunications Union (ITU) 3.4-3.6 GHz, 5-6 GHz, 24.25-27.5 GHz, 37- are identified. 40.5 GHz and 6676 GHz band as 5G communication Spectrum .

Federal Communication Committee (FCC) 60 Non-license frequency band installed GHz, IEEE802.11ad "Standardize as a Wireless Gigabit AllianceWigig "2013 . In this study, hairpin is shaped Working with MPA compatible with 5G technologies IEEE802.11AD Standard and ISM Frequency A 60 GHz band (57 GHz 64 GHz) is designed and simulated. First, it is used to

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investigate using three different boards. Influence of dielectric constant on antenna performance First, the optimal size parameter is obtained at 60 GHz CST Studio Optimization Tool for FR4, Rogers R054350B and ARLON AD255C. Bandwidth, reflection attenuation, etc. Directional analysis is performed on these and compared Three different dielectric layers, with these optimal dimensions The most appropriate data for bandwidth and reflection attenuation Realized with Rogers RO4350B, it has excellent cost performance. The directivity uses Arlon AD255C. In addition, with bandwidth Reflection attenuation analysis is performed on 4 different substrates Rogers RO4350B thickness and optimal results Obtained at 1.2mm.

Microstrip antenna (MSA) technology is the fastest development topic. Antenna fieldfor the past 20 years paid creative attention of the academic industry Government engineers and researchers around the world Microstrip antenna has developed a commercial reality from academic eyes Various microwave system applications actual, rapidly evolving market markets Personal Communication System (PC), Mobile Satellite Communication, Direct Send TV (DBT), Wireless Local Area Network (WLAN) and Intelligence Vehicle Expressway System (IVHS) Suggested that the demand for microstrip antenna and array continues to increase. The concept of MSA was first in 1953 in the above US. Suggested as DesChamps France of Gutton and Busporn . As always, Manson's practical antenna has been developed In the 1970s, and Howell . A large number of advantages of MSA such as low weight, small capacity, light weight LING Circuit technology manufacturing and designed to design multiple configurations Various applications . By increasing the request for personal and mobile communication, Demand for small and low profiling antenna brought microstrip antenna foreground. With decades of research microstrip antennas are primarily driven by printed patch shapes and materials The properties of the board on which the antenna is printed. Therefore, properly You can improve the performance of the antenna by manipulating the board. Basic Characteristics of microstrip antennas and advantages and disadvantages of MSA This is explained in the next section.

II.BASIC CHARACTERISTICS OF MICROSTRIP ANTENNA

Microstrip antennas, in their simplest form, consist of a radiating patch on one side. The ground plane on the opposite side of the dielectric substrate. The most common shape is a rectangle And circular. But there are other formats such as squares, patches, triangles, semicircles, etc. A circular ring shape is also used. Radiation from the microstrip antenna Around the patch and ground plane. Rectangular patch length L The basic excitation in TM10 mode is slightly less than λ / 2. Where λ is A dielectric given as λ0 / √εe in free space with respect to wavelength λ0. Where εe is Effective permittivity of a W-wide microstrip line. The value of εe is slightly smaller Dielectric constant εr of the substrate due to the drifting electric field from the patch to the ground Not only are planes not confined to dielectrics, they also propagate in the air. To improve The fringe field from the patch that makes up the radiation is the patch width W. Elevated. Fringe fields are also enhanced by reducing or increasing εr. Substrate thickness

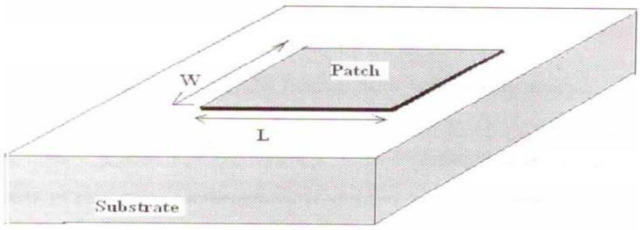

Fig:1 Front view of rectangular patch antenna

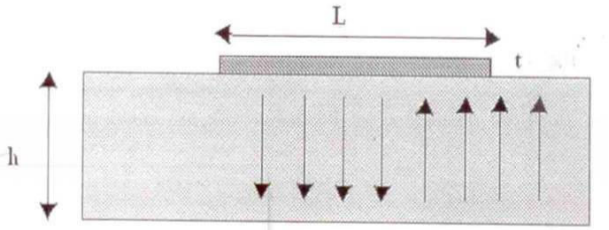

Fig2: Side view of rectangular patch antenna

II. LITERATURE SURVEY

ROSLINA HUSSIN[2019]

Mobile technology has been developing rapidly in recent years because it has a great impact on social life. Therefore, the antenna system is considered a core device and the progress of the antenna system should be investigated. Wireless technology. Modern antenna designs allow a single element to be used in many systems. Also Microstrip patch antennas are an important consideration in the design of modern communication mechanisms. Plain or plain as opposed to traditional types Inexpensive manufacturing process. Over the last 40 years, there has been intensive research on this topic.Antenna system. Therefore, this review provides a comprehensive description of the former and subsequent

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ones.This results of microstrip patch antennas. Different types of systems considered for comparison Includes millimeter wave, broadband, dual / multiband or reconfigurable structure, size reduction, compact, thin Profile, impedance bandwidth, high gain or linear and circular polarization applications.

DR. NIRALIA[2020]

5G cellular systems are expected to be widely deployed spectrum. The antenna design for 5G applications is as follows: A painstaking task. This paper is 5G applications using microstrip patch antennas Load the slot into the radiant patch and Antenna performance related to gain and radiation pattern Bandwidth of the 56GHz spectrum. Have a microstrip antenna Several benefits such as low profile, low cost and ease of use Manufacture. Main drawbacks of microstrip patches Antennas are inherently narrow impedance bandwidth. finished Load a specific slot into a radiating microstrip array The antenna can be a compact or small microstrip antenna receive. This can happen when loading a slot into a radiating patch With the meandering of the excited patch surface current path It leads to a decrease in the fundamental resonance of the antenna. Frequency corresponding to reduced antenna size Such an antenna. This paper uses FR4 material 1.6 mm thick substrate.

BILAL[2021]

This study is about a new microstrip antenna Proposing 5G mobile communication with IEEE802.11ad Default. Third, hairpin-shaped radiation spots are analyzed Various boards; FR4, Rogers R054350B, and Arlon AD255C. Directivity and bandwidth analysis based on Dielectric constant is performed to select the best substrate 60GHz operation under these three dielectric layers frequency. The directivity of the Rogers RO4350B is 1.17dBi higher. Low directional gain compared to FR4 and 0.13dBi Compares to Arlon AD255C, but offers 2.4GHz more Bandwidth and compactness than others. Finally, it The proposed antenna is analyzed for four different thicknesses Rogers RO4350B and best performance observed at 1.2 mm.

MD.MOHIUDDIN SOLIMAN[2020]

This paper describes the range and application of design parameters for 5G antennas. Requirements. When designing a microstrip patch antenna [MPA], there are three parameters. As a board element, board height and supply technology have a big impact About the performance of the antenna result parameter. If these are not properly selected, 5G application requirements are not covered. This work specified three parameters Design an MPA that meets the requirements of your 5G application. again, A comparative analysis of antenna performance is based on these three structures. Parameter. In addition, foam, substrate height 0.5 mm, 1/4 wavelength transformer Power supply technology has been found as the optimal parameter for the requirements of 5G applications. Finally individual

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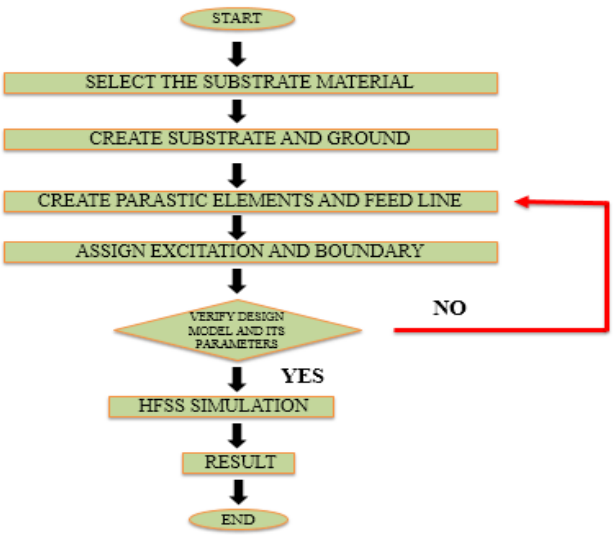

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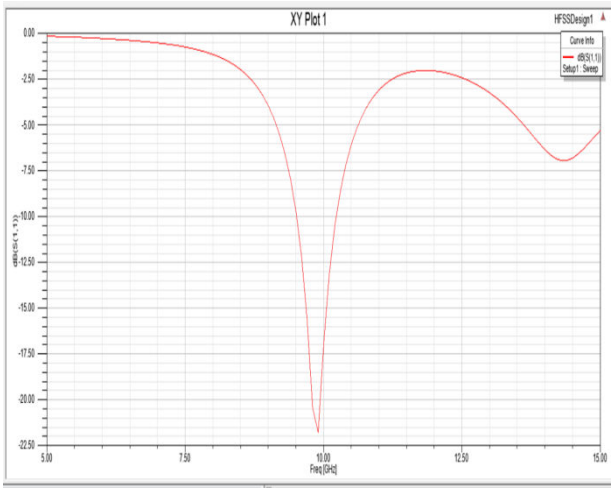
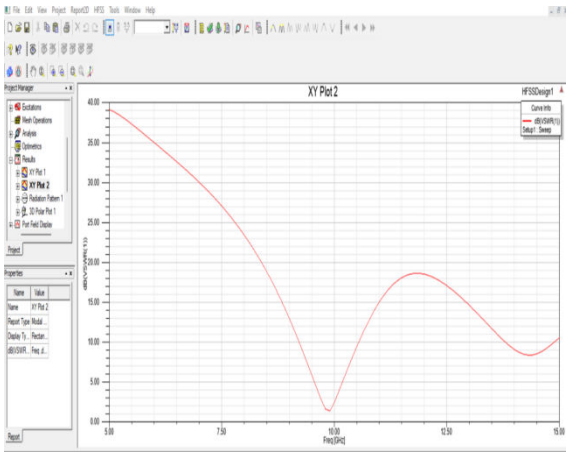
III.RESULT AND ANALYSIS



Return loss Vs Frequency

Return loss defines the loss of power by any error via transmission line/cable. This error can be due to mismatching between the source and the load. An antenna is said to be efficient when it has a power loss below -10 Db. The S11 parameter obtained using Lumped Port Configuration is shown in the above screen.
The proposed MPA model resonates at 9.8 GHz with a return loss of -22.2 dB as shown.



VSWR Vs Frequency

The term VSWR is a measure that tells how well the signal(power) is transmitted to the receiver. The VSWR of the proposed architecture is shown in screen. The range of VSWR lies from 1 to infinity. But VSWR value under 2 is suitable for an efficient antenna. From the above screen we have obtained VSWR of 1.34 at 9.8 GHz.

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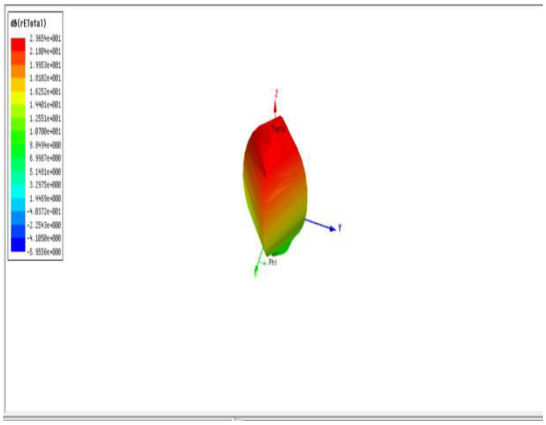
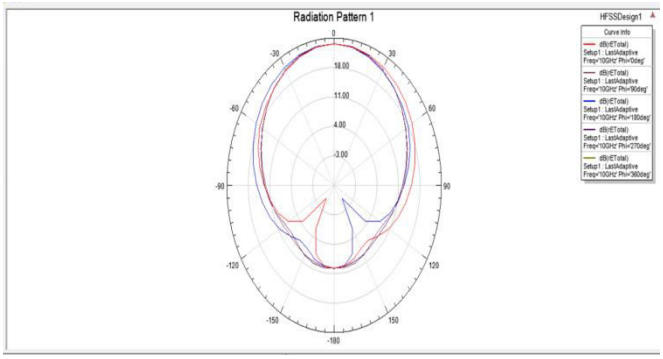


3D Plot the Gain

The term Gain describes how the antenna transforms its source power into the radio waves at the transmitter side and vice versa at the receiver side. An efficient antenna should consist of minimum 2dB OF gain. The proposed antenna provides 2.36 dB which presents good performance for a patch antenna.



Radiation Pattern

The radiation pattern is defined as a mathematical function or a graphical representation of the far field (ie, for r≫2D2/λ, with D being the largest dimension of the antenna) radiation properties of the antenna, as a function of the direction of departure of the electromagnetic (EM) wave. The designed antenna performance is compared with the existing similar designs in literature survey. In terms of radiation efficiency, the designed antenna shows better performance than the designes presented in literature survey.

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Impact Factor
7.54

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