Journal of Science, Computing and Engineering Research (JSCER)
Volume-3, Issue-1, Jan-Feb 2022.
DOI: *https://doi.org/10.46379/jscer.2022.030111*

Design and Analysis of Frequency Reconfigurable Mimo Antenna for 5g

[1] M.Priyadharshini [2] Prof.I.Kalphana

[1] PG Scholar, Communication Systems, Department of Electronics and Communication Engineering, Government College of Engineering, Salem-11, Tamilnadu, India.
[2] Assistant Professor, Department of Electronics And Communication Engineering, Government College of Engineering, Salem-11, Tamilnadu, India.

Article Information

Received : January 09 2022
Revised : January 20 2022
Accepted : January 27 2022
Published : February 02 2022

Corresponding Author:

Author Name: M.Priyadharshini, Prof.I.Kalphana

Email: priyadharshini1999kavitha@gmail.com

***Abstract*—** The two port MIMO reconfigurable antenna is designed by using two E shaped patches surrounded by four parasitic patches. Each E shaped antenna contains a port and two parasitic patches. Each parasitic connected to E shaped antenna using PIN diodes. These four diodes can be turned ON/OFF by giving supply voltage to establish connection between corresponding parasitic patches and E shaped patches respectively. Since, four diodes were used in this reconfigurable antenna, there are 16 combinations which can give 16 possible set of results. Various frequencies attained by the respective antenna at various switching conditions are 3.5 GHz, 3.8 GHz, 4 GHz, 4.9 GHz, 5 GHz, 5.1 GHz, 5.2 GHz, 6 GHz, 6.1 GHz, 6.2 GHz, 6.7 GHz. From the Federal Communications Commission (FCC) frequency allocation standards the above given frequencies can be used for following applications FIXED-SATELLITE (Earth-to space) (space-to-Earth), MOBILE, Satellite Communications, Fixed Microwave, MOBILE except aeronautical mobile, RADIO ASTRONOMY, AERONAUTICAL MOBILE SATELLITE, AERONAUTICAL RATIONALIZATION, RADIONAVIGATION-SATELLITE (Earth-to space) (space-to-Earth) (space-to-space). A single antenna can be used for various applications delicately by simply switching diodes ON/OFF.

Keywords: Diodes, E shaped patches, Frequency, Parasitic patches, Reconfigurable antenna, Switches, Voltage supply.

Citation: M.Priyadharshini and Prof.I.Kalphana."Design and Analysis of Frequency Reconfigurable Mimo Antenna For 5g", Journal of Science, Computing and Engineering Research, 3(1), 206-209, 2022.

I.INTRODUCTION

Reconfigurable switching operation used in Diode "ON" and "OFF" Diode "ON" and "OFF" condition used in one antenna, different frequency level of value will be getting. The work cantered of frequency 3.5 to 5.5 GHZ, set of band "ON" operation certain frequency created and "OFF" operation certain frequency created. Proposed system four switch possibility used. 2^k (k=4) sixteen different frequency value analysis. Switch -1010 possibility analyzed, effective output of VSWR, s-Parameter, Radiation Pattern getting. The present day trend in industrial and authorities communique systems will had been to increase low cost, minimum weight, low profile antennas which can be able to retaining excessive overall performance over a huge spectrum of frequencies.

Through the years, micros trip patch antenna structure is that the commonest choice accustomed understands millimeter wave monolithic integrated circuits for microwave, radiolocation and communication purposes. Within this in operation vary of frequency, the antenna should have stable response in terms of gain, radiation pattern, polarization and so on At a similar time it should be of tiny size, conformal, low price and may be simply integrated into the RF circuits. These characteristics make slotted micros trip patch antennas ideal for use in cell phones and other small electronic devices. A Microstrip patch antenna consists of a non-conductive substrate, with a ground plane on the opposite side. The micros trip patch antenna is extremely well matched for applications like wireless communication systems, cellular phones, pagers, radio detection and ranging systems and satellite communication systems. With the rapid development of modern communication and semiconductor technologies, a wide variety of wireless services have been successfully introduced to the world in recent years. A well-designed antenna reduces complexity and improves receiver performance.The type of application size, configuration and the frequency of operation.

ll. LITERATURE SURVEY

Single-Layer Differential CPW-Fed Notch Band Tapered-Slot UWB Antenna [2]. In order to achieve the clean and controllable notch strip characteristic, a pair of half wavelength

stubs and slits is introduced into the taper slit and circular patches respectively. The return loss could hardly remain stable when the notch band was changed and it was difficult to control the notch band. [3] Ultra-Wideband Differential Wide-Slot Antenna With Improved Radiation Patterns and Gain .The UWB systems need the antenna with the same radiation pattern and the stable gain in the whole frequency range. These antennas did not exhibit a consistent radiation pattern across the whole frequency band.[5] Frequency reconfigurable pixel slot antenna. The resonance direction of the pixel slot antenna can be a traditional slot or a slot plus a ring, with a view to attain better tiers of freedom withinside the technology of numerous resonant frequencies.. From the end results with MEMS switches, we can see that there are larger losses occurring along the different modes. [6] Integrated RF MEMS frequency reconfigurable ring slot antenna. Turning / deactivating MEMS RF actuators, which are strategically positioned in the geometry of the antenna power line and Microstrip, the operating frequency band has changed. This is outside the active band with negligible effect on antenna performance. [8] A reconfigurable coplanar folded slot antenna without a polarization network for WLAN applications. To change the perimeter of the slot and thus change the resonant frequency of the antenna.

lll. EXISTING SYSTEM

Frequency reconfigurable antenna mainly bases on several different components, such as RF-MEMS, varactors, the field-effect transistor. Most of the reported frequency reconfigurable antennas are asymmetric and there are only several studies of differential frequency reconfigurable antennas.

A. Problem Formulation

From the analysis of the literature survey, the study reveals that the existing work shows the increase in performance loss and that the total gain is also significantly necessary to be increased .frequency coverage is only for three frequency bands are generated. The drawbacks present in the available antennas VSWR can be identified as Less reception of thanks to the unique patch antenna, they are used for each device. Not compatible for future reconfigurable multiband antenna system applications. Each antenna requires each of them a separate processor to execute the particular data reception operation.

lV. PROPOSED SYSTEM

To achieve wide bandwidth and keep a simple structure, the dipole is adopted as the basic structure to design a reconfigurable differential frequency antenna. By switching “on” and “off” PIN diodes, the antenna can resonate at two states centered from1 to 11 GHz. Although the two states correspond to different resonance modes, the actual radiation pattern is the same and the mode switching structure will not contribute far field for both states .This results in similar radiation pattern for both states. Two port MIMO concept is included in this antenna. To design a differential frequency reconfigurable antenna .To analysis a VSWR value, Radiation pattern, s-parameter value and return loss value .To analysis the frequency value of Ultra wideband.

A. Coaxial Feed

Coaxial power or probe power is a very common technique used to power Microstrip patch antennas. The inner conductor of the coaxial instrument extends through the material and is welded to the radiating pad, whilst the outer conductor is hooked up to the floor plane. The main advantage of this type of power supply scheme is that the power supply can be placed in any desired position in the patch to match its input impedance. This feeding method is easy to manufacture and has low stray radiation.

B. Return loss

Return loss or reflection loss is the reflection of signal power when inserting a device into a transmission line or optical fiber. It is expressed in the form of a ratio in dB compared to the power of the transmitted signal.

C. VSWR

A standing wave in a transmission line is a wave in which the distribution of force, voltage or field is formed by the overlap of two waves of the same frequency that are propagated in opposite directions. Then the tension along the line produces a series of knots and bellies in fixed positions.

D. Radiation pattern

The antenna diagram is a three-dimensional graphical representation of antenna radiation as a function of direction. It is a graph of the power radiated by an antenna per unit of slip angle which gives the intensity of the radiation of the antenna. If the total power radiated by the isotropic antenna is P, then the power is spread over a sphere of radius r, so that power density S at this distance. Isotropic antennas are not feasible in practice but can be used as a benchmark to compare the performance of practical antennas. The radiation pattern largely provides information about the antenna beam width , side lobes and resolution of the antenna. The E plane pattern is a graphical representation of antenna radiation as a function of direction in a plane containing a radius vector from the center of the antenna at the point of maximum radiation and at the intensity vector of the electric field. Similarly the H plane can be drawn considering the magnetic field intensity vector.

E. S-parameters

Diffusion parameters are used to describe how energy can propagate through a power grid. Parameters are used to describe the relationship between different gates, when it becomes particularly important to describe a network in terms of amplitude and phase with respect to frequencies, rather than voltages and currents. The settings are used to show a complicated network as a simple black box and to easily present what is happening to the signal in that network. Dispersion parameters describe the input-output relationships between the gates of an electrical system. Particularly at high frequencies, it becomes essential to explain a given network in terms of waves instead of voltage or current. So in S parameters we use power waves.

F. Reconfigurable antenna

To provide a dynamic response, reconfigurable antennas incorporate an internal mechanism (RF switches) that allow the

intentional redistribution of RF currents across the surface of the antenna and produce reversible changes in its properties. Reconfigurable antenna designs, recent state of used RF switches are FET switches, PIN diodes and MEMS switches. The switch is a device that acts as a circuit maker or circuit breaker to configure antenna settings.

V. OPERATIONAL DIAGRAM

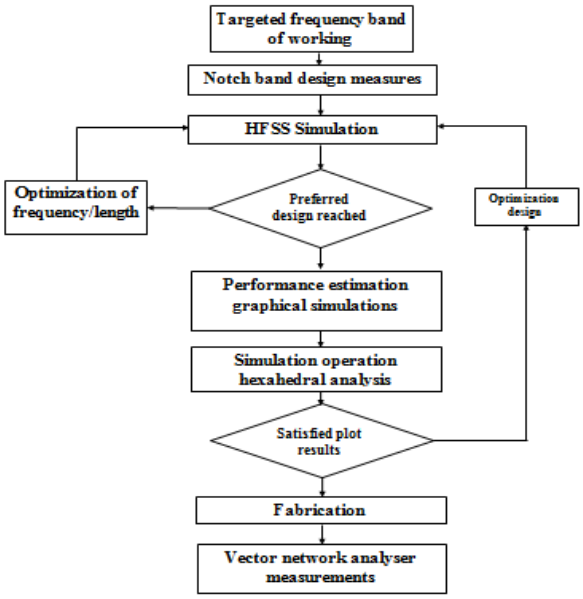

Figure 1: Operational diagram

Vl. STRUCTURE OF ANTENNA

A. Front view

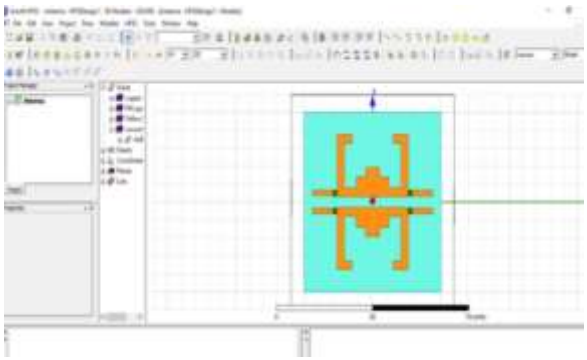

Figure 2: Front view of Antenna

B. Back view

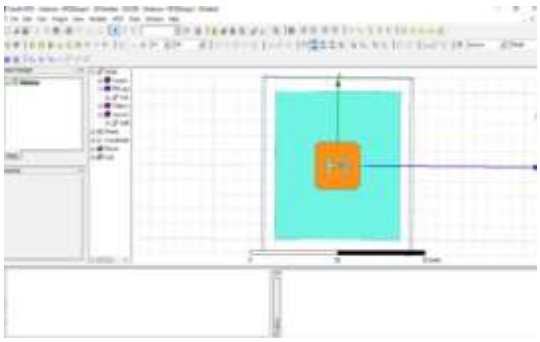

Figure 3: Back view of Antenna

C. Side view

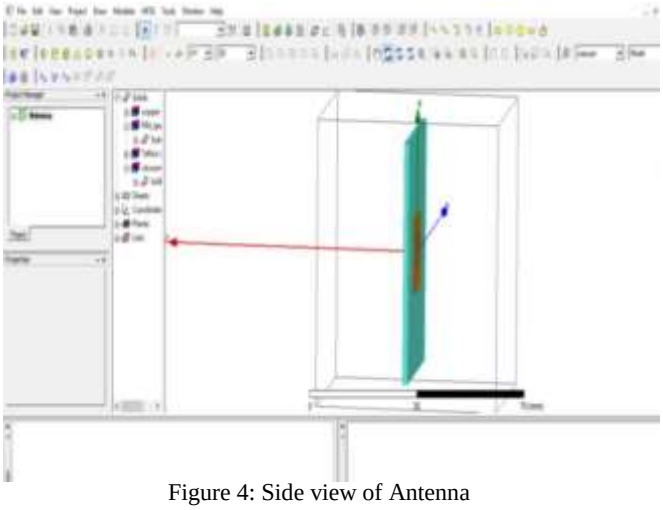

Figure 4: Side view of Antenna

Vll. RESULT OF SWITCH 1010

D. S-PARAMETER 1

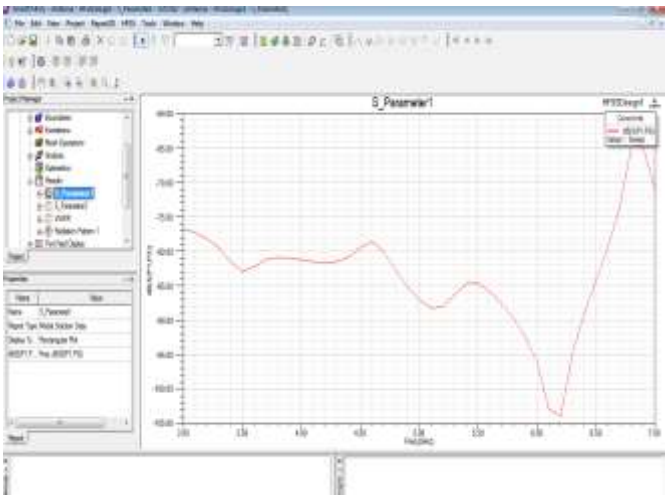

Figure 5: S-Parameter 1 of Antenna

E. S-PARAMETER 2

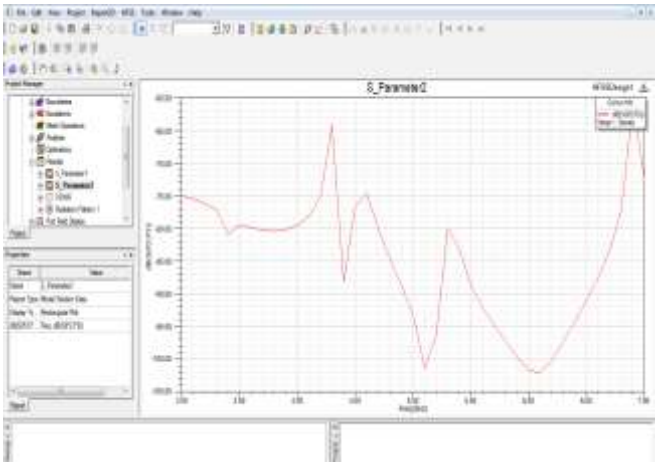

Figure 6: S-Parameter 2 of Antenna

F. VSWR

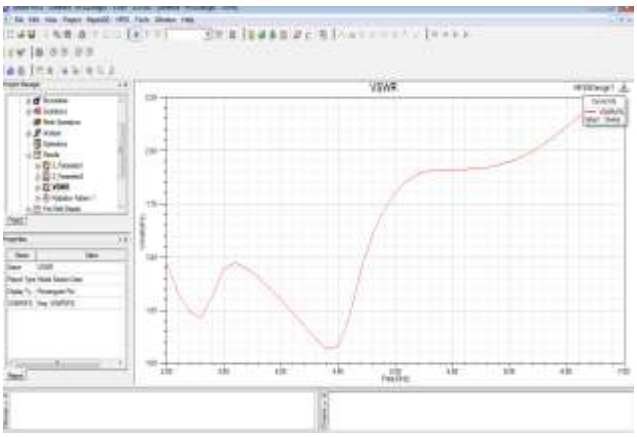

Figure 7: VSWR of Antenna

G. RADIATION PATTERN 1

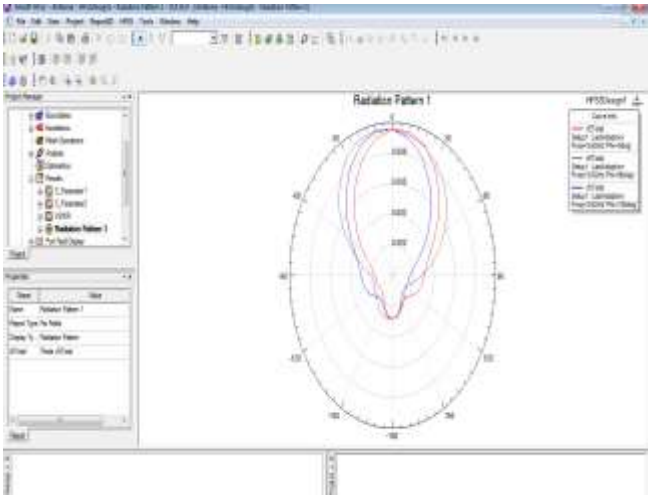

Figure 8: Radiation pattern of Antenna

Vlll. CONCLUSION

The MIMO Differential frequency Reconfigurable antenna can analyze in 6GHZ frequency. The Switch 1010 combination 6 GHZ frequency value gutted. The VSWR value is 1.5 GHZ and the return loss value is -10 dB. Two port radiation pattern value is same. A reconfigurable patch antenna with stubs in the radiator and full ground plane has been designed and simulated. The proposed antenna exhibits multi bands, it supports for Ultra Wide Band (UWB) as well as good radiation properties. Therefore this antenna suitable for Ultra High Frequency application are other wireless applications that works in these frequencies. A patch antenna is simulated for multiband frequency applications with the MIMO technique.

IX. FUTURE WORK

To compare return loss and VSWR value of a Microstrip patch antenna with various feed line techniques. To analyze and design this reconfigurable patch antenna with any shape in the partial ground plane by using some other feeding method. Results of studies have also been used to propose a methodology to design other frequency bands.

REFERENCES

[1]. Y. Y. liu, Z.H.tu,"Compact differential band notched stepped slot ultra-wideband MIMO antenna with Common mode suppression, "Lett volume: 16, pp:593 – 596 ,IEEE antennas and wireless propag , 2017.

[2]. Z.h.tu,W.A.li, and q.x.Chu ,"Single layer differential CPW Fed - notch band Tapered Slot uwb antenna"lett. vol. 13, pp. 1296–1299 IEEE antennas wireless propag, 2014.

[3]. L.Li Et Al, " UWB Differential wide Slot antenna with Improved Radiation Patterns and Gain"IEEE Trans. antennas Propag ,vol. 60, no.12, pp. 6013–6018,Dec. 2012.

[4]. A. Tariq and H. Ghafouri-Shiraz, "Frequency-reconfigurable monopole antennas," vol. 60, no. 1,pp. 44–50, IEEE Trans. Antennas Propag., Jan. 2012.

[5]. C. Y. Chiu, J. Li, S. Song, and R. D. Murch, "Frequency reconfigurable pixel slot antenna,"vol. 60, no. 10, pp.4921–4924, IEEE Trans. Antennas Propag., 2012.

[6]. B. A. Cetiner, G. R. Crusats, L. Jofre, and N. Biyikli "RF MEMS Integrated frequency reconfigurable Annular slot Antenna" IEEE Trans. antennas Propag , vol. 58, no. 3, pp. 626–632, Mar. 2010.

[7]. S V hum, H Y xiong ," Analysis and design of a differentially fed frequency agile Micro Strip patch antenna",vol. 58, No. 10, pp.3122–3130 , IEEE Trans.antennas propag,octobre. 2010.

[8]. D.E.Anagnostou and A. A.Gheethan " A coplanar reconfigurable folded -slot antenna without bias network for wireless local area network applications ,"IEEE Antennas Wireless propag.Lett,vol.8, pp. 1058–1060, 2009.

[9]. C.lugo Jr.and J.papapolymerou, "six-state reconfigurable filter structure for antenna based systems" IEEE Trans.antennas propag , vol.52, no . 12, pp.3220–3227,Dec. 2004.

[10]. B. R. Holland, R. Ramadoss, S. Pandey,P.agrawal "tunable coplanar patch antenna using varactor "Lett,vol. 42, pp. 319–321, IEEE Electron,Mar. 2006.