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A Study on Frequency Reconfigurable Antenna in Wireless Communication Systems

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ABSTRACT
Antennas play a vital part in the communication system that's wireless. It is accountable for the transformation of electric signals into electromagnetic waves and vice versa. The performance of the antenna can be improved in a variety of interesting ways by employing a large number of different processes. The reconfiguration of antennas is one of the newer technologies that is becoming available. We can improve the performance of the antenna by re-configuring the settings of the antenna. MEMS, varactor or Leg diodes, tumble accoutrements, and other similar technologies can be utilized to facilitate the reconfiguration process. With the help of these bias, we can alter the inflow that's current the patch. Reconfiguration can be done in frequence, polarization, radiation pattern and the mongrel of these. In this paper, we're reviewing frequence that's colorful designs in wireless communication systems.

Keywords: Reconfiguration, Micro strip patch antenna, MicroElectroMechanical Switch

I. INTRODUCTION

In a wireless communication system, an antenna serves as a critical component of the overall system. An antenna is a metallic device that is capable of transforming electric signals to electromagnetic waves and vice versa. It does this by converting electromagnetic signals to electric signals. The numerous forms of antennas comprise a dipole antenna, log periodic antenna, orifice antenna, microstrip antenna, glass antenna, etc. In the beginning stages, an antenna is only capable of meeting a single operation, which means that there is only one frequency that can be used for operation. However, because there are now more factors to consider in communication, additional progress must be made in the design and production of antennas. One of the major advancement surfaced in recent times is reconfigurability, we can reconfigure the antenna. therefore we can use a single antenna for multiple operations. Reconfiguration can be done in frequence, radiation pattern, polarization, etc. In reconfiguration, the

antenna characteristics can be changed by changing the inflow that's current it. Changing the inflow that's current be achieved either by altering the figure of an

antenna or by changing its electrical parcels. In order to accomplish this, RF switches, varactor diodes, Leg diodes, and other adjustable accessories are utilized.

Radiation Pattern Reconfigurable Antenna It is possible to achieve the signal with the requested direction by utilizing pattern reconfiguration. The form, the direction, and the gain of the patterns of radiation have all been altered.

ii. Polarization Reconfigurable Antenna Antenna with polarization reconfigurability has the ability to switch between a variety of polarization modes. In a gadget that can be moved, this helps prevent polarization mismatch from occurring.

iii. Frequency Reorientation Antenna Electronic switches (variactors and leg diodes), radio frequency microelectromechanical systems (RF MEMS), tunable accessories, and other components enable these antennas to operate at a frequency that can be altered.

iv. Emulsion Reconfiguration: They have the capacity of tuning antennas that are many at the same time.

In this paper use frequence Reconfigurable Antenna. frequence Reconfiguration is achieved by;

i) Integrated electronic switches similar as varactor or Leg diodes.

ii) Using RF MEMS.

iii) Tunable material is used for the substrate.

Antenna integrated with electronic Switches Leg

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diodes and varactor diodes are the most commonly employed device that is switching to switch the frequency bands. The Leg diode is among the most commonly used because of its compact dimensions, low price, easy assembly, insertion loss, and high switching speed. In addition, Leg diodes bear a bias voltage that is dc.

RF Switching Using MEMS Because of its diminutive size and exceptional performance, RF MEMS has recently attracted a lot of attention due to the tremendous reconfigurability it offers over electronic switches. In comparison to leg diodes and FET transistors, they provide greater efficiency in terms of insulation, insertion loss, consumption of electricity, and linearity.

Tunable accoutrements for substrate Antenna are also made reconfigurable through a change in the characteristics that are substrate using accoutrements like liquid chargers or ferrites. A liquid demitasse is a material that's nonlinear dielectric constant can be changed under different voltage situations.

In this check, we concentrate on colourful frequentness of reconfigurable ways in the wireless communication system.

H.Huffet.al (1) proposed a pattern and frequency. Reconfigurable turn square spiral microstrip that is single antenna. Frequency reconfigurability is achieved by on/ off of the tuning rudiments. The operating frequency attained are3.7 GHz and 6 GHz and polarization that's direct coextensive feeding are used in the design. The gain attained in the structure was 6dBi. Shynu Set.al(2) proposed a feed that's single binary- frequence, binary- polarized hexagonal niche square antenna. The reconfigurable frequence that's binary achieved with the help of Legdiodes.Depending upon the state of Leg diode at the arm the current inflow and thereby frequence stirring can be controlled. Symeon Nikolaouet.al(3) proposed a frequence and pattern reconfigurable niche that's annular. The frequency reconfiguration, impedance matching, and the revision of the radiation pattern are all the responsibilities of the Leg diode at this point. After that, a planar antenna is produced on one side of the Duroid substrate, and a microstrip feed line and the network that corresponds to it are fabricated on the opposite side of the substrate. The frequentness attained then are5.2 GHz and6.4 GHz and the gain is 15dBi.

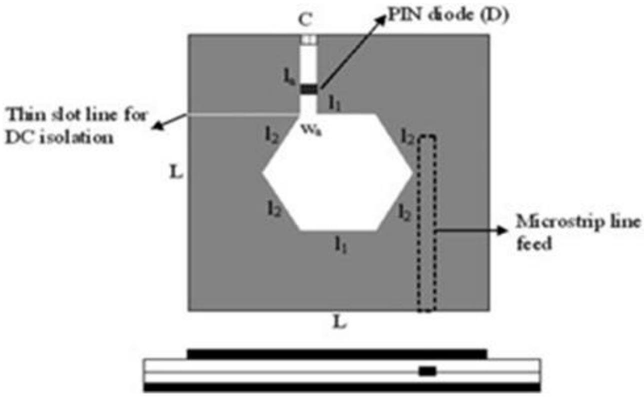

Fig1: Geometry of the proposed reconfigurable antenna controlled by pin diode [2]

S. S.Yanget.al (4) proposed a frequency U niche microstrip patch that is reconfigurable antenna. At the antenna input are positioned a variable capacitor and an inductor, which are used for matching the impedance and frequency reconfiguration respectively. The frequency tuning range associated with this is2.6 to3.35 GHz. At the antenna input are positioned a variable capacitor and an inductor, which are used for matching the impedance and frequency reconfiguration respectively. Ming- Iu-Laiet.al(5) proposed the design of a antenna that is reconfigurable compact wireless bias using Leg diodes. Leg diodes and lumped capacitors are used to produce short and open circuits across the niche. Thereby controlling the diodes, the current distribution around the niche can be changed. W. Junget.al (6) came up with the idea for a reconfigurable antenna that would use legdiodes and would be able to operate concurrently over connection and cellular bands. J. Leonardo et al. (7) presented their proposal for the optimization of an original and small frequency reconfigurable antenna type. MEMS switches attached at the edge sector of the radiated element are responsible for providing the capability of reconfigurability. The antenna is the best option for minimizing the amount of power that is lost both through dissipation and reflection.

ISSN:0975 -3583,0976-2833 VOL12, ISSUE 02, 2021

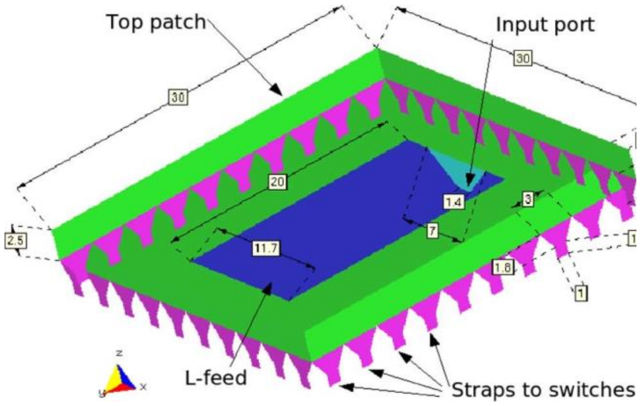

Fig2: Bottom view of the starting structure for optimization [7]

J.Choet.al(8) proposed a frequency reconfigurable antenna that are two- harborage mobile phones operating over multiple service bands. It's a planar reversed F antenna (PIFA) for LTE,- Wimax, WLAN operations. Gain associated with a frequency lower than 3 GHzis2.39-4.62 dBi and provides good radiation characteristics. F. Ghanemet.al(9) proposed a frequency that is two- harborage antenna for cognitive radios. One of the two harbors has a wideband frequency range, while the other has a narrowband frequency range that can be tuned. Narrowband is represented by a microstrip feedline, while wideband is represented by a coplanar feedline. Both of these feedlines are placed in the vicinity of the airplane.

The locations are to blame for the sludge behavior, which lowers the frequency of signals that fall outside the requested band. By altering the length of the slots, one can achieve fine-tuning of the frequency of the signal. The study and construction of a frequency-nimble patch microstrip antenna that is differentially supplied was proposed by V.Humet.al (10) and involved the use of three unions of varactor diodes. The frequency range that can be obtained is between 2 GHz and 4 GHz when varactor diodes are utilized. In (11) suggested a frequency reconfigurable antenna that uses optically pumped radiation. In addition to the frequency switches that are used in traditional technology, photoconductive silicon rudiments are utilized in the production of optical switches. These switches are activated by shaft light and are related to a grounding airplane and are responsible for conductive the fundamentals on the radiating face. Additionally, the radiating face is coupled to a ground plane. Optical switches outperform MEMS, leg diodes, and lumped rudiments in terms of performance because of their high switching speed (measured in nanoseconds) and the fact that they do not contain bias lines. The VSWR attained is1.149 at18.3 GHz and1.106 at11.8 GHz with earnings10.26 dB and5.42 dB independently. J.R. DeLuis et.al(12) proposed a frequency-nimble switched shaft antenna array system. A phase shifter is associated with this double- frequency, 4.7 GHz and7.5 GHz, reconfigurable antenna array. The Leg that is high- performance diode responsible for microwave oven roaster switching and is used in telemetry operations. It's associated with a planar performance presented in a 2 caste PCB thereby reducing complexity, space and total cost of the system that is overall. The gain associated with7.5 GHz and4.7 GHz is5.4 dB and 5dB independently. B. A. Cetiner et.al(13) proposed an RF MEMS integrated frequency reconfigurable annular niche antenna. also a double and single- arm cantilevers type DC Contact RF MEMS chooser is integrated with the antenna. frequency reconfiguration is achieved by twiddling or killing the RF MEMS pickers. The frequency attained is2.4 GHz and5.2 GHz with a gain of 2dBi.Z.Tawket.al(14) proposed a cognitive radio front- end using a rotatable controlled frequency antenna that is reconfigurable. The stir that is rotational of antenna structure is responsible for reconfiguration. Additionally, there is no requirement for any bias lines in order to activate or deactivate switches. Physical adjustments are made to the patch forms, which results in the tuning of the frequency. The actual transformation of patch shapes is accomplished by the use of a stepper motor. There is an application of microstrip line feeding, and the gains obtained with various shapes are 6.62 dB, 8.45 dB, 7.77 dB, and 6.67 dB respectively. A new magnetodielectric materials loaded tunable UHF antenna for handheld bias was proposed by F. Ferrero et al. (15). In conjunction with a folded

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monopole antenna and a varactor diode, the reconfigurable antenna has both of these components. Zhongliang Denget. al (16) proposed a frequency reconfigurable antenna predicated on MEMS technology for Ka- band. Two planar spiral structures are arranged at either side of the patch that is dumbbell- shaped MEMS switches are used for control the connection between the rotations and patch. The frequency attained also are 33.2 GHz and 35.1GHz. Y. Ban et.al (17) proposed a compact eight- band frequency reconfigurable antenna for LTE/ WLAN tablet computer operations. A circle strip that is feeding a strong strip and RF switch are associated with the antenna structure for frequence reconfigurability. N. Nguyen-Trong et.al (18) proposed a frequency and pattern reconfigurable centre shorted microstrip antenna. Patch centre consists of shorting vias and two groups of varactor are placed at the contrary sides of the antenna. Resonance frequence changed by varying the DC bias voltage at the varactor diode and the sonorous frequence range attained are2.68 GHz to3.51GHz.Y.P.Selvamet.al(19) proposed a low profile frequency and pattern antenna that is reconfigurable. Two longitudinal rips are associated with the simple patch that is thickish. These rips are connected to the patch through Leg diodes thereby enabling the frequency reconfiguration. The frequence attained are4.5 GHz &4.8 GHz/5.2 GHz &5.8 GHz.

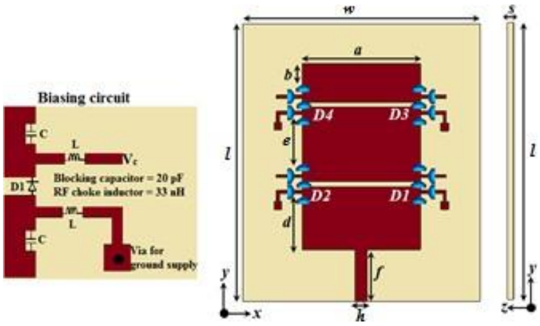

Fig 3: frequency and pattern reconfigurable antenna [19]

No.	Size(mm)	Centre Frequency	Gain (dBi)	Device
[1]	34× 36	3.7 GHz - 6GHz	5.6	PIN diode
[2]	40× 40	1.48&1.99 GHz (off) 1.585&2.05 GHz (on)	4.7	PIN diode
[3]	50×50	5.2 GHz 6.4GHz	-	PIN diode
[4]	150×150	2.6 - 3.35 GHz	-	Variable Capacitor and inductor
[5]	52×52	2.15 - 2.8GHz	0.72	PIN diode Lumped capacitor
[6]	40×20	0.82 - 0.96 GHz 1.7 - 2.17 GHz 3.4 - 3.6GHz 2.3 - 2.5 GHz	1(0.9GHz) 1.4(1.9GHz) 1.4(2.4GHz) 2.7(3.5GHz) 2(5.26GHz)	PIN diode
[7]	30×30	1.7,2.2,2.7GHz	-	MEMS
[8]	40×75	746 - 787 MHz 704 - 746MHz	2.39-4.62	Switch
[9]	60×50	4 - 5 GHz	-	
[10]	63×63	2-4 GHz	1	Varactor diode
[11]	250×250	18.3 GHz 11.8 GHZ	10.26 5.42	Photo conductive silicon elements
[12]	20×22	4.7 GHz 7.5 GHz	5.4 5	High Performance PIN Diode
[13]	40×40	2.4 GHz 5.2 GHz	2	RF-MEMS
[14]	70 ×50	2- 10 GHz	6-7	-
[15]	230×130	470 MHz 860 MHZ	2.6 4.2	Varactor diode
[16]	20×20	33.2 GHz & 35.1 GHz	-	RF-MEMS
[17]	40 ×12	830 MHz 1750 MHz 2450 MHz	2.3 - 4.4	RF Switch
[18]	18×8	2.6-3.5GHz	6	Varactor diode
[19]	50×50	4.5 GHz& 5.2 GHz	2-3	PIN Diode

III. CONCLUSION

In recent years, frequency reconfigurability has come to play an important role in the operation of wireless communication systems. Therefore, it is absolutely necessary for wireless communication systems to make use of antennas that can change their frequency. The applications of reconfigurable antennas can be found in a wide variety of fields, including space communication, radar, satellite communication, and cognitive radio. In frequency-reconfigurable structures, it is possible to make a single antenna resonate at a number of different frequencies. Leg diodes, varactor diodes, and other adjustable accoutrements are utilized in order to accomplish this goal. A comparative analysis of the many different ways that frequency can be reconfigured is presented in this article. based on the

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findings of the study, the researchers came to the conclusion that structures formed of adjustable metamaterial have a wide variety of benefits, and that these benefits can be further investigated.

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