

A SURVEY: ANALYSIS OF RECONFIGURABLE MICROSTRIP PATCH ANTENNA

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Abstract–In this paper, we describe about micro strip patch and slot antenna then we also describe about the reconfigurable antenna and their types like frequency, polarization, radiation pattern and gain. Reconfigurable antenna can be achieved by switching element like MEMES, VARACTOR DIODES, and PIN DIODES. From all this frequency-reconfigurable antennas is use because of their high reliability to be applied in multiple applications using a single antenna, which cans achieve different frequency. For this, we use different technique like FRSPMA, RDGS and U-slot.

Index terms – Microstrip Patch Antenna, Micro Strip slot antenna, Reconfigurable Frequency, RF PIN Diode.

I. INTRODUCTION

Microstrip patch Antenna is widely used in wireless communication. It has compact size and easy to fabricate use with multiband antenna operation [2][3][5].The antenna consists of micro strip patch and slot antenna. Micro strip patch antenna is consisting of ground plane and dielectric substrate. A slot in the ground-plane positions underneath the patch [1] [5]. Micro strip patch antenna has the some drawbacks like narrow bandwidth and low gain performance which can not suitable for communication system. So, some techniques of Reconfigurable Antenna can be used [2].

Reconfigurable Antennas (RA) have recent received best deal in wireless communication, satellite communication and mobile communication [1] [8]. RA has capability of radiate more than one pattern at different frequency and polarization [1] [3] [5].

The requirement of increase bandwidth, gain performance, command , direction finding, control etc can be achieved by RA [1] [3].The basic working principle of this reconfigurable antenna is achieved by switching the status of an RF switch either to ON or OFF mode which then affects the current distribution of the antenna. Switching components such as PIN diodes, varactor diodes, MEMs switches, and optoelectronic switches are normally used to achieve frequency reconfigurable

Antenna. PIN Diode Switch is optimum choice, which is shown as below table [1] [4] [6].

Switching Components	Advantages	Disadvantages
MEMES	Low power losses, Reduced insertion loss, good isolation	Slow switching speed, need high control voltage ,fabrication is hard, cost is high
VARACTOR DIODES	The current flow through the varactor is small compared to PIN diode or MEMS	Varactors are non-linear and have low dynamic range
PIN DIODES	Low cost, easy to fabricate, fast response, low control voltage, reliable	High DC bias current in their

Table.1 Components of RF Switch

II. TAXONOMY OF RA

RA is classified in four different categories, which are below.

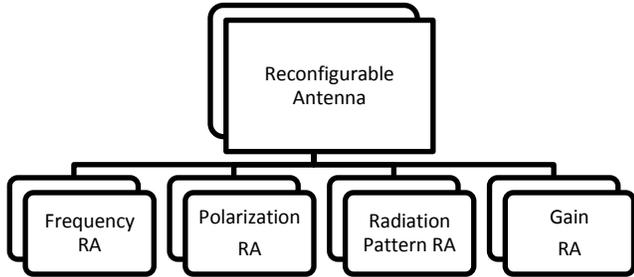


Figure.1 Classification of RA

I. Frequency RA

RA is able to change frequency at different bands is called frequency RA. Some tuning in antenna achieve this. So using reconfigurable antenna achieved different frequency at single antenna [1] [4] [9] [14].

II. Polarization RA

Radiating structure that can change its Polarization like horizontal polarization, vertical polarization, left hand side polarization right hand side polarization called Polarization RA. This antenna diversity can realize frequency reuse. This antenna are used for enhance bandwidth, avoid fading loss which is in multipath effect [8] [9] [13].

III. Radiation Pattern RA

Radiating structure able to tune radiating pattern that is called Radiation Pattern RA. Different antenna has different pattern so use the RA and tune the Radiation Pattern at different frequency and also give the similar Radiation Pattern [1] [15].

IV. Gain RA

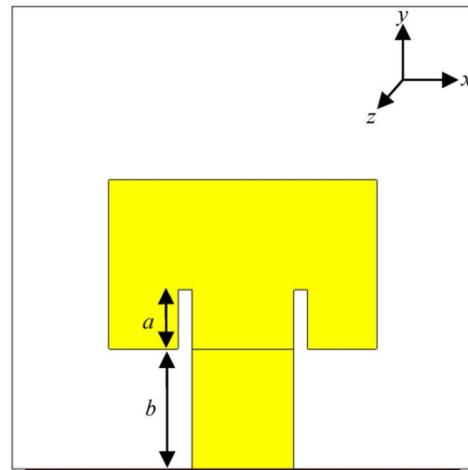
Radiating Structure able to enhance the gain called Gain RA. That can be achieved by some techniques like FRSPMA, RDGS [3] [5] [15].

III. FREQUENCY RECONFIGURABLE ANTENNA

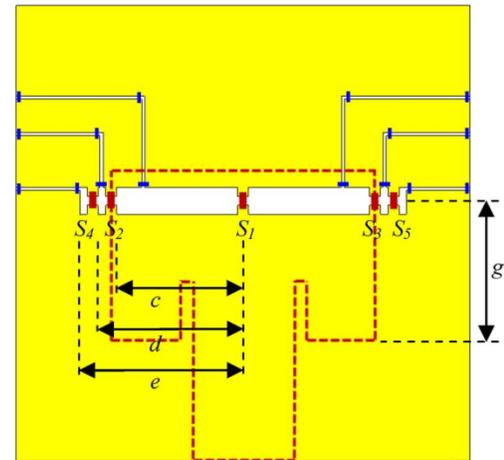
Most reconfigurable antennas are frequency-reconfigurable antennas are use because of their high reliability to be applied in multiple applications using a single antenna like for single antenna achieved different frequency using this antenna [1] [3].

There are some methods for achieving frequency reconfigurable antenna.

- I. Controlling the connected and disconnected the connection of patches on the substrate that results was in multiple frequency reconfigurable antennas [3] [5].



(a)



(b)

Fig.2 Geometry of the proposed antenna (a) front view and (b) back view.

Fig a shows that front view of patch antenna consists of ground plane and dielectric substrate. And fig b shows that slot antenna positioned on ground plane

with in PIN Diode. So, using this diode achieving different frequency for antenna.

- II. Varying the effective length of the slot with embedded RF switches across U slot, rectangular slot, V slot etc. can be connected either patches (radiating elements) or ground plane. And the results is in multiple resonance frequency [2] [3] [16].

IV. TECHNIQUES OF RA

Some methods had include for achieving frequency reconfigurable

I. **FRSPMA (Frequency Reconfigurable Stacked Patch Micro strip Antenna):**

Using this method achieve higher bandwidth and high gain performance. It is feeding methods, which is designing patch antenna. This method is achieved by changing the structure or size dynamically without changing whole antenna. Frequency reconfigurable aperture coupled antenna is achieved by controlling the switch at the slot on the ground plane [3].

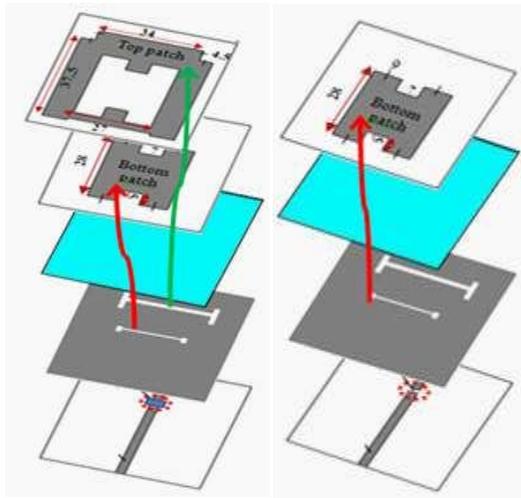


Fig.3 FRSPMA when all switches are in (a) ON (b) OFF

Configuration of Aperture Coupled technique are shown in figure(a) when switch is ON than both patch are connected to the slot antenna. And shown in figure(b) when switch is OFF than bottom patch is

connected the one slot and upper patch was disconnected.

II. **RDGS(Rectangular Defected Ground Structure) :**

Using this method for control the frequency in single band, which is avoiding the problem in steering frequency. This method is used for single frequency band. The antenna consist of rectangular patch and ground plane etched RDGC at location and switching network which can make and break connection with ground plane. Using mode 0 and mode 1 the ground plane are achieved make and break connection that can be possible by PIN diode and getting frequency [5].

III. **U-Slot and V-Slot :**

Using this method varying effective length of slot and get different frequency within PIN diodes. As shown in figure U slot antenna are on ground plane within patch antenna. It is a technique, which is increase bandwidth, impedance matching bandwidth of probe, feed patch antenna with thick substrate [2].

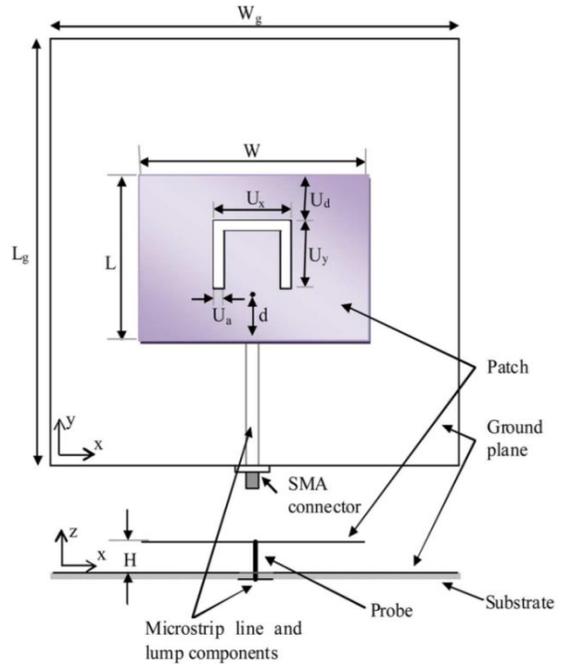


Fig.4 Geometry of the proposed antenna.

IV. **FRPC(Frequency Reconfigurable Passive Components) :**

This method using passive component like PIN Diode that help to achieve different frequency. In this using PIN diode which is placed at feed line. In addition, when passive component are switched ON than achieved some frequency and when switched OFF frequency. So using this method achieves the different frequency on single antenna result using passive components.

V. CHALLENGES

I. **Bandwidth :**

It has narrow bandwidth so the problem are occurred so using some techniques of RA which is enhance the bandwidth

II. **Gain :**

The performance of gain is low. Because of using biasing network within switching elements so power consuming is high. Sp the gain is low.

III. **Radiation pattern :**

Antenna has radiation pattern which can be achieved by RA

IV. **Frequency :**

Different antenna has achieved different frequency than crosstalk is occurred in multi channels.

V. **Complexity :**

Using Biasing network for activation and deactivation of switching element which add the complexity

VI. APPLICATION

Reconfigurable antennas are required to cover different wireless services that are spanned over a wide frequency range.

Some applications are as below:

I. **Frequency Reconfigurable Antenna for a Cognitive Radio Application**

A cognitive radio system is able to communicate efficiently across a channel by altering its frequency of operation based on the constant monitoring of the channel spectrum. This system is able to continuously monitor gaps in the finite frequency spectrum occupied by other wireless systems, and then dynamically alter it's transmit/receive characteristics to operate within these unused frequency bands, thereby minimizing interference with other wireless systems and maximizing throughput.

So solve this problem used reconfigurable. And frequency

reconfigurable achieved by patch antenna within switching elements. So achieved the frequency tuning which is suitable for cognitive radio applications [1] [10].

II. **Pattern Reconfigurable Antenna for MIMO System**

MIMO systems are work on both transmitter and receiver meant multiple inputs and multiple outputs. The use of such type of antennas increases significantly the capacity by allowing the selection between different pattern diversity and polarization configurations. Reconfigurable antenna arrays are also best solution for MIMO systems to maintain good communication links

III. **Reconfigurable Antennas for Satellite Applications**

The need for dynamic space applications has use of reconfigurable antennas for satellite communication [10]. In this system, it is necessary to reconfigure the antenna radiation pattern to give out a new coverage zone, limit fading in rainy areas, and maintain high data rate at all possible frequency bands of operation

VII. CONCLUSION AND FUTURE WORK

In this paper we conclude the different frequency can be achieved by different switching element like pin diode. Using different technique, we can achieve the high gain and also enhance the bandwidth. As a future work, I am going to work on this type of technique which is going to increase a result of frequency antenna and try to getting different frequency on single antenna.

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