

# Brief Survey on Electrical Reconfigurable Antenna for Various Wireless Application

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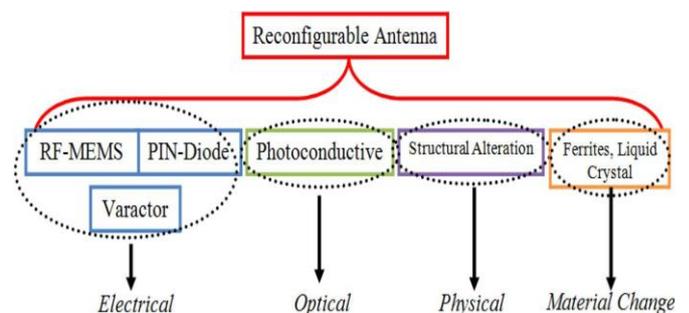
**Abstract**— Antenna is a device that convert radio-frequency field in to alternating current and vice versa. Some properties of antenna is frequency, gain, bandwidth, radiation pattern etc are depending on their shapes, structure, material and different type of techniques. Electrical Reconfigurable antennas used to radiate more than one pattern slot at different frequencies, which are important for wireless communication. The requirement of electrical reconfigurable antenna is to improve efficiency of radar, finding a direction and control the signal within a large volume on transmitting and receiving systems. Electrically reconfigurable antennas solve such type of problems. This paper based on discussion of electrical components which are used in this type of antenna to improve their structure and function. These reconfiguration concepts are based on the integration of radio-frequency micro electro mechanical systems (RF-MEMS), PIN diodes, varactors, photoconductive components, or on the use of smart materials such as ferrites and liquid crystals. Reconfigurable antenna concept used in both wireless and space application such as cognitive radio, multiple-input-multiple-output (MIMO).

**Keywords**—Reconfigurable antenna, PIN diodes, photoconductive switches, multiple-input-multiple-output (MIMO), radiation pattern, radio frequency micro electro mechanical systems, varactors

## I. INTRODUCTION

The rising fact for modern mobile communication, satellite and wireless communication systems in the world to improve the output and efficiency of Electrical Reconfigurable antenna will be an attractive quality in the wireless communication system because it enables to provide a single antenna device to be used for multiple systems. The reconfigurable antenna used to create its radiation pattern at different frequencies. The dual-frequency operations have been accomplished multilayer stacked patches and single layer micro strip antennas. The dual band micro strip antenna (MSA) is developed by cutting of different shapes like U-slot, V-slot, and pair of rectangular slots. A different reconfigurable MSA with a switchable slot has been proposed to realize various functionalities, such as dual frequency operation so reconfigurable antenna which integrated with radio frequency switching. Reconfigurable slot antenna of operating (2-6) GHz have been studied and analyzed. In this work, a comprehensive study to understand the effects of various dimensional parameters of slots and PIN diodes switches mode (“on” or “off”). The reconfigurable

of slot of operating multiband, as well as single band frequencies (2.4 GHz and 5.6 GHz) for wireless local are the first antenna is a conventional of rectangular MSA with added two parallel slots onto patch is off mode. While another antenna is when two PIN diode switches are added along each slot is on mode a network (WLAN) [1]. Reconfigurable antenna is developed by changing its frequency, polarization, or radiation characteristics. Reconfigurable antennas efficiency is improved by redesign their structure and electrical behavior. This change is accomplished by many techniques by change their antenna current and reliability by which we increase their efficiency (i.e., bandwidth, operating frequency, and radiation pattern, polarization). Reconfigurability is an important and desired feature radio-frequency system for wireless and satellite communications. Reconfigurable deals with multiservice, multi standard and multi band operation, with very efficient spectrum and power utilization. These concepts use to reduce complexity of reconfigurable antenna, and cost of radio technology, and give very compatible communication.



*Various techniques to achieve reconfigurable antenna*

Reconfigurable antennas can be classified into four different categories.

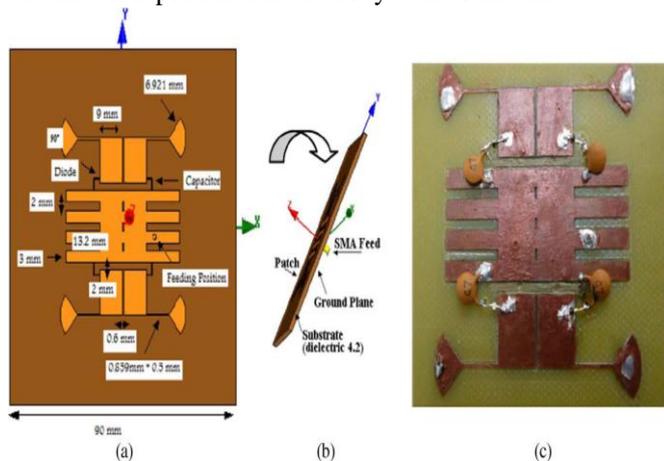
1: A radiation pattern is changed its operating frequency by hoping between different frequencies bands is called frequency reconfigurable antenna. It is obtained by developed some tuning or notch in the antenna reflection coefficient.

2: A radiating structure that is able to adjust its radiation pattern is called radiation pattern of reconfigurable antenna, by change in shape, direction, or gain the desire radiation pattern is accomplished.

3: A radiating structure that can change its polarization is called polarization reconfigurable antenna. In this case the antenna can change, for example, from vertical to left-hand

circular polarization.

4: A new system is achieved by frequency reconfigurable antenna with polarization diversity at the same time.



(a) Frequency reconfigurable antenna. (b) Side view of the antenna. (c) Fabricated prototype

### Electrically reconfigurable antenna-

#### Reconfigurable antenna based on RF-MEMS-

Reconfigurable rectangular antenna deals with RF-MEMS switches, the antenna circuit board (PCB) with dielectric constant of 3.27 and fed through a coaxial cable in its main part. In this structure consists of five sections that are joined with four RF-MEMS switches. The spiral arm is increased by some steps in the manner 1U, 2U, 2U, 3U, 3U, NU, where U is the length of first segment of the rectangular spiral and N is a number of integers. It is obtained in following the right-hand direction to provide right-hand circular polarization for the desire field. The function of switches is used to find such that the axial ratio and gain of the antenna are optimum at the frequency. RF-MEMS type reconfigurable antenna change radiation beam direction.

#### Reconfigurable antenna based on PIN DIODES-

A frequency reconfigurable antenna based on PIN diodes. The activation of the switches is controlled via an FPGA. The antenna structure has three layers. The bottom layer is a type of physical layer that covers the entire substrate. The middle layer has a dielectric constant of 4.2 and a thickness of 0.235 cm. The upper layer is the metal patch composed of an important section and four surrounding smaller sections. The variations are achieved through individually controllable by switches, each implemented by a PIN diode. The antenna deals its operating frequency according to the four switch combinations.

#### Reconfigurable antenna based on varactors-

Single and dual polarized slot-ring antenna with wide band tuning using varactor diodes. The single-polarized antenna tunes from 0.95 to 1.8 GHz which is more efficient with 13-dB return loss. Dual-polarized antenna tune from 0.93 to

1.6 GHz, with more than 10 db loss greater than 20-dB port-to-port isolation over most of the tuning range. Varactor diodes capacitance varies from 0.45 to 2.5 pf. The antennas are substrates with a dielectric constant of 2.2. The dual-polarized slot-ring antenna deals with both frequency and polarization simultaneously, or can operate at two frequency o band two orthogonal polarizations. [2]

## II. LITERATURE SURVEY

**M.T.ALI et al. [1]** Reconfigurable micro strip slot patch antenna of operating frequencies in the range (2-6) GHz is used for Wireless Local Area Network (WLAN) applications. It has one port excited with micros trip line feed mechanism. Reconfigurable antenna consists of a single layer slot antenna with two parallel slots designed that can be operating by two PIN diode switches. Two parallel slots are connecting with the surface current path, introducing local inductive effect that is responsible for the excitation of the second establish mode. By adjusting the status of the switches state either on or off mode in simultaneously so, the resonance frequencies can be varied, thus achieving frequency reconfigurable.

**Christos G. Christodoulou et al.[2]** Reconfigurable antennas is a more precious device that radiate more than one pattern at different frequencies and polarizations, which is need in modern telecommunication systems. The requirements for increased functionality system which related telecommunication. Reconfigurable antennas are a solution to this problem. Different reconfigurable components which are uses antenna to change its structure and function. These reconfiguration techniques are based on the radio-frequency micro electromechanical systems (RF-MEMS), PIN diodes, VARACTOR, photoconductive elements, or on the surface of the antenna radiating structure and use other such as ferrites and liquid crystals. The mechanisms that can be used in each different reconfigurable technique to achieve high level performance. [2]

**Emran sohiab et al. [3]** the antenna has two switches that are reduce the surface current distribution and radiating edge antenna, so the frequency and radiation pattern of the antenna. The baseline antenna configuration with switches in OFF state is single-band having -10 dB loss bandwidth from 5.401 to 6.045 GHz and a broadside radiation pattern. The second configuration with switches in ON state deals with dual-band operation in the 2.110–2.875 GHz and 5.665–5.968 GHz bands, combined with a radiation pattern in the upper frequency band while maintaining a common impedance bandwidth with configuration around 5.78 GHz. A good agreement is found between the simulation and measurement.

**Isni husna idris et al. [4]** Reconfigurable antenna is

comprised to switch between single-band, dual-band or triple-band operation. The antenna comprises three pairs of pin diodes which are designed in the dipole arms. The antenna will operate at 2.4 GHz, 3.5 GHz and 5.2 GHz using microwave. The average measured gains are 1.54, 2.92 and 1.89 dBi for low, mid and high band. A prototype was then constructed in order to verify the performance of the device. A good level of agreement was observed between simulation and measurements.

**Ratnesh kumari et al. [5]** in wireless communication, reconfigurable radios are becoming very popular due to its ability to operate with much frequency range with the same hardware. Its important part of such a radio is the antenna. reconfigurable antenna with the size of 22 X 16 X 1 mm<sup>3</sup>. The designs are carried out using FR-4 substrate which has 4.05 dielectric constant with thickness of 1 mm with 0.03 loss tangent. The proposed antenna uses the concept of T-slot in the radiating patch, which differ antenna into three parts and an E-slot in the ground plane. The radiating patch is connected by two PIN diodes for the reconfigurable operations.

**Preet kaur et al. [6]** Increasing demand for cost effective, multiband and wideband antennas. Reconfigurable antenna designs can support fulfill these requirements. By which these antennas provide several advantages but at the same time performance of the antennas can be further enhanced using reconfiguration concept. Reconfigurable fractal antenna that combines the advantage of both the situations. A reconfigurable fractal antenna is designed, simulated and optimized using a soft-High Frequency Structure Simulator (HFSS). The optimized antenna is fabricated and tested using vector network system.

### III. TECHNOLOGY USED

S. NO.	Technology Used	Parameters Included	Year	Merits
1.	Pin diode switching	a. Antenna with two slots (off mode) b. Antenna design with two slots and pin diode switches (on mode)	2011	1. The new slot antenna operating a frequency range (2-6) GHz 2. Resonance frequency vary 5.8GHz to 2.4GHz
2.	Integration of radio frequency micro electromechanical (RF-MEMS), pin diodes, varactors, ferrites and liquid crystal	a. Antenna physical structure b. Frequency reconfigurable antenna c. Radiation structure change its polarization	2012	1. Efficient use of frequency 2. channel capacity improve 3. Increases efficiency of channel and reduce their cost
3.	Surface current distribution on the antenna	a. Antenna design b. Frequency adjustable c. dual band operations	2013	1. Antenna give frequency and radiation pattern characteristics with small number of switches 2. Antenna s-parameters show good ability
4.	1. narrow band to another narrow band 2. wideband to narrowband 3. multi band to another multi band	a. Antenna design b. different operating bands	2014	1. flexibility of different frequency so antenna suitable for operate multiple bands
5.	1. Design are carried out using FR-4 substrate 2. concept of T-slot in the radiating patch 3. E-slot in the ground plane	a. Different type of shape slots V slot, U slot, pair of rectangular slot	2014	Antenna operates in different type of frequencies
6.	1. Cognitive radio technology 2. Novel frequency reconfigurable E-shaped patch design	a. RF-MEMS switching design b. E-shaped patch antenna design c. Proposed method	2015	For wireless network we used unused spectrum

## IV. CONCLUSION

Various reconfigurable antennas used in many wireless applications such as satellite communication, radar, space, mobile radio, MIMO system etc. Reconfigurable antenna operates with different resonant frequencies which is useful in the wireless communication applications. PIN diode and switching operation are used in this antenna for reconfiguration. This type of reconfigurable antenna is modified by using varactor diode and MEMS switch. Reconfigurable antennas are more reliable than all other antenna techniques because single antenna can be operated with different modes. It is a type of single antenna with multi-use applications or users to use simultaneously. Reconfigurable antenna has the ability to switch from one application to other very efficiently. By using reconfiguration concept power interference can be avoided by switching between different modes of reconfigurable antenna. By using reconfiguration concept we provide more efficient communication with minimum cost and complexity.

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