

Review on Types of Reconfigurable AntennaAsmita M. Sonwalkar¹, M. M. Jadhav²¹EnTC Dept.VPCOE,Baramati, Savitribai Phule Pune,University, Maharashtra ,India.²Department of Electronics and Communication Engineering, VPCOE, Baramati, Maharashtra, India

Abstract— Reconfigurable Antenna Is an alternative to multi-band Antenna. Different techniques are use to achieve multi-band and wideband operation of antenna. Reconfigure Antenna Provide the ability to dynamically adjust various antenna parameters. It has received a lot of attention in areas like communication. Reconfigurable means antenna has the ability to modify its characteristics, such as operating Frequency, Polarization or radiation pattern. Reconfigurable antennas have the potential to add functionality to mobile communication. Reconfigurability in antenna allows us for spectrum reallocation in multi-band communication systems therefore reducing the number and size of antenna in a system. Reconfigure antenna are designed to support multiband and wideband wireless applications in different frequency bands. This paper provides different type of reconfigurable antenna and its working like Frequency Reconfigurable Antenna, Radiation Pattern Reconfigurable Antenna, Polarization Reconfigurable Antenna, Radiation and Frequency Reconfigurable Antenna.

Keywords— Frequency Reconfigurable, MEMS switch, Patch Antenna, Polarization Reconfigurable, econfigurability, slot antenna.

I. INTRODUCTION

With increasing demand for reliable wireless communications, the need for efficient use of electromagnetic spectrum is on the rise. Conventional broadband antennas discussed above never satisfy all these demands. The reconfigurable antennas have shown strong potential in this field due to its low cost and flexibility. This section depicts the recent advancements in reconfigurable antenna technology. Wireless communication systems are attracted toward multi-functionality. This multi-functionality provides users with options of connecting to different kinds of wireless services for different purposes at different times. It is very important to develop single radiating element which is having a capabilities of performing different functions and multi-band operation in order to minimize the antenna's weight and area. An antenna that have the ability to modify its characteristics, such as operating frequency, polarization or radiation pattern is referred to as a reconfigurable antenna[1]. Reconfigurable antenna is used for to reduce the number of antenna necessary for Multiband function, but they can also be designed to work in complex systems such as emerging applications include software defined radio, cognitive radio, MIMO systems[2]. Reconfigurability can be achieved using slot configuration in the microstrip rectangular patch antenna with switching devices are connected inside the slot with on & off State working [2]. Switching devices such as PIN diodes, MEMS switches and optical switches are used for switching purposes.

This paper provides detail information of all type of reconfigurable antennas. Section I introduce the concept of frequency reconfigurable antenna. This section provides the geometry of frequency reconfigurable antenna and techniques used in papers. Section II elaborates the concept of radiation pattern/beam reconfigurable antenna. Section III deals with the concept of polarization reconfigurable antenna. Section IV presents reconfigurable single printed antenna capable of both radiation pattern and frequency reconfiguration. Section VI concludes the paper.

II. FREQUENCY RECONFIGURABLE ANTENNA

Reconfigurable antenna is an antenna that capable to reconfigure its characteristics such as frequency, pattern, bandwidth, and polarization to adapt to the environment. The reconfiguration is not limited to a single characteristic but can be a combination of different characteristics depending on the application. Recently, frequency reconfiguration has attracted significant attention due to the introduction of future wireless communication concept such as cognitive radio which employs wideband sensing and reconfigurable narrowband communication.

As described in [1], the proposed antenna consists of a microstrip patch antenna and a microstrip slot antenna where the slot antenna is positioned at the ground plane underneath the patch. Three switches are placed in the slot as shown in Fig.1. The antenna is capable to reconfigure up to six different frequency bands from 1.7 GHz to 3.5 GHz. The microstrip patch antenna produces three different frequency bands with directional radiation pattern while the microstrip slot antenna produces another three frequency bands with bidirectional radiation pattern. Due to the reflector placed at the back of the antenna, the radiation pattern is directional at all frequency bands [1].

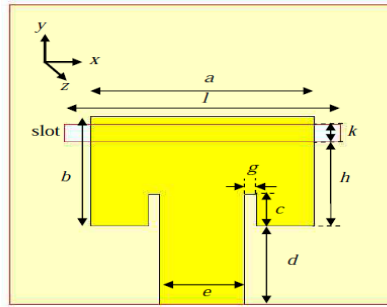


Fig. 1 Geometry of Frequency Reconfigurable patch antenna

III. RADIATION PATTERN RECONFIGURABLE ANTENNA

Radiation pattern reconfigurability is based on the some modification of the spherical distribution of radiation pattern. Pattern reconfigurable antennas are usually designed using movable/rotatable structures or by using switchable and reactively-loaded parasitic elements. The antenna is designed to be able to reconfigure its radiation pattern during operation such that it maintains its broad pattern in the absence of interferences, and is capable of narrowing its pattern, when the interfering signals arrive at the antenna, to suppress these undesired signals as much as possible.

The total radiation pattern from the microstrip antenna originates from three things: direct space wave, edge diffracted space wave and edge diffracted surface wave. The Basic idea about the pattern reconfigurable antenna is antenna mounted on electrically thick substrates so that edge-diffracted surface wave field can be strong and which is having the magnitude higher than the diffracted space wave field.

As described in [2], the element of microstrip antenna is surrounded with a parasitic ring loaded with switches. The structure of this antenna is shown in fig. 2. Reconfigurable antenna is based on some modification of the EM propagation characteristics of the surface waves, and thus the radiation pattern could be modified through the use of a metallic switch-loaded parasitic structure. Then next the modified radiated surface waves contribute to the main beam pattern in a controlled manner, hence pattern reconfigurability achieved. The switches provide two different ring configurations and the two states of the switches i.e ON and Off Controlled the pattern reconfigurability. The switches can be RF MEMS, electronic or photonic-controlled or diode switches.

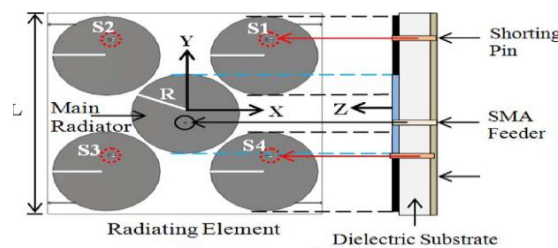


Fig. 2 Radiation Pattern reconfigurable patch antenna Geometry

IV. POLARIZATION RECONFIGURABLE ANTENNA

Polarization reconfigurable antennas are capable of switching between different polarizations modes. The capability of switching between horizontal, vertical and circular polarizations can be used to reduce polarization mismatch losses in portable devices. Polarization reconfigurability can be provided by changing the balance between the different modes of a multimode structure. Antenna with polarization diversity is very important due to the rapid growth of wireless communications and radar systems.

As described in [4], a reconfigurable microstrip patch antenna with polarization states being switched among linear polarization (LP), left-hand (LH) and right-hand (RH) circular polarizations (CP). The CP waves are excited by two perturbation elements of loop slots in the ground plane. A p-i-n diode is placed on every slot to alter the current direction, which determines the polarization state. The influences of the slots and p-i-n diodes on antenna performance are minimized because the slots and diodes are not on the patch. The antenna radiates either RHCP or LHCP at a time, depending upon the operating state of the diode switches. Therefore, there is no coupling is induced between the two polarizations [4].

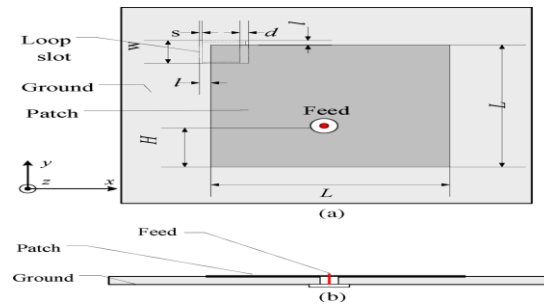


Fig. 3 A Geometry of a CP patch antenna with loop slot on the ground.
 (a) Front view. (b) Side view

V. RADIATION AND FREQUENCY RECONFIGURABLE ANTENNA

In general, most antennas are capable of either frequency or pattern reconfigurability. However they can be made combination of both frequency and pattern reconfigurable simultaneously. Frequency and Pattern reconfigurable microstrip antenna is done by using multiple switch connections. They have also called as compound reconfigurable antenna.

VI. CONCLUSIONS

In this paper theoretical survey on Reconfigurable antenna is presented. After study on different type of reconfigurable antenna we can concluded that Reconfigurable antenna have their applications in diversified areas like communications. They possess the properties to modify their radiation characteristics, frequency of operation, polarization or even a combination of these features in real time. Reconfigurable antennas have the potential to add substantial degrees of freedom and functionality to mobile communications.

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