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A Brief Review Of Reconfigurable Antenna For Wireless Communication

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***Abstract*— Reconfigurable antennas are those antennas which are able to modify its frequency and radiation diagram in a controlled and reversible way .Reconfigurable antennas differ from good antennas as a result of the reconfiguration mechanism lies within the antenna instead of in an external beam forming arrangement. The reconfiguration capability of reconfigurable antennas are wont to maximize the antenna performance in a very varied state of affairs or to satisfy dynamical and effective necessities. In this paper we tend to compare numerous frequency reconfigurable antennas , their operational frequencies and applications**

***Index Terms*—beam steering, intentional relocation, reconfigurable antenna**

I. INTRODUCTION

Reconfigurable antenna are the antennas that are designed to cover various wireless services that operate over a wide frequency range. Antenna configuration is achieved by changing the radiated field of antenna's effective aperture . In order to offer a dynamical response, reconfigurable antenna use an inner mechanism (such as RF switches, mechanical actuators or tuneable materials) that allow the intentional relocation of the RF currents over the antenna plane and produce reversible modifications over its properties The reconfiguration capability of reconfigurable antennas are used to maximize the antenna performance in a varying scenario or to satisfy changing and effective requirements.

1.1 TYPES OF ANTENNA RECONFIGURATION

1.1.1 FREQUENCY RECONFIGURABLE ANTENNAS

Frequency Reconfigurable Antenna can regulate dynamically their frequency of operation. They are mostly used in cases where several communications systems congregate because number of antennas are replaced by a distinct reconfigurable antenna. Frequency reconfiguration is usually achieved by changing physically or electrically the antenna dimensions using RF-switches, tunable materials or impedance loading

1.1.2 RADIATION PATTERN RECONFIGURATION

Radiation pattern reconfigurability depends on the intentional alteration of the spherical allocation of radiation pattern. Beam steering is the most comprehensive application and it consists in routing the direction of maximum radiation to increase the antenna gain in a link with mobile devices. mostly designed by using pattern reconfigurable antennas are switchable and reactively-loaded parasitic elements or movable /rotatable structures.

1.1.3 POLARIZATION RECONFIGURATION

Polarization reconfigurable antennas are able to switch between different polarization modes. Switching between different polarization modes such as horizontal, vertical and circular polarizations can be used to reduce polarization mismatch losses in various portable devices. Polarization reconfigurability can also be provided by varying the balance between different modes of multimode structure.

1.1.4 COMPOUND RECONFIGURATION

Compound reconfiguration is the ability of simultaneously tuning various antenna parameters, for instance radiation pattern and frequency. The most frequent application of compound reconfiguration is the combination of beam-scanning and frequency agility to provide better spectral efficiencies. Compound configurability will be achieved by combining completely different single-parameter reconfiguration techniques or by reshaping dynamically a surface within the same structure

II. LITERATURE REVIEW

M. T. Ali, N. Ramli ,M.K.M. Salleh and M.N.Md.Tan (2011) A reconfigurable rectangular microstrip slot patch antenna of frequencies operating in the range of (2-6) GHz is presented for Wireless Local Area Network (WLAN) applications. Its one port is excited with microstrip line feed mechanism. The antenna consists of a single layer patch antenna which has two parallel slots that are controlled through two PIN diode switches. Two parallel slots are incorporated to agitate the surface current path that introduce local inductive effect which is responsible for the excitation of the second resonant mode. Resonance frequencies can be varied by adjusting the status of the switches either on or off mode simultaneously, thus achieving frequency reconfigurability. A complete parametric study is carried out to recognize the effects of several dimensional parameters (slots and PIN diode switches) and to optimize the antenna performance This antenna is capable to attain return loss less than -10dB and VSWR≤2 in multiband frequencies at 2.4GHz and 5.8GHz when both switches are in ON mode while in 2.4GHz can be achieved when both switches are in OFF mode. The designed antennas are fabricated on FR-4

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and measured to compare the results of return loss (S11) and voltage
standing wave ratio (VSWR) with those obtained from the simulations. The proposed antenna is capable for several modern communication applications.

Syed Ahsan Ali, Umair Rafique, Umair Ahmad and M. Arif Khan (2012). They presented a fractal shape slot based patch antenna for multiband operations. The slot is designed on the rectangular patch and the antenna is fed through a microstrip line. The feeding technique and proposed design allows the antenna to operate at multiple frequencies in the range of 1- 20 GHz. It is verified through simulation that the Return Loss (RL) occurrs at 1.33 GHz, 4.16 GHz, 7 GHz, 12.70 GHz, 15.5 GHz and 18.30 GHz and having VSWR less than 2. It is observed that gain of this design is greater than conventional patch antenna.

Imran Shoaib, Sultan Shoaib, Xiaodong Chen and Clive Parini (2013). They proposed a compact reconfigurable monopole slot antenna . The antenna has two switches that are used to change the radiating edges on antenna and surface current distribution . The baseline antenna configuration with switches in OFF state is single-band from 5.401 to 6.045 GHz provides a return loss of -10 dB and a broadside radiation pattern. Second configuration allows dual-band operation in frequency bands 2.110–2.875 GHz and 5.665–5.968 GHz , combined with a radiation pattern in upper frequency range and maintaining a common impedance bandwidth with a baseline configuration of around 5.78 GHz. A better conformity is found between the simulation and measurement results.

Ratnesh Kumari and Mithilesh Kumar (2014). In the modern era of wireless communication reconfigurable radios are getting popular due to its ability to operate with in different frequency ranges with the same hardware. One of the important aspect of such radios is the antenna. This paper presented a new, compact reconfigurable antenna with the size of 22 X 16 X 1 mm3• The designs are approved using FR-4 substrate which has dielectric constant 4.05 with thickness of 1 mm with loss tangent 0.02. The proposed antenna uses T -slot in the radiating patch, that separates antenna into three parts and E-slot in the ground plane. The radiating patch is connected by two PIN diodes for operating in the reconfigurable . When the diode Dl is OFF and D2 is ON then this antenna is switched at 3.9 GHz, 8.9 GHz and 11.2 GHz frequencies. When the diode Dl is ON state and D2 is OFF state then this antenna works at 4.1 GHz, 8.4 GHz and 11.3 GHz resonant frequencies . This antenna is useful for the Wimax, X-band , C-band, and fixed satellite communication systems.

Monika Arora, Suman (2015) .They proposed a frequency reconfigurable microstrip patch antenna . The antenna is designed to achieve the reconfigurabilty within wideband(X-band). The proposed antenna is a multipart having eight arms with star shape frequency reconfigurable antenna that is designed to cover the frequency range from 7.5 GHz to 14 GHz. The antenna exhibit the property of varying frequency which results in change in return loss characteristics depending upon the configuration required. The frequency reconfiguration capability of antenna can be achieved with the help of metal strip line that act as a switch to reconfigure the antenna. Small rectangular slots are cut from patch to insert switches so that reconfigurability is obtained. The antenna is pretend using Ansoft HFSS software package. This results gives high gain & wide band performance of 6.3805 GHz in the range of 8.1650 GHz to 14.5455 GHz without the use of switches. The same antenna also gives multiband and wide bandwidth switches.

Zainab Aizaz and Poonam Sinha (2016) .Cognitive radio network (CRN) is the latest technique for enhancing the usefulness and quality of radio communication systems by the well-organized use of frequency spectrum. It is classified by overlay and underlay cognitive radio Antennas that is designed for the overlay scheme and should have the capability to sense the channel and provide communication . Overlay antennas can be designed as two-port, where one port supports the ultra wideband, and other port supports narrowband and are frequency reconfigurable. Moreover, they can be implemented as a one-port antenna, in which single port is used for both sensing as well as communicating, and thus it switches between wideband and narrowband modes. Evolutionary computation techniques like genetic algorithm (GA) is efficient in designing new kinds of antennas with challenging designs. A binary genetic algorithm is used to optimize the shape of antenna to achieve maximum frequency reconfigurability with lesser number of switches to obtain wideband performance from a single cognitive radio antenna

III. TABLE

Year of publication	Frequency range	Design Specification	Applications/Advantages
2011	2-6 GHz	Rectangular microstip slot patch antenna	Wireless LAN
2013	2.6 GHz, 3.5 GHz	Stacked patch microstrip antenna	LTE, Wimax
2013	2.4 GHz -5.8 GHz	Monopole slot antenna	Improve wireless connection and increase system capacity
2014	3.9 GHz,8.9 GHz,11.2 GHz, 4.1 GHz, 8.4 GHz, 11.3 GHz	Multiband Inverted T slot	Wi-max , Fixed satellite communication
2015	C band, X band ,ku band (7,5 GHz- 14 GHz)	Eight armed star shape	Switch from one application to another upon configuration request

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IV. CONCLUSION

In 2011 M.T.Ali and N. Ramli designed a rectangular microstrip slot patch antenna of operating frequency in the range of 2-6 GHz and is suitable for WLAN Applications. Then in 2013 A.L.Yusof and N. Ya'coab designed a stacked patch microstrip antenna of operating frequency 2.6 GHz, 3.5 GHz that is used for LTE and Wimax. Also in 2013 Imran Shoaib , Sultan Shoaib and Xiaodong Chen designed a monopole slot antenna that improves wireless connection and increase system capacity and is proposed for the frequency range 2.4 GHz-5.8 GHz. In 2014 Ratnesh Kumari and Mithilesh Kumar designed a multiband inverted T slot antenna that operate at frequencies 3.9 GHz, 8.9 GHz, 11.2 GHz when diode is in On state and at 4.1 GHz, 8.4 GHz and 11.3 GHz when diode is in OFF state. This antenna is useful for Wimax and fixed satellite communication. In 2015 Monica Arora and Suman proposed an eight armed star shape frequency reconfigurable antenna designed to cover the frequency band from 7.5 GHz to 14 GHz. The antenna exibits the property of switching from one application to another upon configuration request.

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