DESIGN AND DEVOLPMENT OF WEARABLE PATCH AND ANTENNA FOR GPS APPLICATIONS

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***Abstract*: The GPS (Global Positioning System) has revolutionized modern day navigation and position location. It is now the means of tracking and location mapping in most of the aircraft carriers, ships and even in automobiles. With advancement in technology and science, GPS applications are even used by common public for the want of updating location, tracking purposes and even travelling from one place to another. With the growing technology wearable devices have become very popular now-a-days. The wearable device is equipped with antenna is capable to transmit the entire sensor's data to the system for monitoring such as tracking, navigation, mobile computing, medical science and public safety. As a wearable antenna can be a part of the clothing, the design of antenna is very important to ensure comfort to the wearer without affecting the antenna performance. This paper intends to focus on the specification of the truncated square micro strip rectangular patch antenna by using jute as the substrate for the antenna and analysis that to design proper wearable antennas for (GPS) applications.**

I.INTRODUCTION

Antenna is a transducer designed to transmit or receive electromagnetic waves. There are many types of antennas such as: linear wire antenna, aperture antenna, horn antenna and microwave antenna. Among all these antennas, micro strip antennas are more popular now a days over conventional other antenna due to their advantages like small size, lightweight, low cost and easy to fabricate with planar structures. As a result, huge research is going on design of micro strip antenna has made significant progress during the recent years. These micro strip patch antenna scan provide dual and circular polarizations and is very well suited for applications such as wireless communications system, GPS, cellular phones, pagers, radar systems, and satellite communications systems. Researchers present various designs to improve different antenna parameters at different resonate frequencies. Design of Micro strip Patch Antenna for GPS Applications using EBG Structures: This paper proposes a circularly polarized micro strip patch antenna for Global Positioning System GPS) and has studied the performance of square shaped micro strip patch antenna in L1 andL2 bands. Operating range of GPS is 1.227GHz (L2Band) to 1.575GHz (L1Band). Improvement is significant in terms of gain and axial ratio bandwidth when compared to antenna designs without EBG. Design of Rectangular Micro strip Patch Antenna: This article proposes a rectangular micro strip patch antenna in Advanced Design System Momentum (ADS) with resonant requency4.1GHz. This antenna operates at UWB frequencies. Now a days Global positioning system are widely in use today for many scientific applications. GPS is increasingly being used as a standard hardware clock reference GPS is an US military system consisting of an array of 24 satellites equipped with high precision atomic clock arranged such that covers the entire globe and is capable to provide accurate time and positioning information to Earth based systems. The fundamental component of the GPS system is to provide accurate time. Moreover, GPS is a global system, it can be utilized anywhere in the world. Radio timing systems have different frequencies and are localized by national boundaries with the signals varying from location to location. On the other hand, GPS signals are the same across the globe. Due to these advantages GPS system is used in antenna now a days. A single GPS antenna can be shared between multiple GPS servers by using a GPS splitter. Applied successfully in various part of life such as health monitoring, physical training, navigation, RFID, medicine, military etc. Considering the easily available flexible textile as a dielectric material, the cost of the antennas becomes very low. The integration of wireless electronic with textile technology resulting in smart garment in global Positioning System (GPS) application is a solution for several applications, especially for tracking and rescue issues. Hence in this paper the antenna performance is studied towards achieved circular polarization (CP) by truncating two opposite edged of the square patch by using jute as the substrate.

II.DOMAIN DETAILS

Making antennas reconfigurable so that their behaviour can adapt to changing system requirements or environmental conditions can alleviate these restrictions and provide additional levels of functionality for systems. As the next generation wireless communications systems require to support multimode and multi-band applications, the number of antenna elements on these platforms increases. This, in turn, causes problems associated with co-site interference, cost, maintainability, reliability, and increased weight. One approach to alleviate such challenges is to use a multi-function reconfigurable antenna which can replace multiple of single function legacy antennas. This is the main reason for the recent popularity of multi- functional reconfigurable antennas (MRAs). An MRA is a single antenna element which could perform multiple functions by dynamically changing its properties (frequency, radiation pattern and polarization). The reconfigurability may be achieved by using radio frequency (RF) micro electro mechanical system (MEMS) or other developing technologies such as liquid metal systems. For example, an MRA can operate over several frequency bands simultaneously or operate over a wide band instantaneously. It can also form a desired radiation pattern or steer the beam into different directions. The polarization of a specific beam direction could also be reconfigured between linear and circular polarizations. All the above benefits can result in a significant reduction in the overall size of multi-mode multi-band wireless communication systems by replacing multiple single-function legacy antennas. Also, the reconfigurable antenna properties of an MRA can be used as important additional degrees of freedom in an adaptive wireless communication

system. One example is multi-input multi output (MIMO) systems equipped with MRAs. Such a system attains improved channel diversity performance which results in a robust and reliable wireless communication. This is due mainly to the additional degree of freedom provided by an MRA which enables further exploitation of the theoretical gains of MIMO systems. The capacity of a MIMO wireless communication with a sparse multi- path structure could also be maximized by reconfigurable antenna arrays.

III.EXISTING SYSTEM

Radio resource management (RRM) techniques applied to radio-over- fibre architecture have been the focus of recent investigations. Techniques have been extensively used in cellular network and local area network planning, but most of them were proposed for static decision making one central problem for wireless network optimization is the positioning of base stations for optimal use of radio resources. Solutions for this traditional problem are usually based on static methods and can lead to resource waste in dynamic networks such as those involving mobile users. Some of the recent work on RRM in wireless networks will be briefly surveyed here. RRM algorithms in the RF scenario have not yet been thoroughly explored. The RAU positioning problem in hybrid wireless-optical networks is addressed. A greedy algorithm for solving this problem is proposed, which tries to minimize the Euclidean distance between RAUs and users. A solution based on simulated annealing is proposed; the results show significant cost reduction. These solutions, however, provide last-mile access for fixed users and are not appropriate for mobile users since clustering of users is disregarded. Although some attempts have been made to deal with the positioning problem, few have explored the cell- size adjustment, which consists of finding the best radius for each cell in order to improve spectrum or energy efficiency can be improved. The optimization of this parameter is crucial for the best network performance, since small cells can improve throughput, and resource savings, since the number of base stations required is decreased, which saves infrastructure and reduced energy costs. A framework for cell zooming algorithms is proposed for green cellular networks. To compare two different algorithms, one distributed and the other centralized; results show that the second provides better results. Both, are based on a greedy approach and don't provide optimal results. Moreover, the implementation of cell zooming depends on features not widely deployed, such as automatic adjustment of antenna height and tilt. A two-level hierarchical cellular network with dynamic cell adjustment for efficient energy operation was introduced. However, its implementation has the same problem of the cell zooming approach. Actually, cell zooming explores the concept of self-organizing networks for optimization of radio resources, dynamically defined cell sizes; these seminal papers dealing with self-organizing networks for green cellular networks have shown benefit for energy savings and is currently implemented in 3GPP standard. Energy waste is minimized for a multi-operator cooperative network. The final three papers mentioned show that cells, and even network elements, can be turned on and off to improve the efficiency of wireless network.

IV.PROPOSED SYSTEM

The GPS (Global Positioning System) has revolutionized modern day navigation and position location. It is now the means of tracking and location mapping in most of the aircraft carriers, ships and even in automobiles. With advancement in technology and science, GPS applications are even used by common public for the want of updating location, tracking purposes and even travelling from one place to another. Most of the GPS Antennas require circular polarization and this is achieved by micro strip antennas which satisfy criteria like low cost (economically feasible), ease of fabrication, miniaturization along with high precision and reliability. Design of a patch antenna on a high dielectric constant substrate results in a highly inefficient radiator due to surface wave losses and has a very narrow bandwidth and even less gain. All these effects can be eventually minimized by printing EBG structures on high dielectric substrates. GPS operates under the frequency of 1.227GHz (L2 Band) to 1.575 GHz (L1 Band). To produce GPS operating frequency, many complex designs are proposed earlier. These complex designs increase the fabrication cost. In order to reduce the fabrication cost and to improve the antenna parameters we propose a simple square shaped patch antenna operating at 1.227-1.575 GHz to operate at GPS frequencies. Later EBG structure is incorporated into the design. Surface waves reduce antenna efficiency, gain, limit bandwidth, increase end fire radiation, increase cross-polarization levels, and limit the applicable frequency range of microstrip antennas. A simple EBG structure comprises of elements interconnected with each other to form an array of metallic parts embedded in a slab of dielectric. Sometimes metallic pins (or via) are introduced to prevent electromagnetic waves from traveling in the waveguide between the array and ground.

V. DESIGN CONSIDERATION AND RESULTS

In the micro strip antenna, the upper surface of the dielectric substrate supports the printed conducting strip which is suitably contoured while the lower surface of the substrate is backed by a conducting ground plane. Such antenna sometimes called a printed antenna because the fabrication procedure is similar to that of a printed circuit board. Many types of micro strip antennas have been evolved which are variations of the basic structure. Micro strip antennas can be designed as very thin planar printed antennas and they are very useful elements for communication applications. Microstrip patch antenna is a type of microstrip antenna. It is the most common form of antennas. It consists of a conducting patch of any planar or non-planer geometry on one side of a dielectric substrate and a ground plane on other side.

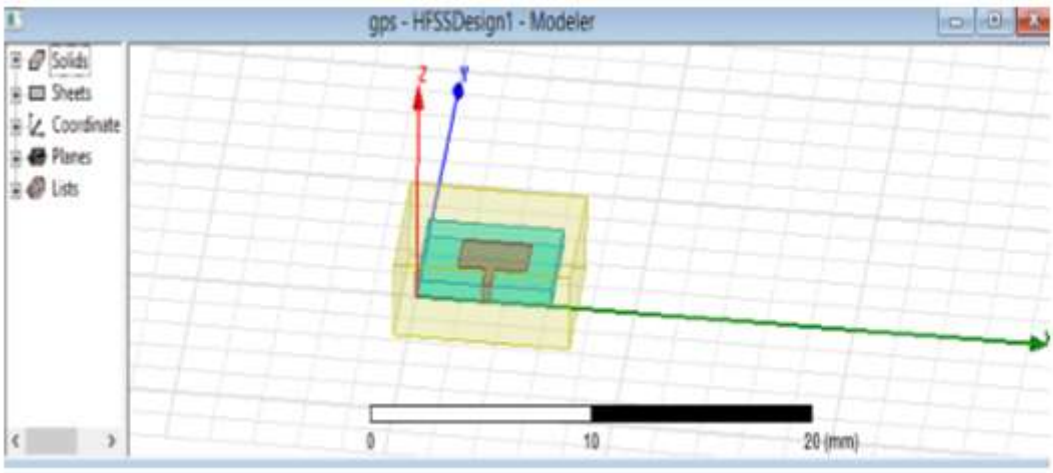

Fig 1.1 Design of Wearable Patch Antenna

The metallic patch is normally made of conducting material such as copper, gold, tin and nickel and the metal must be corrosion resistant. Patch can be of any shape such as rectangular, circular ring etc. Microstrip patch antennas have low profile configuration and are capable of dual and triple frequency. Due to these advantages these antennas are most suitable for aerospace and mobile applications. However narrow bandwidth, lower gain, extraneous radiations from feed and junction are their main disadvantages. To overcome these limitations these antennas can be further loaded with stubs, shorting pins, diodes to obtain compactness dual

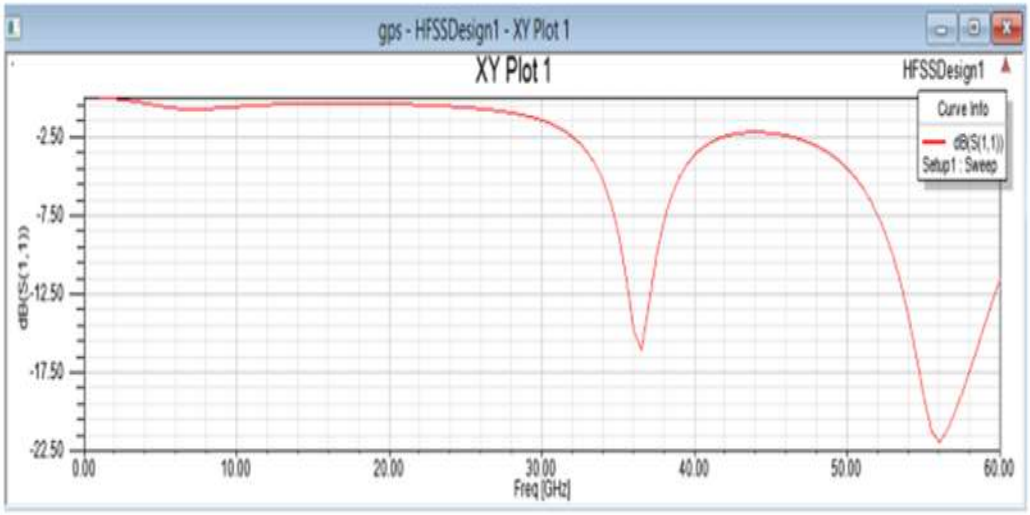

Fig 1.2 S – Parameter Plot

frequency operations, frequency agility and polarization control. Thus, these antennas are finding increasing applications in commercial sector of industry especially in GPS (Global Positioning System), SDARS (Satellite Digital Audio Radio Services) and WLAN (Wireless Local Area Network). C. Rectangular Patch The rectangular patch is by far the most widely used. It is very easy to analyse using both the transmission line model and cavity model which are most accurate for this substrate. Fig. 1: Rectangular Microstrip Patch Antenna 1. Transmission Line Model The transmission line model is the easiest of all models but it yields less accurate result and it lakes the versatility. A rectangular microstrip antenna can be represented as an array of two radiating narrow apertures (slots) each of width w and height h, separated by a distance L. Basically the transmission line model represents the microstrip

Fig 1.3 3D PLOT DIAGRAM

antenna by two slots, separated by a low- impedance Zc transmission line of length L. It is used to determine the input performance of a rectangular patch antenna. This model is only used in rectangular patch antenna. This model is only used in rectangular patch antenna and not in any other patch form. This model represents the microstrip antenna by two slots of by a transmission line of length L. The microstrip is essentially a non-homogeneous line of two dielectrics.

VI.CONCLUSION

A wearable patch antenna developed for different types of GPS application has been presented. This research paper gives emphasis on particular wearable patch antenna for GPS application at 1.575GHz using Jute as the substrate for the antenna. The designed micro strip patch antenna can be used for GPS applications under the frequency band of 1.227- 1.575GHz. VSWR calculated is observed to be 1.04 at resonant frequency of 1.476GHz which clearly shows it as an efficient radiator and maximum power is coupled between the transmission line and the antenna. From the results it is clear that the measured axial ratio is less than 3db for the proposed antenna. Different parameters of Antenna are analysed clearly with and without EBG clearly depicting the advantage of using EBG structures to suppress surface waves and for improving antenna parameters.

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