Analysis Of Wearable Textile Antenna

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Abstract- *A wearable antenna integrated into a military beret for an indoor/outdoorpositioning system is proposed. The truncated patch antenna is designed for the Global Positioning System (GPS) band for use in out- door situations. The antenna is fabricated using textile materials and is integrated into a military beret. The effects of the antenna deformation due to the shape of the military beret and the effects of the human head are analyzed via both simulation and measurement. The simulated and measured 10-dB return-loss bandwidths of the antenna on the head phantom fully cover the 915-MHz industrial, science, and medical band and the 1.575-GHz GPS band. we analysis by using various substrates like jean cotton and silk.*

Keywords- Global Positioning System (GPS), Patch Antenna, Return-Loss,substrates.

I. INTRODUCTION

The body centric wireless communication has drawn the attention of researchers in the present era. The body worn antennas are widely used for these type of communications and have received much attention in commercial sports, entertainmentand healthcare applications. Body worn antenna may be made from textiles or may be worn as a button antenna. The wearable antenna may be operating on single or dual frequencies. For body worn applications the antennas should be of small size, light weight, consumes less power, almost maintenance free, and with no installation cost. The compact size, low cost, easy fabrication makes microstrip patch antenna highly suitable and comfortable on body surface. But the reduction of the size of the antenna leads to reduced performance of the antenna such as poor efficiency, impedance and bandwidth. Hence design of a wearable antenna is quite challenging. Wearable antennas are usually placed in human torso or arm. The human body acts as a lossy medium which degrades the performance of wearable antenna . In order to design a body wearable antenna the design parameters and different dielectric properties of substrates should be clearly studied. Also the effect of body on antenna parameters needs to be understood. These parameters should be optimizedaccording to body-worn applications. To improve the body wearable antenna performance, various techniques have been proposed by the researchers like selecting thick and high dielectric substrates materials, various radiating microstrip patch shapes, slotting in patch toimprove bandwidth, the array of antennas etc. The wearable antenna may use the combination of these techniques to give favourable performance in the vicinity of the human body.

II. LITERATURE SURVEY

Existing systems

[1] In this paper, systematic and comprehensive investigations of the bending effects of wearable rectangular patch antennas are presented. We present the resonant frequency and radiation pattern variations due to bending in two principle planes bysimulating patch antennas in a full-wave model.

[2] The need of smaller flexible electronic systems increases rapidly. Among theflexible electronic devices, printed planar antennas attract a great attention. Actually, thedesign of flexible antennas for wireless local area network (lower and upper WLANs) andbody area network communication technology applications has drawn significant interest from the research community. The proposed work emphasizes, at first, the development of magnetodielectric nanocomposite materials made of nanoparticles (CCo) and a conductivepolymer matrix (PANI/PU). At second, the focus is put on the antenna design andfabrication. Finally, a comparison between the simulation study and the experimental investigation is made to evaluate the antenna performance (reflection coefficient, bandwidth, radiation patterns, and gain).

[3] Wireless body area network (WBAN) communication technology has been attracting much attention in recent years because it can be used in many fields, such as military applications and health monitoring. The significance of investigating wearable antennas is clearly reflected in the widespread use of WBAN systems, such as antenna integrated garments , bags, glasses, and smart watches. As is known, two important aspectsshould be considered in the wearable antenna design: comfort level and specific absorptionrate (SAR). Wearable antennas are usually made of a soft material.

[4] Three-Dimensional (3-D) printing has recently gained a lot of interest in severalfields including the wireless electronics industry. This new printing technique allows the

manufacturing of complex 3-D models using layer-by-layer deposition of versatile materials. This type of fabrication enables customized substrate structures (thickness, filling, shape), electrical properties (permittivity), and mechanical properties (weight, flexibility). The widely used materials for 3- D printing are acrylonitrile-butadiene styrene (ABS) and polylactic acid (PLA).

[5] Portable electronic devices have become part and parcel of everyday human life. Modern mobile phones are quite often carried throughout the day and they allow not just telephone calls alone but also provide internet access, multimedia, personal digital assistant and GPS functionality. This form of 'always on' and constantly connected status is a step towards the pervasive computing paradigm. In future, a person is likely to carry a range of devices and sensors, including medical sensors which constantly communicate with each other and the outside world.

[6] The evolution of antenna technology for man machine interface has taken quantum leaps in utilizing textile materials as antenna substrates. In that sense, textile materials form interesting substrates hence fabric antennas can be easily integrated into clothes.

[7] The advances of current wireless communication systems are targeting at the 5thgeneration (5G) systems, where wireless devices are able to communicate with each other like the Internet of things (IoT).

[8] Modern wireless communication devices are often required to integrate multiple standards and services,operating at different frequency bands, into a singleportable handset. Thus, it is highly desirable to design multiband antennas to meet the needs of multiple communication standards. A compact quad-band antenna with a circle slot and an inverted L-slot on the radiating patch as well as a comb-shaped groundstructure is proposed not only to obtain good quad-band operational performance but alsoto achieve a smaller size and simpler structure with respect to the previous designs.

[9] It is a collection of small and lightweight sensors placed inside or outside thebody to monitor the function and the environment of the human body . The network of such intelligent systems allows the doctors and medical staff to continuously monitor the health of patients and acquire the feedback. Very minute sized microelectronics, sensors installed on the body or clothes or even implanted inside the human body, convert the main parameters (Blood pressure, Sugar level, Oxygen level etc.) into electrical signals and are transmitted to the base station.

[10] As the wearable electronics industry is growing dramatically every year,novelmind-blowing wearable products have been seen in the mark the last decade.Mean while, academic research effort in wearable electronics has been growing tremendously every year. The ''smart'' features of most wearable electronics highly rely on wireless communication systems ,in which wearable antenna design is one of the major challenges and requires a special attention. Wearable antennas suffer performance decrements from detrimental human body proximity effects, namely detuning, attenuation and shadowing effects, due to the high-permittivity and high-loss dielectric properties of the human body. The most comprehensive problem is the shadowing effect: the body is commonly in the line of sight (LOS) between transmitters and receivers, thus preventing a high-quality LOS communication.

III. PROPOSED SYSTEM

A patch antenna is a type of radio antenna with a low profile, which can be mounted on a flat surface. It consists of a flat rectangular sheet or "patch" of metal, mounted over a larger sheet of metal called a ground plane. They are the original type of microstrip antenna; the two metal sheets together form a resonant piece of microstrip antenna with a length of approximately one half wavelength of the radio waves. Theradiation mechanism arises from discontinuities at each truncated edge of the microstrip transmission line. The radiation at the edges causes the antenna to act slightly larger electrically than its physical dimensions, so in order for the antenna to be resonant, a lengthof microstrip transmission line slightly shorter than one-half the wavelength at the frequency is used. The patch antenna is mainly practical at microwave frequencies,at which wavelengths are short enough that the patches are conveniently small. It is widely used in portable wireless devices because of the ease of fabricating it on printed circuit boards. Multiple patch antennas on the same substrate (see image) called microstrip antennas, can be used to make high gain array antennas, and phased arrays in which the beam can be electronically steered. Substrate is a base or container on which microstrip patch (metallic sheet) antenna is fabricated and it plays important role in microstrip antenna functioning. The substrate in microstrip antennas is principally needed for the mechanical support of the antenna. To provide this support, the substrate should consist of a dielectric material, which may affect the electrical performance of the antenna, circuits and transmission line.

Fig.1proposed model

Hardware Requirements

This consists of copper, jean, silk and connector.

Software Requirements

CST(Computer Simulation Technology).

Ground

Ground plane size on square microstrip patch antenna designed on A low-permittivity substrate with an air gap decreasing the antenna height changed the smallest ground plane size for impedance matching, and also reduced back radiation, which improved the front-to-back level of the microstrip patch antenna.Advantages such as low profile, light weight, easy fabrication and easy integration with circuits.

Substrate

Hence, a substrate can enhance antenna's radiation capability. Microstrip line and ground: Copper. Substrate material depends on, which band you want to operate, FR4(high loss, low gain antenna, cheap, easy availability). hence substrate in microstrip antennas is needed for the mechanical support of the antenna.Lower the permittivity of dielectric material, larger the size of the antenna but it achieves better efficiency and larger bandwidth.

Radiating Element

Microstrip patch antennae radiate primarily because of the fringing fields between the patch edge and the ground plane. For good antenna performance, a thick dielectric substrate having a low dielectric constant is desirable since it provides higher efficiency, larger bandwidth and better radiation. The feed line is there between two substrates

Connector

The simplest and most widely employed strategy is the use of conductive epoxy (Fig. 2a). In this strategy a thin layer of conductive epoxy is applied at the contact area between the inner pin and the transmission line.

CST(Computer Simulation Technology)

A computer simulation or a computer model is a computer program that attempts to simulate an abstract model of a particular system Computer simulations build on, and are a usef-ul adjunct to purely mathematical models in science, technology and entertainment. CST Studio Suite is a high-performance 3D EM analysis software package for designing, analyzing and optimizing electromagnetic (EM) components and systems. CST MWS enables the fast and accurate analysis of high frequency (HF) devices such as antennae, filters, couplers, planar and multi-layer structures and SI and EMC effects.CST Studio Suite includes FEM solvers dedicated to static and low frequency applications such as electromechanical devices, transformers or sensors.

IV. RESULTS

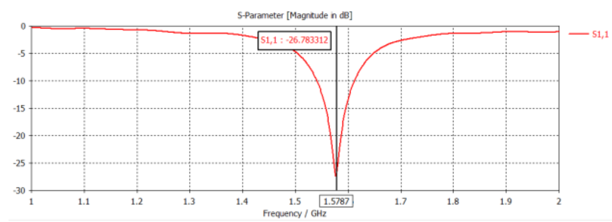

Fig.2 Return Loss Of Silk After Meta Material

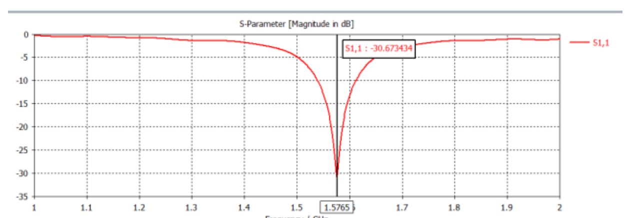

Fig.3 Return Loss Of Jean After Meta Material

V. CONCLUSION

The conclusion of this project is we use jean and silk substrate to the antenna of metamaterial. In the components are ground, substrate, radiating element in the use of meta material wearable antenna. In the final result will be jean is more effective than silk.

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