DESIGN AND ANALYSIS OF MICROWAVE WEARABLE ANTENNA FOR BRAIN TUMOR RECOGNITION

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ABSTRACT
A Wearable microwave head imaging is proposed for medical application, namely stroke and cancer detection. The wearable device in a hat-like structure incorporates an array of flexible ultra-wideband antenna. The characterization and assessment of a custom-made composite substrate using a flexible polymer poly-di-methyl-siloxane(PDMS) and magnetite iron oxide (FeO.Fe2O3) for wearable head imaging systems is presented. Micro-scale FeO.Fe2O3 particles are homogenously combined with PDMS in different ratios to build the flexible engineered magneto-dielectric (MD) composite substrate. Besides the low cost, fabrication simplicity, and durability, the magnetite FeO.Fe2O3 particles can be used to control the relative permittivity and permeability over a wide range of values to suit the proposed application. The permittivity, permeability and losses of the developed substrate are extracted using a custom-made 2-port multilayer microstrip transmission line test fixture with the help of conformal mapping algorithms. Our proposed design has been designed and analyzed using HFSS tool.
Keywords: Microstrip batch antenna, HFSS,

I. INTRODUCTION
In general, a microwave imaging system is made up of hardware and software components. The hardware collects data from the sample under test. A transmitting antenna sends EM waves towards the sample under test. If the sample is made of only homogeneous material and is of infinite size, theoretically no EM wave will be reflected. Introduction of any anomaly which has different properties in comparison with the surrounding homogeneous medium may reflect a portion of the EM wave. The bigger the difference between the properties of the anomaly and the surrounding medium is, the stronger the reflected wave will be. This reflection is collected by the same antenna in a mono static system, or a different. Part propagates beyond the surface. The larger the difference in the wave impedance, the larger is the reflected part. In order to find material defects, a test probe, attached or in a small distance, is moved over the surface of the device under test. This can be done manually or automatically. The test probe transmits and receives microwaves.

Besides the reflection method also the through transmission method is possible, in which separate transmit and receive antennas are used. The backside of the device under test (DUT) must be accessible and the method gives no information about the depth of a defect within
the DUT. A test probe attached to the DUT's surface gives information about the material distribution below the point of contact. When moving over the DUT surface point by point many such information is stored and then evaluated to give an overall image. This takes time. Directly imaging procedures are faster: Microwave versions are either electronics make use of planar microwave detector consisting of a microwave absorbing foil and an infrared camera. Microwave testing is a useful NDT method for dielectric materials. Among them are plastics, glass-fiber reinforced plastics (GFRP), plastic foams, wood, wood-plastic composites (WPC), and most types of ceramics. Defects interior in the DUT and at its surface can be detected, e. g. in semi-finished products or pipes.

II. EXISTING SYSTEM

Magneto dielectric material (MDM) are widely used in miniaturization of devices, as the magnetic properties of these materials can be tailored to a great extent by varying the concentration of magnetic inclusions. Incorporating some mathematical manipulations the above concept can be used to design microstrip antennas with dielectric cover. In touch superstrate (ITS) method is a simple method for accurately calculating important microwave parameters such as permittivity [5]. The main advantage of the ITS technique, as compared to other existing techniques [6-8], is that, it requires a simple resonant circuit viz. microstrip patch antenna (MPA) and a receiving antenna viz. horn antenna. In addition, it is a non-destructive technique like co-planar sensors [8] but coplanar sensors are rather more complex to design than a MPA. The ITS technique, basically measures the effect of perturbation in resonant frequency and transmittance power [9-12]. Perturbation is brought about by use of superstrate over the MPA. Change of permittivity of the superstrate changes the strength of perturbation which translates into change in resonant frequency and peak amplitude of the resonator. The properties of the NZF-LLDPE magneto dielectric composite substrate are discussed. The percolation limit of LLDPE for NZF was found to be 7 wt.%. Complex permittivity, permeability and losses both magnetic and dielectric in C-band are determined using the transmission/reflection method, with E8362C vector network analyzer (VNA).

III. PROPOSED SYSTEM

Microstrip patch antenna used to send on board parameters of article to the ground while under operating conditions. The aim of the these is to prepare a novel material for satisfying the conditions to obtain a desire epsilon r and tan delta for designing E shaped microstrip patch antenna. To design Microstrip patch antenna and study the effect of antenna dimensions Length (L), Width (W) and substrate parameters relative Dielectric constant (εr), substrate thickness (t) and Antenna parameters Return Loss, Voltage Standing Wave Ratio (VSWR), Directivity, Gain and Efficiency, on the Radiation parameters of Bandwidth and Beam-width. Selection of proper substrate material is prime important task in microstrip patch antenna design. Because the limitations of micro strip antenna such as low gain, low efficiency and high return loss can overcome by selecting proper substrate materials, because permittivity of substrate is critical parameter in controlling band width, efficiency, and radiation pattern of patch antenna. The substrate materials have two basic properties such as dielectric constant and loss tangent. Present project comprehensive study of various dielectric materials and its effect on radiation characteristics of rectangular patch antenna such as resonance frequency, bandwidth, gain, return loss, input impedance, radiation pattern, and current distributions are investigated. The dielectric materials selected here having zero loss tangent. The frequency bandwidth of a micro strip patch antenna
depends primarily on both the thickness and dielectric permittivity of substrate.

A thick substrate with low dielectric permittivity can increase the band width of printed patch. If the thickness of substrate increases create 1) difficulty in integration of antenna with other microwave circuits, 2) surface wave propagation and the large inductive image part of input impedance of antenna which makes its resonance unfeasible. Hence a reasonable band width of 1.56mm used in present project common for simulation all substrates. In our project main objective is reduced the return loss and increase the operating frequencies up to GHZ range. The nano powder is suitable for the application in multilayer chip inductor due to its low temperature sinter ability, good magnetic properties and low loss at high frequency. The antenna performance to best the others as the return loss achieves a greater negative value, voltage standing wave ratio achieves a value closer to the ideal value of 1 and the bandwidth achieved being maximum. The return loss achieved for MSPA is of the minimum value of -26.66 dB and SWR value as 1.097 closest to the ideal value of 1. Very low return loss indicates that maximum amount of input power is converted into electromagnetic waves and very less amount of it is reflected back.

The microstrip patch antenna designed to enhance the electrical and magnetic properties and enhance the antenna parameters. The impedance bandwidth of reduced size patch antennas loaded with dispersive magneto dielectric substrates and high-permittivity substrates are compared. It is shown that unlike substrates with dispersion-free permeability, practically realizable artificial substrates with dispersive magnetic permeability are not advantageous in antenna miniaturization. The sinter ability of combustion synthesized powder (≈900oC) is much better than that of conventional solid oxide route powder. The composition of nano materials highest permeability, magnetization and lower loss factor among all the compositions studied here. The composition is highly suitable for application up to 4MHz frequency. Considering all the advantages, especially sinter ability below 960oC, the composition may be suggested as a better material for MLCI applications. Its most basic form, a micro strip patch antenna consists of a radiating patch on one side of a dielectric substrate which has a ground plane on the other side. A rectangular patch is used as the main radiator. There are several advantages of this type of patch antenna, such as being planar, small in size, simple in structure, low in cost, and easy to be fabricated. Thus, it is attractive for practical applications like Bluetooth, Wi-Fi, Microwave oven, GPS.

IV. RESULT AND DISCUSSION

Fig 1 Flexible Patch Antenna
Above fig: Shows layout of our proposed antenna with virtual radiation and air box parameters. HFSS design styles verified for environmental conditions with corresponding port placement. Below fig: Shows return loss generation report with corresponding operating cutoff frequency of 6GHz to 9.2GHZ. Fig 3 Shows input impedance graph, measure its input impedance so that feed line may be accurately designed to cancel the reactive part and to match with the resistive part.
V. CONCLUSION

The observation of antenna parameters table and radiation pattern diagrams we can conclude that the increment of substrate dielectric constant in antenna design, results degradation of performance characteristics. Antenna parameter table the gain, directivity radiation efficiency. A single slot rectangular micro strip antenna consists of a substrate patch with slot embedded on patch and placed above the ground plane, developed for various wireless applications. Compared with a conventional patch antenna, it has a better omni directional radiation pattern and provides an increase in bandwidth upto 9.41 % (320 MHz) with a compactness of 21 %. Hence, the proposed antenna is quite easy in design, fabrication and implementation and uses low-cost dielectric material as cost effective method. The reduction of surface waves due to lowering of effective dielectric constant can reduce the end fire radiation, decreasing interference with devices in proximity to the antenna and may lead to more compact structure. The real time antenna testing was done in GHz ranges due to shortage of instruments (Or) else the antenna can be worked in THz range also.

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