BODY-WEARABLE FLEXIBLE RF ANTENNA FOR 3 GHZ JAMMING APPLICATIONS

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Abstract

This paper presents the study and design implementation and procedure of fabrication of Body wearable Flexible antenna For a wide band Frequency of 3GHz. The design and simulation of Body wearable Flexible antenna For a wide band Frequency of 4Ghz is done in HFSS software and finally fabrication procedure is done using Polythene (substrate) and copper sheet.

Index Terms: Array antenna, Industrial Scientific Medical (ISM), Microstrip, Wearable antenna,

I. INTRODUCTION

In now day's communication systems, there are a few sorts of microstrip Antennas (otherwise called printed reception apparatuses) the most well-known of which is the microstrip fix recieving wire or fix recieving wire. A fix reception apparatus is a narrowbanded wide-transmitted recieving wire which is manufactured by carving the radio wire component design in metal follow reinforced by a protecting dielectric substrate with a persistent metal layer clung to the inverse side of the substrate which makes the ground plane of the recieving wire. Basic microstrip radio wire shapes were rectangular, square, roundabout and curved, yet all nonstop shape is conceivable.

Some fix recieving wires shun a dielectric substrate and suspend a metal fix in air over a ground plane utilizing dielectric spacers; the subsequent structure is less vigorous yet gives better data transfer capacity. Since such reception apparatuses have a position of safety, are mechanically rough and can be similar, they are frequently mounted on the outside of flying machine and rocket, or are fused into versatile radio specialized gadgets

Microstrip antennas were cheap to make and plan as a result of they are having basic physical structure. They were typically utilized at Ultra High Frequency because, their size and shapes were specifically tied with the wavelength of the reverberation recurrence. A solitary fix recieving wire will gives a most extreme pick up of 6-9 dBi

Microstrips have received lots of attention since the last decade their size and shapes were straightforwardly tied with the wavelength of the reverberation recurrence. A solitary fix reception apparatus will gives a most extreme pick up of 6-9 dBi. Microstrips are likewise ready to work in an extensive variety of frequencies Reception apparatuses assume a critical part in today's remote correspondence. The raise of using microstrip for antennas has been due to the several advantages of microstrips. In this project, microstrip antennas are studied, analyzed and designed with the assistance of Ansoft's HFSS software.antenna array is performed and in section V, fabrication and tested results. This section also encloses the results of bending and crumpling analysis.

II. Determining the dielectric constant of a material

The most broad depiction for electromagnetic motivations behind a given homogeneous material is given by complex permittivity (Dielectric constant) together with complex magnetic permittivity

x E = - B/ t, x H = D/ t +σE
Since B = μ *H, D = ε E

Where, σ = conductivity of materials
xE=-jωμ*H, xH=jωεE+σE

where μ *= complex permeability
ε = (Real) Dielectric Constant

The equation (3) can be written

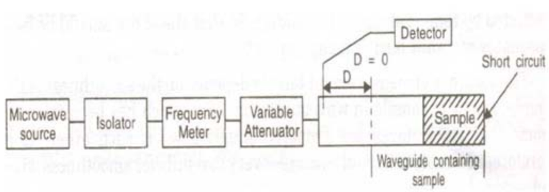
XH=jω (ε-jσ/ω)E

where E" = ε-jσ/ω is complex dielectric constant.

ε = ε o (ε ' - j ε ")

where ε " =σ /ωε and ε '= ε/ ε0"
ε r = ε/ εo= ε'-jε"

III.BLOCK DIAGRAM



IV. PROCEDURE

1.With no specimen in shortcircuited line discover position of voltage minima DR w.r.t. a discretionarily picked reference. With the assistance of opened area and test.

2.Measure the guide wave length λg by measuring the separation between two neighbouring minima in opened line

3.Remove short out, embed a specimen and supplant the short out in such a way that it touches the finish of test.

4.Measure D, the position of minima in opened line as for same reference as in 2.

V. DESIGN CONSIDERATIONS

Microstrip reception apparatuses, as talked about in part 2, comprise of thin (t<< where is free space wavelength) metallic strip placed small fraction of a wavelength (h<< , usually 0.003 above a ground plane. The microstrip settle is sketched out so its case most prominent is run of the mill to the settle (broadside radiator). This is refined by appropriately picking the mode (the field arrangement) of excitation underneath the fix. End-fire radiation can in like manner be refined by astute mode decision. For a rectangular fix, the length L of the component is normally/3<L</2. The strip (fix) and the ground plane are segregated by a dielectric sheet (insinuated as substrate)

For low frequencies, the compelling dielectric consistent is basically steady. At middle of the road frequencies its esteem starts to monotonically increment and in the end approach the estimations of the dielectric steady of the substrate. The basic qualities (at low frequencies) of the effective dielectric predictable are suggested as the static qualities, and they are given by

$$\varepsilon_{reff} = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2}\left(1 + 12\frac{h}{W_f}\right)^{-\frac{1}{2}} \qquad W/h>1 \qquad (4.1)$$

In light of the bordering impacts, electrically the fix of the microstrip radio wires looks more prominent than its physical measurements. For the essential E-plane, where the measurements of the fix along its length have been connected on each end by end isolate ΔL, which is a component of the convincing dielectric predictable and the width-to-stature extent (W/h). A correct association for the institutionalized development of the length is

$$\frac{\Delta L}{h} = 0.412\frac{(\varepsilon_{reff} + 0.300)\left(\frac{W}{h} + 0.264\right)}{(\varepsilon_{reff} - 0.258)\left(\frac{W}{h} + 0.800\right)} \qquad (4.2)$$

Considering ΔL on each side along the length, the total effective design length should be

$$L_{eff} = L + \Delta L$$

The resonant frequency of the microstrip antenna is a function of its length given by

$$f_r = \frac{1}{2L\sqrt{\varepsilon_{reff}\mu_0\varepsilon_0}} \qquad (4.4)$$

To include edge effects, we write it as

$$f_{rc} = \frac{1}{2(L + 2\Delta L)\sqrt{\varepsilon_{reff}\mu_0\varepsilon_0}} = q\frac{1}{2L\sqrt{\varepsilon_r\mu_0\varepsilon_0}} \qquad (4.5a)$$

where

$$q = \frac{f_{rc}}{f_r} \qquad (4.5b)$$

1. For and efficient radiator, a practical width that leads to good ra efficiencies is

$$W = \frac{1}{2f_r\sqrt{\mu_0\varepsilon_0}}\sqrt{\frac{2}{\varepsilon_r+1}} = \frac{\lambda_0}{2}\sqrt{\frac{2}{\varepsilon_r+1}} \qquad (4.6)$$

, or $$L_{eff} = \frac{1}{2f_r\sqrt{\varepsilon_{reff}}\sqrt{\mu_o\varepsilon_o}} - 2\Delta L \qquad (4.7)$$

Each radiation opening is addressed by a parallel corresponding consent Y (with conductance G and susceptance B).

$$Y_1 = G_1 + jB_1 \qquad (4.8a)$$

where for a slot of finite width W

$$G_1 = \frac{W}{120\lambda_o}\left[1 - \frac{1}{24}(k_o h)^2\right] \qquad \frac{h}{\lambda_o} < \frac{1}{10} \qquad (4.8b)$$

$$B_1 \frac{W}{120\lambda_o}\left[1 - 0.636\ln(k_o h)\right] \qquad \frac{h}{\lambda_o} < \frac{1}{10} \qquad (4.8c)$$

Since slot 2 is identical to slot 1, its equivalent admittance is

$$Y_2 = Y_1 \qquad G_2 = G_1, \qquad B_2 = B_1 \qquad (4.9)$$

Where, f0 is the resonant frequency at which the antenna radiates. C is the velocity in free space (3x108 m/s) and εr is relative permittivity of the substrate. Fig. 1 shows the geometry Microstrip Patch Antenna Polythene substrate. According to the design method described in this section, the overall impedance is equally divided and operated at the resonant frequency of 4GHz.

The antenna was designed using inset feed which is one of the most popular microstrip feeding techniques. It is also known as microstrip feeding and it operated on the resonant frequency of 4GHz. The port is fixed in order to get the output response of S11 i.e., input reflection coefficient. For simulation, waveguide port is used and for testing coaxial

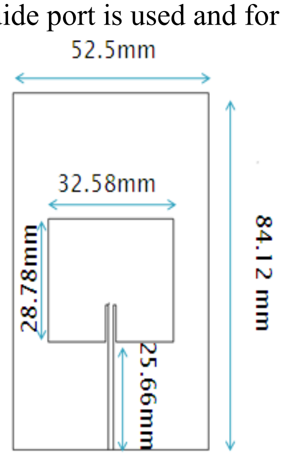


Fig 1.Microstrip Patch Antenna Of 3GHz

The length and width of the patch is calculated by the formulae W and L with the dielectric substrate constant (εr) 1.45. To operate antenna at a particular frequency, the important design issue is the impedance match which means on its operating frequency it should match which with the feeding lines. (i.e., like coaxial line impedance of 50Ω). So that it is a perfect matching between the feeding line and the input signal. It will not radiate back or reflect back the signals to a source.

Fig.2 shows the simulated scattering parameters of the proposed design results. For the microstrip antenna, Fig.2.(a) shows the measured return loss S11 is -17dB which means (RL=10 log│S11|) less than 0.02dB i.e., 2% of the signal is reflected back to the source, is measured at the resonant frequency of 4GHz

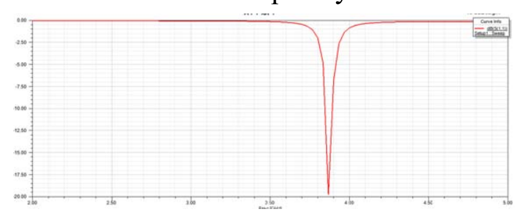


Fig. 2. shows the impedance curve (z-smith chart) at the operating frequency of 3.82GHz is matched

Gain

Gain of an antenna gives the measure of the efficiency of the antenna and its directional competences. Gain is defined as the ratio of radiation intensity in a particular direction to the radiation intensity obtained. The measured gain value of the array antenna at 4GHz is 7.9db which are shown in Fig.3

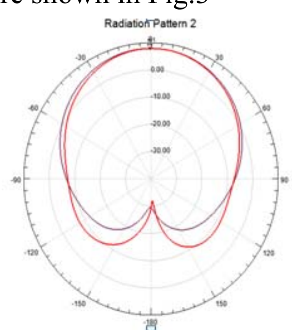


Fig.3 2D Plot of Gain

V . FABRICATION AND TESTING

The fabricated and tested results of a micro strip antenna are shown in Fig.6 shows the fabricated design of the microstrip antenna with the polythene substrate and copper foil tape with the thickness of 0.6mm. and Shows the tested result of antenna in the measuring device of network analyzer with Subminiature

Version A (SMA) connector, which has the impedance of 50Ω.
feed impedance of 50Ω. So that maximum amount of the energy is radiated from the antenna at the desired frequency.

Fig 6 . Fabricated Antenna

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