Wearable Antenna with E Type Slot for Health Tracking

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Abstract: ***The exploration work is done in the field of wellbeing observing framework. The plan, reenactment, improvement, and estimation done on the E-shape microstrip slot antenna for the ISM band of frequencies is introduced in this paper. This E-shape slot antenna is taken care of by a microstrip line feed. Its resonance frequency is learned at 2.6 GHz. This frequency lies in ISM band of remote applications. The design and simulation are done in High Frequency Structure Simulator (HFSS) software with RT Duroid substrate. As indicated by its genuine application, the material, shape, and the type, the microstrip antenna is planned. The size of the antenna is determined by the length, width articulations. Then, at that point, the antenna is mimicked for the radiation boundaries got through upgrading and matching to meet the necessities. The parameters of antenna, for example, Reflection coefficient, Gain, VSWR and Return misfortune are estimated.***

Keywords - E-shaped Slot, RT Duroid, microstrip patch antenna, simulation, Radiation Pattern.

Introduction

Medical care is a sacred basic liberty, and it is one of the most fundamental pieces of our everyday schedule and ought not be viewed as advantaged for the meager few. It is likewise influencing time, traffic, money, and work when one necessity to run medical clinic. The older populace is generally impacted in these circumstances. This persuades the need to distinguish one effective and minimal expense specialized arrangement which is wellbeing checking system. This is conceivable by utilizing a wearable antenna [1-2]. These technologies considered as the critical system for agreeable, great quality and minimal expense medical services. An antenna that is coordinated into clothing of the wearer is known as a wearable antenna. The difficulties behind planning an antenna for medical care observing framework are to be planar, light weight, non-harmful, adaptable, and minimal expense. There is an expanding development in the ability towards the patch antenna because of theirs high conservativeness, low profile and modest framework when contrasted with their relating greater antennas [3]. RT-Duroid [4] is utilized for planning the antenna with HFSS simulation to work in 2.6 GHz resonant frequency and their performance are analyzed and analyzed for wellbeing checking framework.

Literature survey

Microstrip patch antenna has many advantages. It is low cost, lighter inweight, low profile than the conventional antenna. Planar structure provides ease of fabrication [5]. The performance ofmicrostrip antenna depends on its structure. The dimensions of the patch, on the substrate material as well as thickness and feed line are accountable for the resonant frequency of the microstrip patch antenna [6]. For designing Wearable antenna for remote healthcare monitoring, the fabrication of wearable antenna could be integrated with sensors for remotemonitoring of patients [7]. These antennas can be interconnected by networks and active devices with printed microstrip line fed. A patch antenna comprises of a radiation part as coloredon dielectrics substrate top side and bottom side as ground. The radiating patchand the microstrip feed lines are designed on the dielectric substrates. By surveying itis planned to design and implement E- shape microstrip Patch Antenna resonatingat ISM Band of 2.6 GHz frequency.

Design and Analysis

It is necessary to choose a suitable substrate to meet the demands of antennato be efficient. RT Duroid is taken as substrate as it gives better results [4]. The different parameters of microstrip patch antenna are

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calculated from the basicequations given below.

Step 1: Calculation of the Width (W)

$$W = \frac{c}{2f_o\sqrt{\frac{(\varepsilon_r+1)}{2}}}$$

where, C is presenting speed of the light infree space and f0is the operating frequency.

Step 2: To calculate effective dielectric constant

$$\varepsilon_{eff} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\left[1+12\frac{h}{W}\right]^{-\frac{1}{2}}$$

Step 3: Calculation of the effective length

The length of the radiating patch determines the operating frequency, so it isan important factor to design the antenna. Length of the patch is calculated as:

$$L_{eff} = \frac{c}{2f_o\sqrt{\varepsilon_{eff}}}$$

Step 4: Calculation of the length extension

$$\Delta L = 0.412h\frac{(\varepsilon_{eff}+0.3)\left(\frac{W}{h}+0.264\right)}{(\varepsilon_{eff}-0.258)\left(\frac{W}{h}+0.8\right)}$$

Step 5: Calculation of the actual length of patch

$$L = L_{eff} - 2\Delta L$$

Step 6: Substrate Dimension

$$l_g = l + 6h \text{ and } w_g = w + 6h$$

The antenna is fed by Microstrip feed with50-ohm characteristic impedance. The Antenna is simulated at 2.6 GHZfrequency and the results were observed.In this paper, a rectangular microstrip patch antenna having resonant frequenceyat 2.6GHz are designed on flexible substrate using HFSS software. In our work, a simple patch antenna with E- shaped slot is designed by taking different types of flexible substrates and various antenna parameters are analyzed and their properties are represented in the table.

Table 1. Parameters of antenna

S.NO	Parameters	Dimension
1	Operating Frequency	2.6 GHZ
2	Length of the Substrate	65.6 mm
3	Width of the Substrate	74.1 mm
4	Length of the patch	37.7 mm
5	Width of the patch	48.2 mm
6	Length of the feed line	19.6 mm

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7	Width of slot	2.08 mm

Fig 1: Proposed Antenna Design

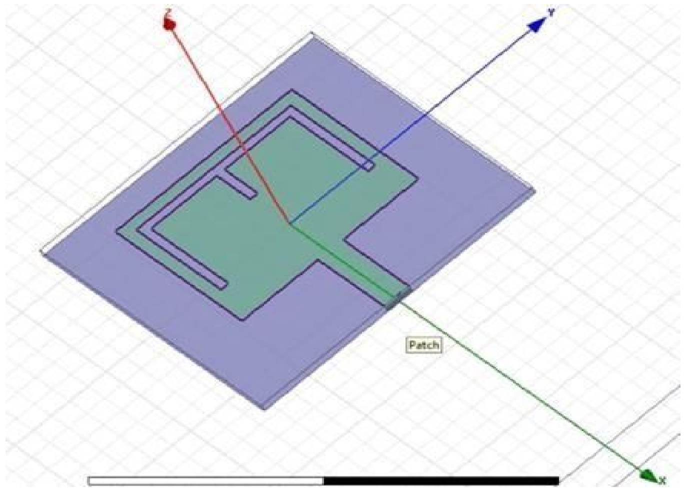

Fig 1: Proposed Antenna Design

The proposed rectangular microstrip patch antenna with E-shaped slot has been designed, simulated and optimized byHFSS software and the results areanalyzed. RT-Duroid is selected as substrate. Gain and bandwidth haveanalyzed and discussed for antenna with RT Duroid substrate. The proposedflexible antennas are chosen to operate at 2.6 GHz operating frequency. Here the intention is to analyze the simulation- based results.

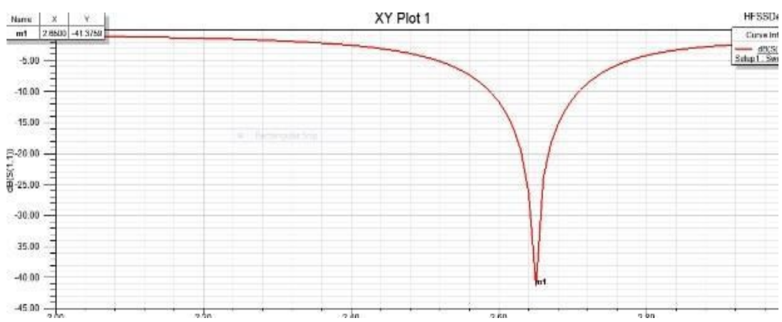

Fig 2: Frequency vs Magnitude

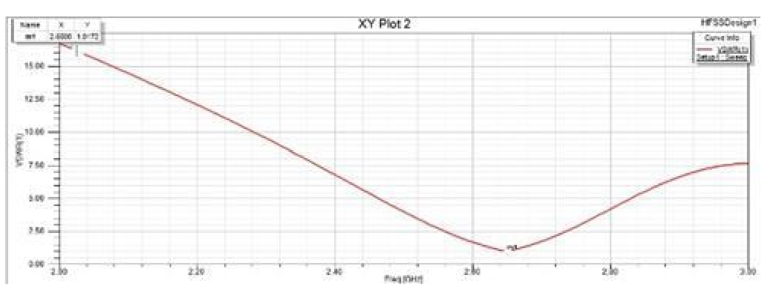

Fig 3 VSWR

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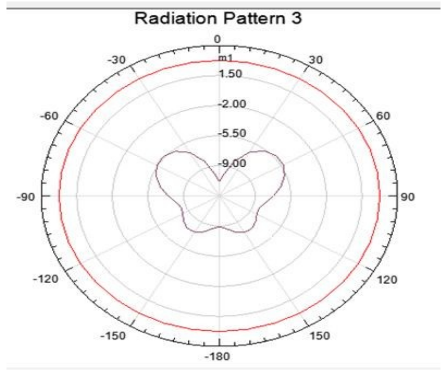

Fig 4: Radiation Pattern of RT Duroid

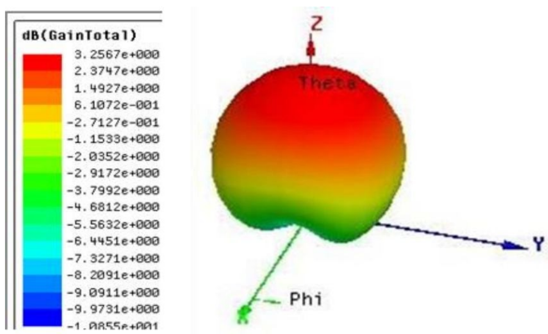

Fig 5 3D Polar Plot of Antenna

Gain is the key performance factor thatholds the directivity and efficiency of atransmitting antenna [6]. If we want to transmit the signal from one point to another, the directivity plays an important role in deciding the amount of power directed in a direction towards the receiving antenna [7]. The result of the designed antenna is shown in table below.

VSWR	1.0172
Gain	3.25 dB

Table 2: Results of the Designed Antenna

Conclusion

The proposed E-shape Slot Antenna for Health Care Monitoring is designed using high frequency structure simulator (HFSS).RT Duroid material is used as substrate for microstrip patch antenna. The E-shape microstrip antenna resonates at 2.6 GHZ. The radiation pattern of the simulated antenna was perpendicular to theaxis of the wearer, which implies that this antenna is feasible for wearable applications. Wearable antenna is best for wireless body area communications, and it has vast applications in health care monitoring and other biomedical applications.

Future Work

The future work can be done by improvingthe bandwidth and efficiency of antenna. The gain of the antenna can also be increased. Under wet conditions, performance of antenna deteriorates. So,we can design antenna using waterproofmaterial.

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