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Design Development of Microstrip Textile Antenna for UWB/5G Communication

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Abstract: *This paper present a review of the design of microstrip patch antenna for 5.2GHZ reasonal frequency. A wearable antenna is meant to be a part of the clothing used for communication purpose. Which includes tracking and navigation mobile computing and public safety. The performance deterioration of a wearable antenna as analyzed under bent conditions too to check capability with wearable application. There has been growing interest in the antenna community to merge between wearable systems technology, Ultra-wideband (USB) technology and textile technology.*

Keywords: Microstrip Antenna, 5G, Textile antenna, feeding technique, bandwidth and C band

I. INTRODUCTION

Textile antenna consistent of Textile materials which have a very dielectric constant, so that is reduces the surface wave losses and improves the impedance bandwidth of textile antenna.

In present developments of the microstrip antenna technology patch gained a significant progress due to its impact size and light weight moreover ease of fabrication to design flexibility therefore by embedding antennas is gaments a patient friendly standalone suit can be obtained moreover the use of embedded textile components guarantees washing of the suit and accordingly reuse of it. The microstrip patch antenna can provide dual and circular polarizations. Dual frequency operation broad bandwidth and feedline flexibility.

Full success however Will be achieved only when antennas and all related components are entirely converted into hundred percent textile materials. Therefore, by embedding antennas in garments a patient - friendly standalone suit can be obtained moreover the use of embedded textile components guarantees washing of the suit and accordingly reuse of it.

Increasing gain and impedance bandwidth and decreasing dimensions of microstrip antennas are primary goals of researchers when high dielectric substrates are used. The size of textile antennas become larger.

1.1 Electromagnetic Coupling to Microstrip Antenna

Considering enhance the current path in the ground and exhibits a band gap attributing to the negative permeability in the vicinity of magnetic resonance taking the advantage of these two features a Microstrip antenna array is then designed, fabricated, and measured by embedding a 5*1 array of the well-Engineered MTM elements between two closely spaced H- plane coupled rectangular patches. A feedline is used to excite to radiator by direct or indirect contact.

In this contacting method the RF power is fed directly to the reading patch using a connecting element while in the non-connecting scheme electromagnetic field coupling is done to transfer power between the Microstrip line and the radiating patch. Both numerical and experimental results indicates a mutual coupling reduction. The proposed prescription wish electrically small dimensions and high decoupling appliciency opens an avenue to new types of antenna with super performances. There are many different techniques of feeding and most popular techniques are co-axial probe feed. Microstrip line aperture coupling and proximity coupling.

1.2 Antenna Design and Configuration

The capacitance C0 is the coupling general between the microstrip line whereas induction L1 is generated due to the current flowing through the pin the rejection frequency is derived as follows:

$$Fr=1/2\pi\sqrt{L1(C0+C1)}$$

The order to reject WiMax the following equation is used An effective dielectric constant €eff can be derived with the following equation

$$€eff = €r + 1/2 + €r - 1/2 (1 + 12h/w)^{-0.5}$$

Simple transmission line model used for the antenna size calculation is given below

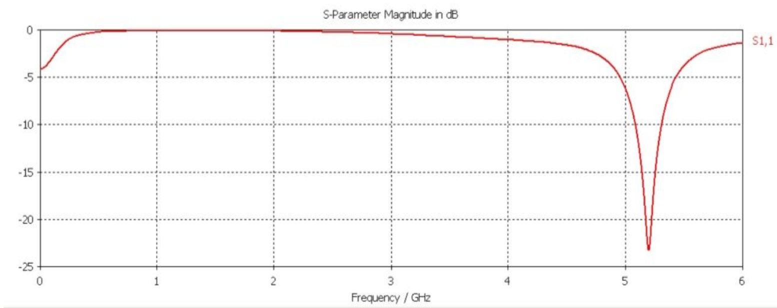
$$W = c/ 2f ((€r + 1)/2)^{1/2} \quad ----------(1)$$

$$L = c/ 2f \sqrt{€r} -2\Delta L \quad ----------(2)$$

he Microstrip edge feed is a conducting strip which is usefully smaller than the patch. In this feeding technique the seperated by feed line which is Microstrip fed and at the bottom there is ground plane.

II. RESULT

S- PARAMETER



From **Figure:1** it is concluded that the resonant frequency is 5.2 GHz, with the db and magnitude displayed Vs frequency .This parameter describes the input –output relationship of an electrical system

SMITH CHART:

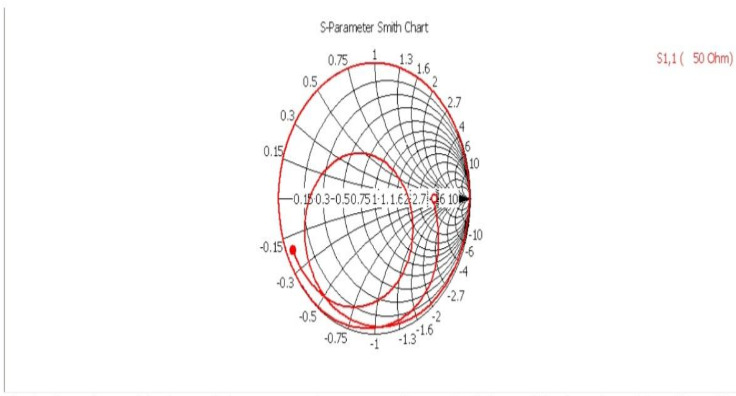


Figure:2 depicts the smith chart of the proposed antenna. The goal of the smith chart is to identify all possible impedances on the domain of existence of the reflection coefficient .

RADIATION PATTERN:

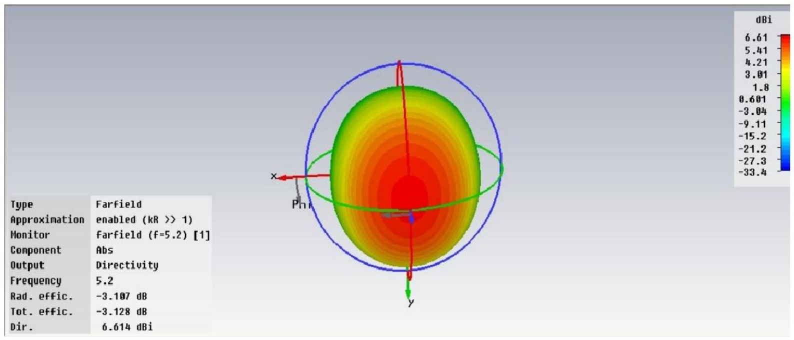


Figure:3 shows the radiation pattern of the proposed antenna. It shows the 3-D radiation pattern with directivity of 6.614 db for proposed antenna configuration at the resonating frequency of 5.2 GHz.

SURFACE CURRENT:

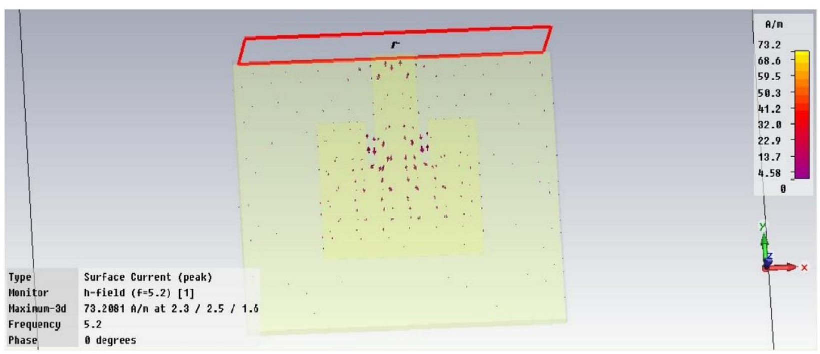


Figure:4 shows the surface current distribution of the proposed antenna

H-FIELD

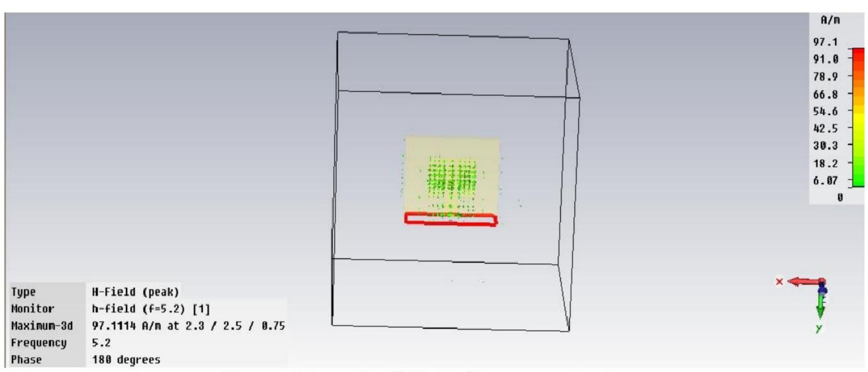


Figure: 5 shows the H-Field of the proposed antenna

2.1 Parameter

DESIGN PARAMETER	VALUE
Dielectric constant (єr)	4.9
Length(L)	13
Width(W)	16.79
Feed length (Lf)	9.5
Feed width (Wf)	8
Feed insertion (Fi)	4
Feed gap (Gpf)	1
Thickness(h)	1.6
Operating frequency	5.2GHz

III. CONCLUSION

In this paper, a simple rectangular microstrip patch antenna for application in 5.2 GHz WLAN Frequency band is demonstrated and designed using CST Microwave Studio software. The radiation pattern and other important parameters such as gain, efficiency and return loss has been studied. This is operating in the frequency band of 5.2 GHz. The return loss at 5.2 GHz frequency is below -10db which shows that there is good matching at frequency. also the main advantage of this feeding technique is that feed can be given anywhere inside the patch which makes easier fabrication compared to other feed technique. In future Micro strip patch antenna array will be designed for the same operating frequency range in order to achieve the maximum gain which is highly suitable for S-band applications following conclusions are drawn from the studies conducted.

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