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Dual-Band Antenna for Wireless Communication

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ABSTRACT

This paper presents dual-polarized antenna for dual-band applications. It works at the 2.4 GHz for WBAN applications, and 3.5 GHz for WiMAX applications. The inverted L-shape strip element is added to obtain dual-band structure. The circular polarization (CP) is obtained by diagonal feed on patch and diagonal slits in the middle of patch at WiMAX band. Proposed antenna has size of 56 × 56 × 1.6 mm3. Both the two band has VSWR less than 1.45. The gain of antenna 4.4 dB and 7.7 dB.

Keywords : Textile, dual band, slit

I. INTRODUCTION

A continuous development in wireless electronic technology enable the integration technology in cloth to enhance the capability. This textile system offers many applications include military, telemedicine, sports and tracking [1-2].

Nowadays, the dual band or multi band antennas have great attention due to their reduction in cost and its number of hardware. So Dual band antennas offers feature like frequency versatility and increase the channel capacity [3-4]. Currently, CP textile antenna offers more advantages due to reduced polarization mismatch losses. The CP has great capability of reduce interference. Although there have been more studies on dual band, dual polarized textile antennas [5–8].

Unfortunately, all of these antennas have a large size with low gain.

Nowadays, many solutions has been proposed for textile antenna [9-10], with dual band or dual polarized. However, these all wearable antennas have large dimensions, low gain. In this paper dual band antenna with dual sense for WBAN & WiMAX application is presented.

II. ANTENNA CONFIGURATION

Dual band Textile antenna has been designed by introducing the inverted L- strip at edge of square textile antenna as shown in Figure. 1. Simple square textile antenna 1 is used to generate 3.5GHz frequency in Figure 1. (a), and in antenna 2, attached inverted L shape strip at side edge of antenna 1 as shown in Figure 1. (b) which produce dual frequency 2.4GHz and 3.5GHz. In this model, dual band textile antenna were designed on jean substrate with εr (dielectric constant) 1.6 and thickness (h) is 1.6mm. The feed point is given at fp (4,4,0) to produce circular polarization at 3.5GHz WiMAX band. Antenna-1 (Figure 1.a) is designed at frequency 3.5 GHz. The

Antenna-1 consists of diagonal slits coupled to the 50 Ω feed. The Antenna Length (L) is given by ,

$$L = \frac{\lambda}{2\sqrt{\varepsilon_r}} \quad \text{..... [1]}$$

Antenna 2 is working at 2.4 GHz. This antenna comprises inverted L shape element connected to antenna1.The length of Antenna2 (L=L1+L2) is calculated using following equation(2), whereas λ calculate at 2.4GHz.

$$L_{2.4GHz} = \frac{\lambda}{4\sqrt{\varepsilon_r}} \quad \text{..... [2]}$$

Figures 1, 2 shows the design of dual band antenna

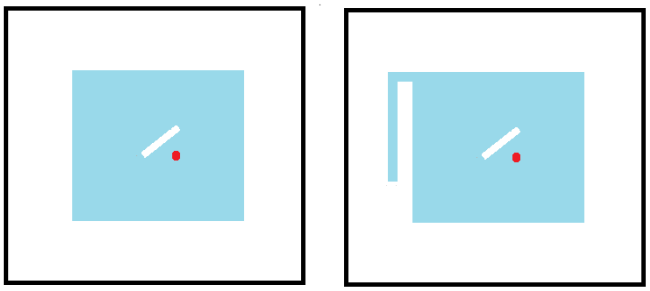

Figure 1 : Antenna Development Steps

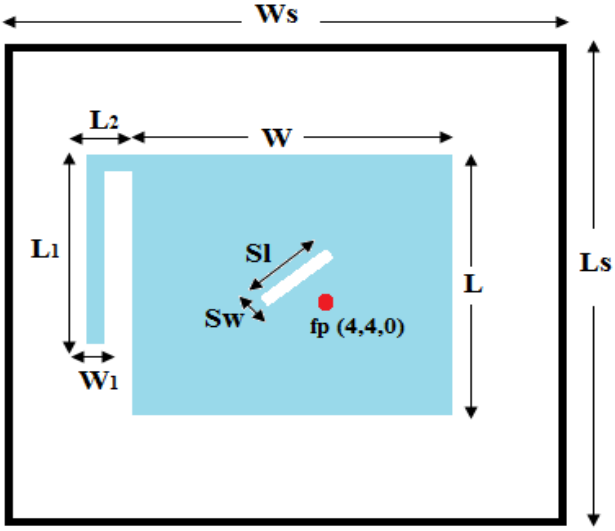

Figure 2: Proposed textile Antenna

The dimensions of proposed antenna are in mm as L = 31.8, Ls = 55, W = 31.8, Ws = 55, L1 = 1.5, L2 = 23, S1=7.0, Sw = 1, W1 = 1.

III. RESULTS AND CONCLUSION

The dual band textile antenna has designed using HFSS software. The simulated return loss of antenna1 and antenna 2 are shown in figure 4. Antenna 1 shows single frequency at 3.55GHz and antenna 2 shows dual band 3.55GHz and 2.4GHz.

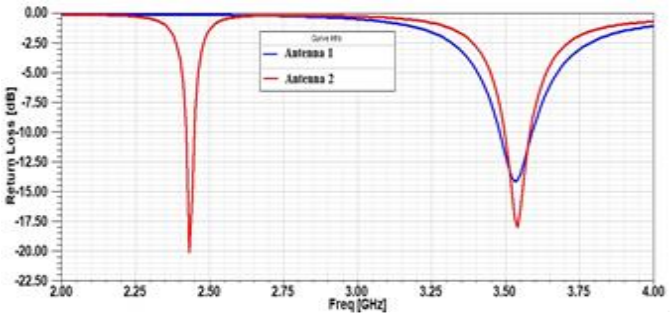

Figure 4: Return loss of antenna 1 and antenna 2

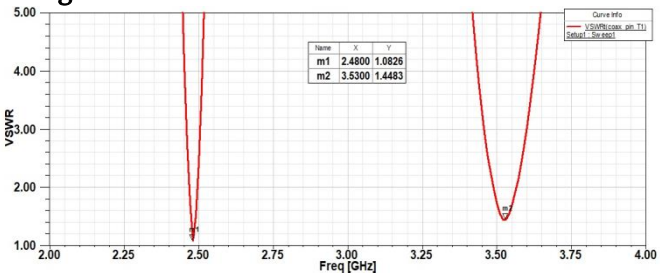

Figure 6: VSWR of proposed structure dual band textile wearable antenna

Figure.5 shows the Return Loss of proposed structure of dual band textile antennas and Figure.6 shows that VSWR is 1.08 at 2.4 GHz and 1.44 at 3.5 GHz. The bandwidth of antenna is 50 MHz at 2.4 GHz and 100 MHz at 3.55 GHz.

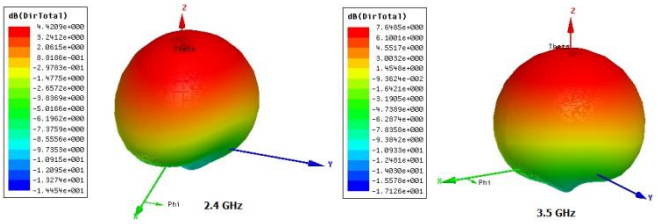

Figure. 9 (a) Radiation Pattern Without AMC

Thus proposed antenna gives return loss of -20 dB and -18dB ,VSWR is1.2 and 1.3with gain of 4dB and 8dB at 2.4 GHz and 3.5GHz respectively.

IV.CONCLUSION

A textile antenna with is proposed for wireless application. Textile square antenna for 3.5 GHz designed and added with inverted L shape for 2.4 GHz. The bandwidths of both bands obtained using length of the attached L-strip & square patch antenna. A high gain and low backward radiation is obtain using AMC. The gain of antenna is 7.8 dB for 2.4 GHz and 8.6 dB at 3.5 GHz. The antenna offers very low FBR of 20.2 dB at 2.4 GHz and 27.83 dB at 3.5 GHz.

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