Design of Ultra wideband Textile Antenna for Wearable Applications

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***Abstract* - A Wearable textile antenna is proposed to cover the Ultra wideband frequency that ranges from GHz to GHz. In this paper, a novel E shaped radiating element is embedded on jeans material with a dielectric constant of 1.7. The performance of the proposed antenna is compared with the existing model. The proposed antenna improves return loss by ---dB and covers the Ultra wideband frequency.**

Keywords— Textile antenna, Bandwidth, Gain, Wearable antenna.

I INTRODUCTION

In the recent years, The wireless technology is increasing pervading in our everyday life. The use of textile materials in wireless communication is increasing due to the recent advanced technology of wireless devices [1]. As wearable computing is developing, there is an increasing need for a wireless wearable system with antennas playing a dominant role. For wearable antennas, Fabric antennas can be easily integrated in clothes as various textile materials resembling normal garments can be used as substrates[2]-[4]. Conversely Ultra Wideband transmission devices don't need to transmit a high-power input signal to the receiver and can also have a longer battery life or be smaller to reduce the wearable devices size[5]-[8] .Several antennas have metal patches on textile substrates. By merging the UWB technology with wearable textile technology [9]-[11]. The substrate of the designed antennas was made from jeans textile material while the radiating element and ground plane made of copper tape. Jeans fabric has been chosen because the thickness and the elastic properties of jean will not change due to material elasticity and compression.

II TEXTILE ANTENNA

Portable electronic devices have become part and parcel of everyday human life. Modern mobile phones are quite often carried throughout the day and they allow not just telephone calls alone but also provide internet access, multimedia, personal digital assistant and GPS functionality. This form of 'always on' and constantly connected status is a step towards the pervasive computing paradigm. In future, a person is likely to carry a range of devices and sensors, including medical sensors which constantly communicate with each other and the outside world. The performance of the existing antenna has been simulated using HFSS. The conductive surfaces and the ground plane of all three designed antennas are made out of copper tape with a thickness of 0.03 mm. The simulations were carried out using HFSS software and the fabric antennas characteristics were studied. Microstrip feed line(50 ohm) was used as antenna feed; The reason behind this, that those antennas were intended to be mounted or embedded in a wearable jacket or suit. The drawback is the user will be uncomfortable as the antenna is shown out of the garment. The conventional antenna design is shown in fig 1.the main disadvantage of this existing antenna size is too high and bandwidth is obtained low with value.

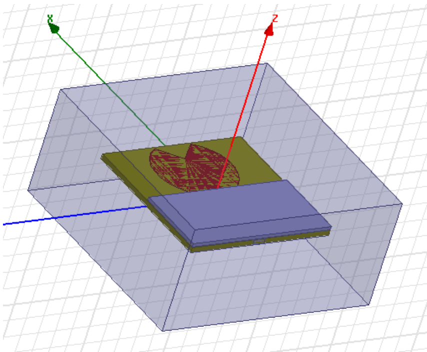

Fig.1.Circular UWB antenna

In the proposed work, we design a textile antenna in ultra wideband frequency which ranges from 8GHZ to 12GHZ, by using the microstripline feeding, which achieves the highest performance for the designed antenna. Jeans is used as substrate with dielectric constant 1.7. The proposed dulip design is shown in Fig 3.

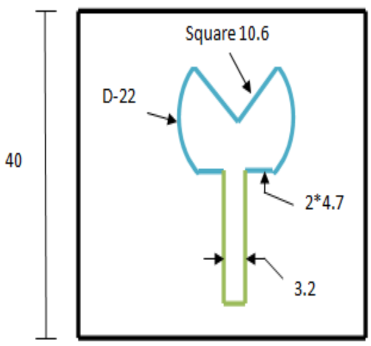

Fig.2.Dimensions-conventional antenna

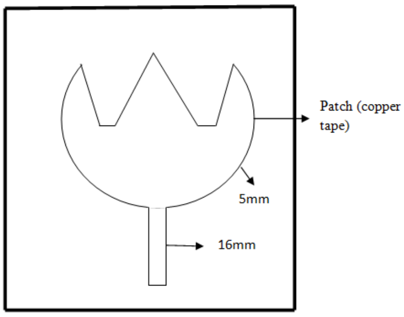

Fig.3. Proposed Dulip structure

III. RESULTS AND DISCUSSIONS

The following simulation results were obtained using Ansoft HFSS software tool. The Fig.4a depicts the simulation result of conventional model. It is the graph between return loss and frequency and we obtained high return loss that is not desirable for a good antenna design.

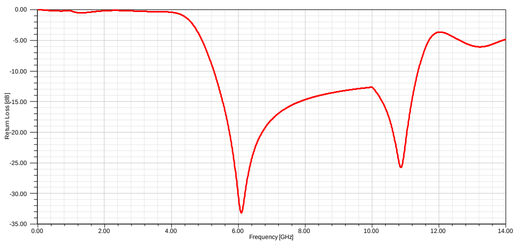

Fig.4 (a).Simulation results of the conventional antenna

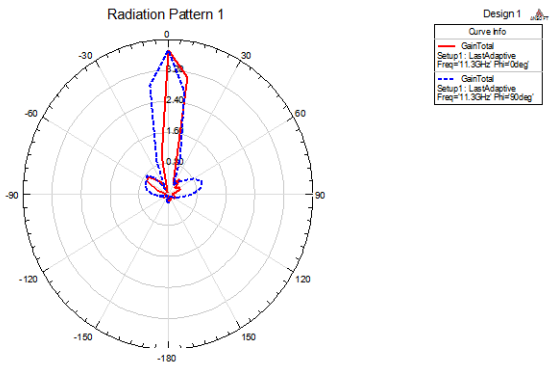

Fig. 4(b). Radiation pattern of the conventional antenna

The fig 3b shows the behavior of 2D radiation pattern of E plane and H plane of antenna design in the range of frequencies between 3GHz and 10 GHz. The lowest gain is 2.8dB in the range of frequencies between 6GHz and 8GHz while the largest gain is 4.1dB at 10GHz. The antenna efficiency was approximately 60%.The existing design consumes high power. After the simulation of the proposed structure we obtained the result as shown in the fig 5a.

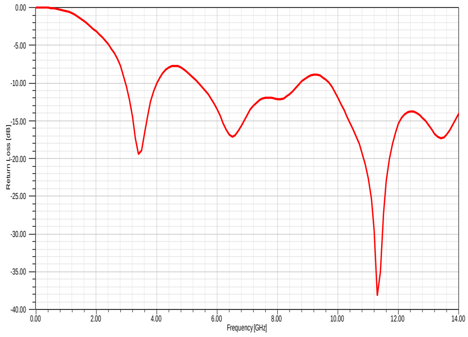

Fig.5(a).Simulation result of the proposed structure.

In this proposed structure we obtain a low return loss that improves the antenna efficiency. By comparing the simulated result of the proposed structure with the conventional model, we obtain an improved gain.

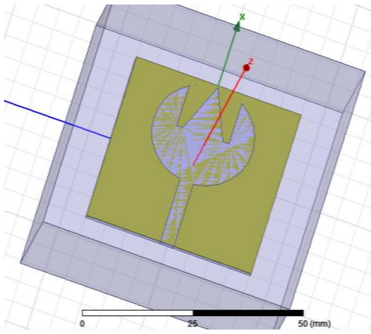

Fig.5.(b)Proposed antenna

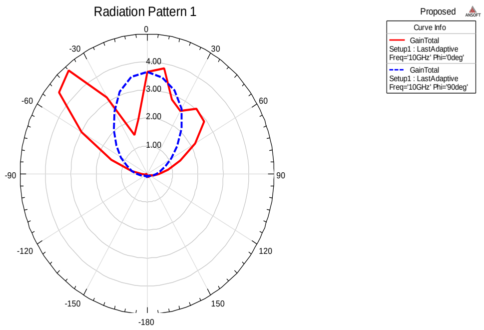

Fig.5(c).Radiation pattern of the proposed structure.

IV. CONCLUSION

In this letter, a textile antenna that can operate on ultra wideband is designed for wearable applications. The proposed antenna has a very low return loss and high gain and efficiency. The bandwidth coverage is improved from 5GHz to 8GHz which is in X band range. The measured bandwidth covers the whole ultra wideband frequency range. The future work is extended to fabrication and testing of the proposed structure using vector network analyser (VNA). Henceforth the Ultra wideband textile antenna is a very good candidate for wearable electronics applications.

IV. REFERENCES

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