Novel UWB Wearable Button Antenna

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Abstract

A UWB metallic antenna with the appearance of a button is proposed in this paper. Fleece fabric is used as the substrate. The antenna operates in the band of 3.1 GHz to 10.6 GHz, which is required for UWB communication systems. Good Omni-directional patterns are obtained with the gain between 2dB and 6.8dB in the working frequency band.

Keywords : Button Antennas UWB Wearable Antennas

1. Introduction

In recent years, there has been an increasing interest in the body centric wireless communication. Some flexible fabric antennas have been published [1-2]. A dual-band wearable metallic button antenna was reported in [3]. A wearable metallic button structure operating in the UWB band was introduced in [4]. Antenna had the appearance of belt was designed in [5]. In this paper, a novel button antenna whose substrate is fleece fabric is proposed, which will serve as a candidate for wearable communication systems.

2. Antenna Design

The proposed antenna dimensions are shown in Fig. 1 and Table 1. The antenna is made up of three steps metallic button. The antenna is mounted on a fleece fabric substrate with a height of h, which is backed by a metallic ground plane of 60mm×60mm. The total visible height of the UWB antenna is 25mm and the top cylinder diameter is 24mm. The antenna was fed by a coaxial line through the ground plane.

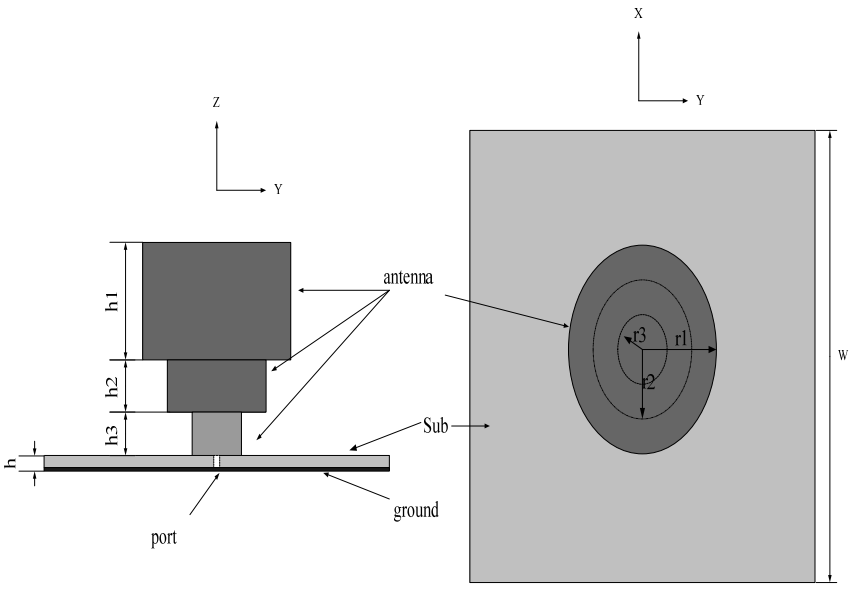


Figure 1: Dimensions of the UWB button.

Table 1: Principal antenna dimensions

Parameter	Size(mm)	Parameter	Size(mm)
h	2	w	60
h1	13	r1	12
h2	6	r2	8
h3	4	r3	3

3. Antenna Performances

The simulated reflection coefficient curves (S11) for the UWB metal button antenna is presented in Fig. 2. Ansoft HFSS is used for the calculation of the antenna. The S11 of the UWB button antenna is achieved a bandwidth from 3 GHz to over 12.6 GHz which is sufficient to cover the 3.1 to 10.6 GHz bandwidth for UWB systems.

The simulated x-y and y-z radiation patterns for the button antenna are shown in Fig.3 and Fig.4, respectively. Good omni-directionality in the x-y patterns can be observed. The gain obtained of the UWB antenna was 3.5dB, 6dB, and 5.4 dB at 4 GHz, 6.5 GHz, and 9 GHz, respectively.

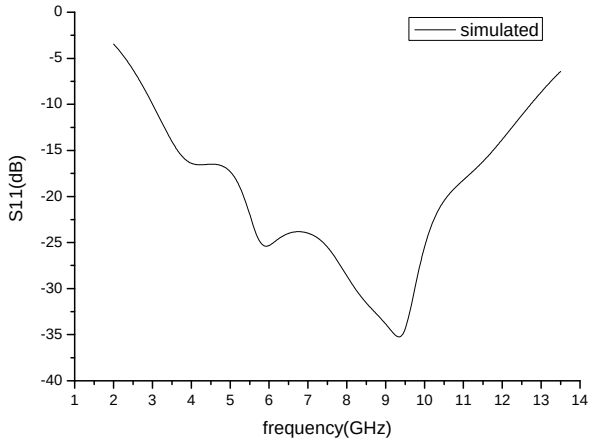
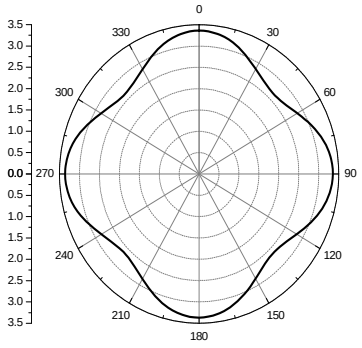
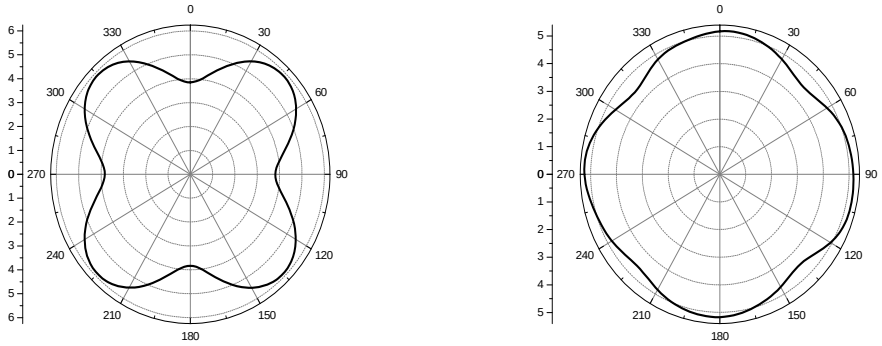


Figure 2: Dimensions of the UWB button.

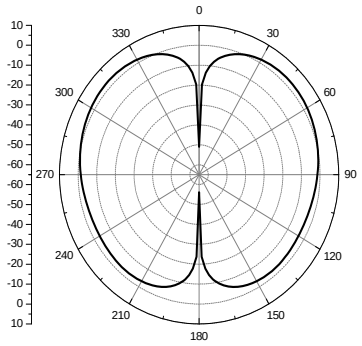


(a)

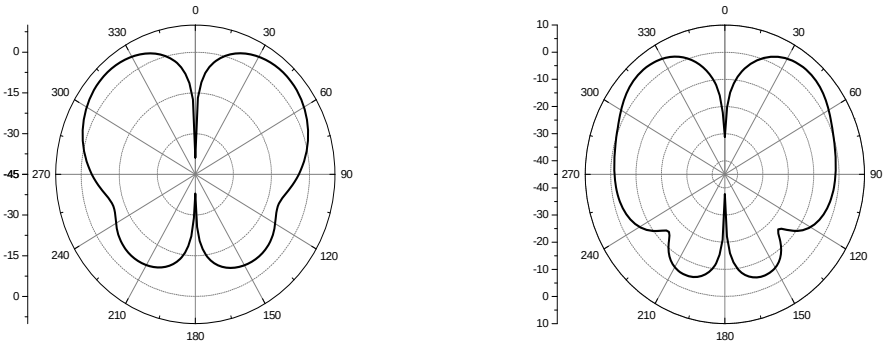


(b) (c)

Figure 3: Simulated *x-y* plane radiation patterns of button antenna button antenna (a) 3.5GHz; (b) 6GHz; (c) 9GHz.



(a)



(b) (c)

Figure 4: Simulated *y-z* plane radiation patterns of Button Antenna (a) 3.5GHz; (b) 6GHz; (c) 9GHz.

3. Conclusions

A novel UWB button antenna with fleece fabric substrate is proposed. The antenna has sufficient bandwidth to cover the 3.1GHz to 10.6 GHz, which is required by UWB systems. The gain of the antenna was between 2dB and 6.8dB in the matched frequency bands. The proposed antenna will serve as a candidate for wearable communication systems.

References

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