

A ULTRA-WIDEBAND MONOPOLE ANTENNA FOR WIRELESS APPLICATIONS

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Abstract. This paper proposes a 3.1-5GHz UWB antenna, defined by a -10dB return loss. The simplified planar antenna structures, compact size and low profile make it profitable to the application of the embedded antenna in wireless USB dongle devices. For reducing manufacture cost and practical fabrication, we also propose a simplified rectangular antenna structure. It is found wideband characteristics of the simplified rectangular structure antenna are similar to that of semi-circular base structure.

Finally the antenna prototypes are fabricated and the antenna characteristics are measured. The radiation patterns are omni-directional in azimuth cut. Moreover, the S parameter of antenna characteristics has been measured. The consistency between the simulated results and the measurement results confirm the practicability of these techniques.

Keyword: Ultra-Wideband, Monopole Antenna, USB Dongle.

I. INTRODUCTION

Ultra-wideband (UWB) technology brings the convenience and mobility of wireless communications to high-speed interconnects in devices throughout the digital home and office. Nowadays, one of major key technology of UWB system is to design a compact, wideband and omni-directional antenna. During these ten years, planer monopole antennas are used as wide band antennas. However, two-dimensional 3.1-5GHz (lower band of UWB) antennas are seldom investigated in the literatures. In this research, we propose a whole planer 3.1–5 GHz UWB antennas and employ both slit and parasitic stub on the ground methods to increase the bandwidth of the antenna with miniature characteristic.

A great attention has been paid to the development of universal serial bus (USB) dongle devices [1] based on the UWB communication standard [2]. UWB is able to provide high data rate wireless connectivity to the hosting PC [3]. To achieve such an objective, a challenging issue is obviously concerned with the design of the antenna. It is expected to be miniaturized for the integration in a dongle board layout and, at the same time, to have electrical parameters suitable for wideband high-speed communications.

II. ANTENNA DESIGN

Fig. 1 illustrates the geometry of the proposed simplified rectangular antenna structure. The antennas are printed on a 10 x 35 mm FR4 microwave substrate with the thickness of 0.4 mm and the dielectric constant of 4.4.

Geometry of the antenna is defined by means of the following set of values of the descriptive parameters: $L=35$ mm (length of the dielectric substrate), $W^g=11$ mm (width of the dielectric substrate, ground plane and radiator), $L^g=24$ mm (length of the ground plane), $g=1$ mm (gap between ground plane and radiator), $S=6.7$ mm (length of the slit shape), $P=3$ mm (length of the parasitic stub). It should be noticed that such a ground plane is common for the USB dongle PCB.

Fig. 2 shows simulated and measured return loss of semi-circular base monopole antenna. For the proposed simplified rectangular monopole antenna prototype, the measured impedance bandwidth, defined by a -10dB return loss, is 2.08 GHz (2.92–5 GHz) and thus easily covers the UWB operating frequency of 3.1–5 GHz.

III. CONCLUSIONS

A printed, whole planar internal monopole antenna integrated for wireless USB dongle has been proposed. The achieved impedance bandwidth for -10dB return loss of the proposed antenna has covered the lower UWB band of 3.1-5GHz. Designing the slit shape on the monopole radiator can miniature antenna and using a parasitic stub on the ground can adjusted impedance matching around the middle frequency band for the 3.1–5GHz UWB operation. As those radiation characteristics and whole planar antenna structures make it profitable to apply of the antenna in wireless USB dongle devices.

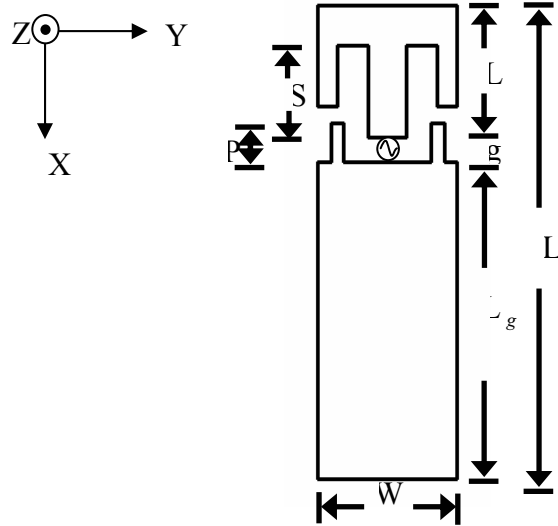


Fig. 1. Antenna geometry of Simplified rectangular antenna

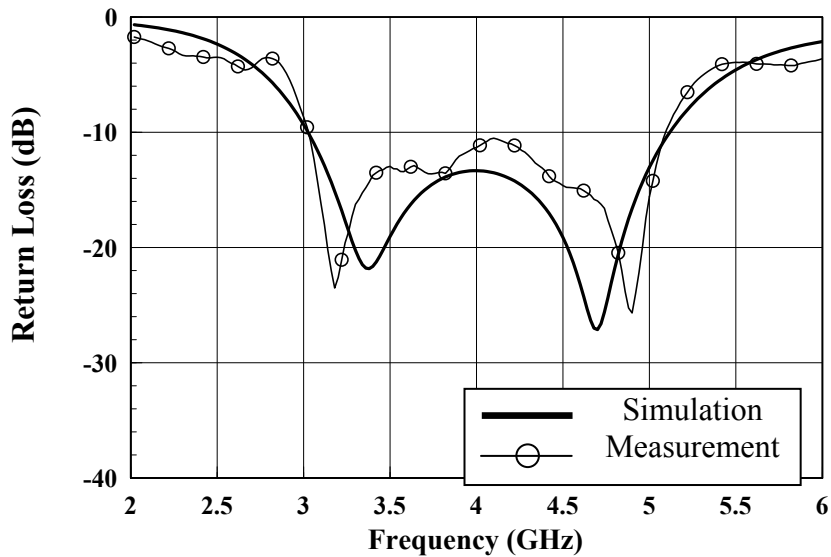


Fig. 2. Semi-base circular antenna simulated and measured return loss.

References

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