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MICROSTRIP W-SHAPE UWB ANTENNA FOR WLAN APPLICATION

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Abstract

This paper presents a Microstrip Antenna for Ultra Wide Band frequency for cover a large bandwidth of 3.1 GHz and 13.1GHz for the resonance frequency of 6.5 and its wide application like WLAN, Wi-MAX, Medical Application, radar imaging technology, PC Peripherals, Wireless USB. The gain and directivity of the proposed antenna are presented at different UWB band frequencies. For HFSS is used to design and simulation of antenna.

INTRODUCTION

Application of ultra-wideband (UWB) technology on wireless communication system has increased considerably in Last seven years. Because the UWB technology has great potential in the development of various modern wireless communication systems, the U.S Federal Communication Commission (FCC) authorized the unlicensed use of the ultra wideband (3.1-10.6 GHz) frequency spectrum for indoor and hand-held wireless communication since early February 2002[3]. To meet the variety of applications in UWB communication systems, many researchers around the world have been aroused on the design, research and development of UWB filter and antenna[4-5].

UWB ANTENNA

UWB is a Radio Frequency (RF) technology that transmits binary data, using low energy and extremely short duration impulses or bursts (in the order of picoseconds) over a wide spectrum of frequencies. It delivers data over 15 to 100 meters and does not require a dedicated radio frequency so is also known as carrier-free, impulse or base-band radio.

People commonly refer to UWB as available spectrum rather than as a technology 7500 MHz of unlicensed spectrum, in the 3.1-10.6 GHz band, is currently available in the US for any Communication system that occupies more than 500MHz. Figure 1 the data rates of ultra wide antenna is very high but cover distance is less in the simulated 10 db at 3.1 to 13.1 GHz with 10GHz large bandwidth. Low dielectric constant substrates are generally preferred for maximum radiation.

Main purpose of this antenna to use one antenna for many application like WLAN, Wi-MAX, Medical Application, radar imaging technology, PC Peripherals, Wireless USB etc., which is the cost effective to deign one antenna for all application.

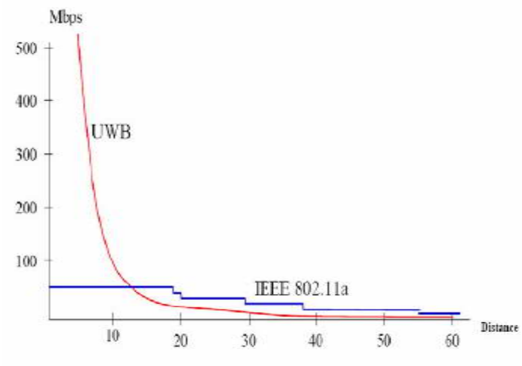


Figure 1 UWB Data Rates

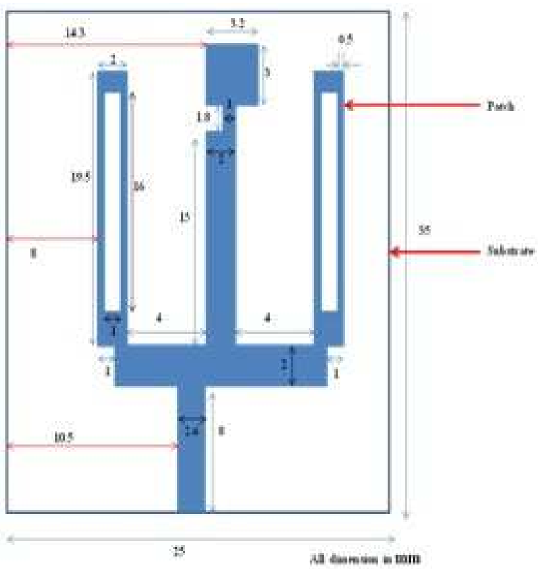
UWB ANTENNA CONFIGURATION DESIGN

In the design of this type of antennas, the width ‘w’ and length ‘l’ plays a crucial role in determining the resonant frequency of the system. The starting values of these parameters are calculated by using the equations given in[9-10] for the substrate height (h), dielectric constant (εr) and for the lower frequency. The designed values of the antenna are optimized with hfss tool. The optimization was performed for the best impedance bandwidth. Figure 2 shows the structure of the ultra wide band planer antenna. The antenna consists of rectangular aperture with width ‘w’ and length ‘l’ and rectangular patch with height ‘h’. In this study, a dielectric substance (fr4) with thickness of 1.55 mm with a relative permittivity of 4.4 is chosen as substrate. The cpw feed is designed for 50 ω characteristic impedance with fixed 2.6 mm feed line width and 0.035 mm ground gap.

By properly adjusting the dimension of the antenna and feeding structure the impedance matching of the proposed antenna is improved that produces wider impedance bandwidth with satisfactory radiation pattern. The wide bandwidth and impedance matching with reduced size of the antenna is achieved by the different surface magnetic currents of the structure.[7-8]. Figure 2 shows the geometry and configuration of ultra wideband (UWB) antenna. The design parameters are L=21.8mm, W=14mm, H=0.035mm, h=1.55 mm (sub. height).

MODIFICATION OF ANTENNA STRUCTURE

The dual band Microstrip antenna (MSA) is realized by cutting the slots of different shapes like, U-slot, pair of rectangular slots and step slots, etc[4–8]. The geometry of Ultra Wide Band W-Shaped Microstrip antenna is shown in Figure 2.



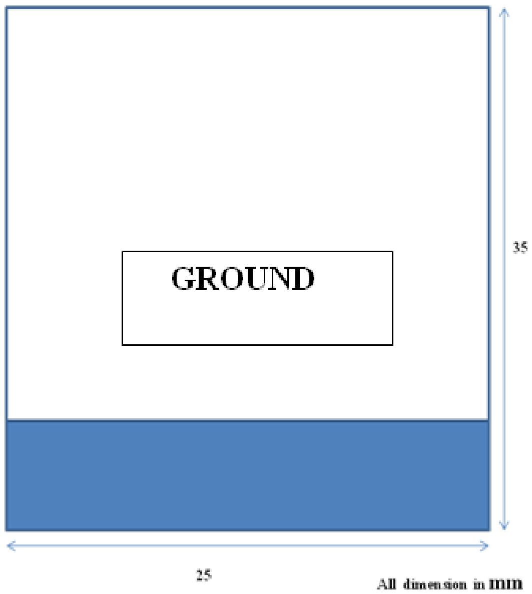


Figure 2 Geometry and configuration of UWB planer antenna. (a) Front view (b) back view.

SIMULATION RESULTS

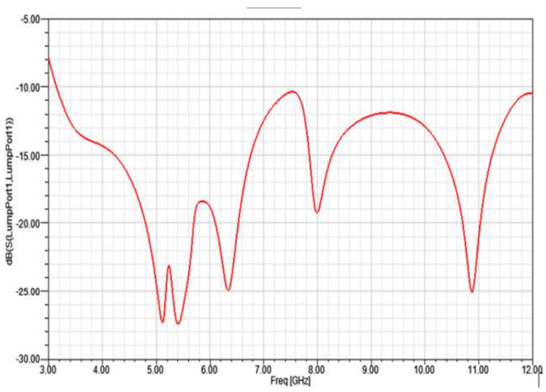


Figure 3 Return Loss vs. frequency of UWB planer antenna.

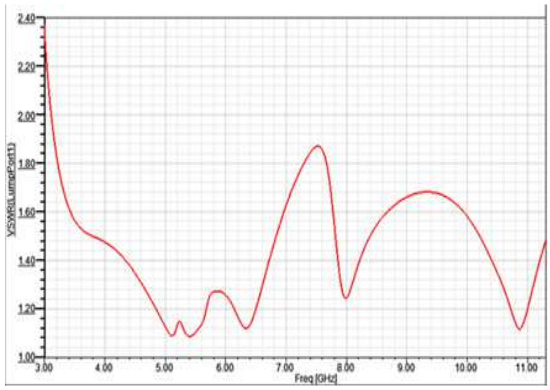


Figure 4 VSWR vs. freq. of UWB planer antenna.

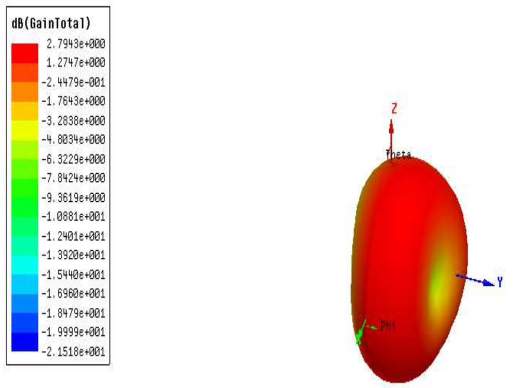


Figure 5 Gains at 6.5 GHz.

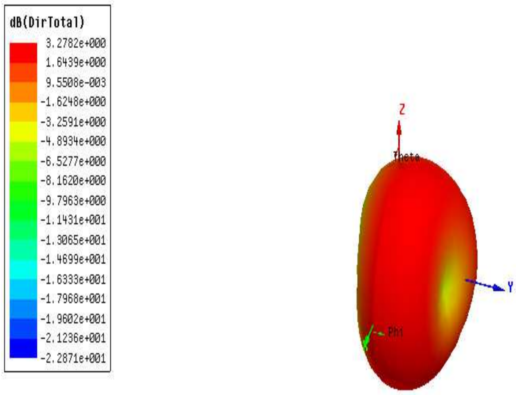


Figure 6 Directivity at 6.5 GHz.

RESULTS AND DISCUSSION

The simulated patch antenna gave a resonant frequency of 6.5 GHz where we find the gain is 2.79 db and directivity is 3.28 dbi. Here the simulated return loss is -29 dB at 5.1 GHz and 10.9 GHz covers with resonant frequency of 6.5 GHz where simulated return loss is found to be -25 dB maximum in the curve shown in Figure 3. It is shown useful return loss Peaks of the dual band at 5.1 GHz and 10.9 GHz. The Gain and directivity pattern at 6.5GHz is 2.79 db and 3.27dbi respectively. VSWR is also for entire band is between 1 to 2 (Figure 4). Here in this antenna directivity is also applicable of good working on WLAN applications for cover large band for UWB wireless application.Proposed antenna hardware as shown in Figure 7 and It has simulation result and experimental results (Figure 8) of Return loss (S11) are not same, it just because of improper connection by soldering of feed line and connector.

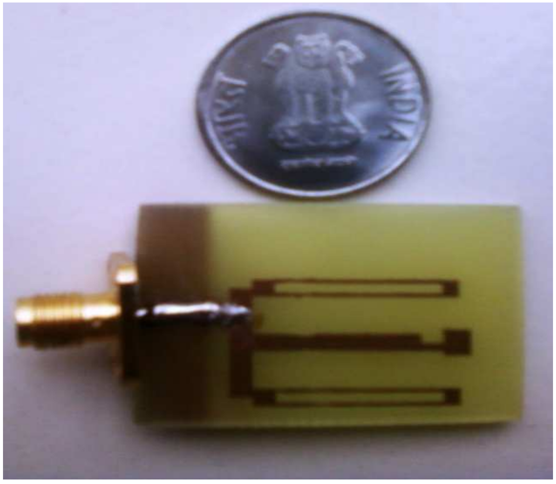


Figure 7 Hardware of UWB planer antenna.

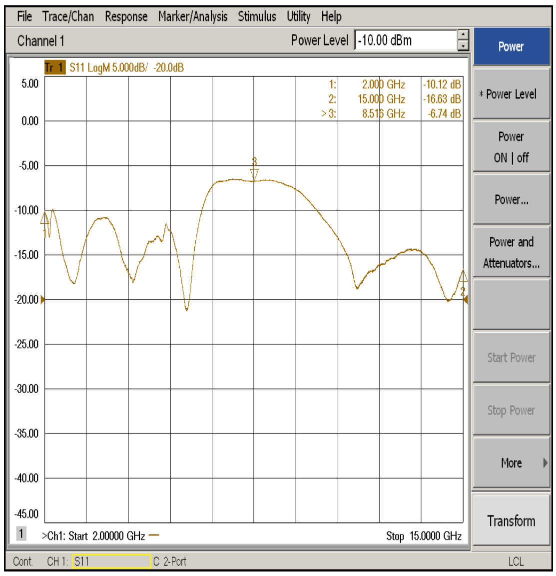


Figure 8 Experimental Result of Return loss of UWB planer antenna.

CONCLUSION

This paper investigates a planar band antenna that cover UWB bandwidth of 9 GHz (3.1 to 12.1GHz) suitable for, WLAN, Wi-MAX, Medical Application, and radar imaging technology, PC Peripherals, Wireless USB The antenna has a low profile and can be easily embedded into the display of a laptop computer. Return loss of the UWB antenna are examined experimentally. UWB complements currently deployed wireless networks in the WLAN environment, plus it extends high bit-rate, multimedia connectivity to WPANs supporting PC, CE and cellular devices. This combination will enable true convergence of electronics and mobile communications

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