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# A Novel Approach to Design of an Ultra Wide Band Antenna for Medical Applications

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***Abstract: Ultra-wideband (UWB) communication systems have the promise of very high bandwidth, reduced fading from multipath, and low power requirements [1]. Our antenna conjointly had to be sufficiently small to suit on the communication device, which was ten inches high, by three inches wide, by one inch thick. The UWB radio systems transmit pulses of terribly short period, as opposed to traditional communication schemes, which send sinusoidal waves. The role that UWB antennas play altogether of this can be that they need to be ready to transmit these pulses as accurately and expeditiously as attainable. The UWB antennas find many applications in medical science due to the use of short pulses. We have some parameters that we have to satisfy. Those parameters were the information measure of the antenna, the VSWR of the antenna, the gain of the antenna, and the radiation pattern of the antenna. The first parameter that we had to consider for our design is the bandwidth. The information measure is largely the frequency (or frequencies) that the antenna is meant to radiate. In narrowband systems the bandwidth specified for an antenna is very small because there is just one frequency that the antenna is required to radiate. The second parameter that we had to take in to account for our design is the VSWR of the antenna. The VSWR is very important as it assures how well two transmission lines are matched. The number for the VSWR ranges from one to infinity, with one meaning that the two transmission lines are perfectly matched. In regards to antenna design, a VSWR that is as low as possible is desired because any reflections between the load and the antenna will reduce the effectiveness of the antenna. The third parameter that we took into account for our antenna design is the gain of the antenna.***
***Keywords: UWB, HFSS, VSWR, FCC, gain, bandwidth***

## I. INTRODUCTION

An antenna could be a electrical device that converts target-hunting magnetic attraction energy in a very cable to radiated magnetic attraction energy in free space. The imminent widespread industrial preparation of ultra-wideband [2] systems has sparked revived interest within the subject of ultra-wideband antennas. The power levels authorized by the FCC[3] mean that every dB counts in a UWB system – as much or perhaps even more so than in a standard narrowband system. Thus, an efficient UWB Antenna[4] could be a important a part of an overall UWB system style. UWB antennas are in active industrial use for many years. Some modulation schemes are having a lot of tolerant of antenna variations than others. For instance, a multi-band[5] or OFDM approach is also less liable to dispersion or alternative variations across the antenna's operational band. The UWB system requires an antenna capable of receiving on all frequencies at the same time. Thus, antenna behavior and performance should be consistent and predictable across the whole band. Ideally, pattern and matching ought to be stable across the whole band. The aim of this paper is to provide a novel design of UWB antenna[6]. This paper can make a case for key UWB antenna ideas, discuss system and network issues for UWB antennas, and gift elementary physical limits to UWB antenna performance.

## II. METHODOLOGY

By using Ansoft HFSS Software the simulation model has been studied and found wonderful results showing VSWR< 2. After several simulations of the optimized design for one port analysis, we have obtained the S parameter curve (return loss curve).

## III.DESIGN PARAMETERS

The resonant length of a microstrip patch can be obtained by using simple relations of the effective relative dielectric constant as a function of the substrate parameters and the operating frequency as follows

$\varepsilon_{reff} = [\ \varepsilon_{reff}+1]/2 + \{[\ \varepsilon_{reff} -1]/2\}\{1+(12h/w)\}-0.5$

$W = (c/2f)\{2/(\varepsilon_r +1)\}0.5$

$L_{eff} = c/\{2f(\varepsilon_{reff})0.5\}$

$\Delta L= 0.5h$

$L= L_{eff} - 2\Delta L$

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where c is the speed of light in free space, L and W are the length and the width of the resonant patch antenna respectively.

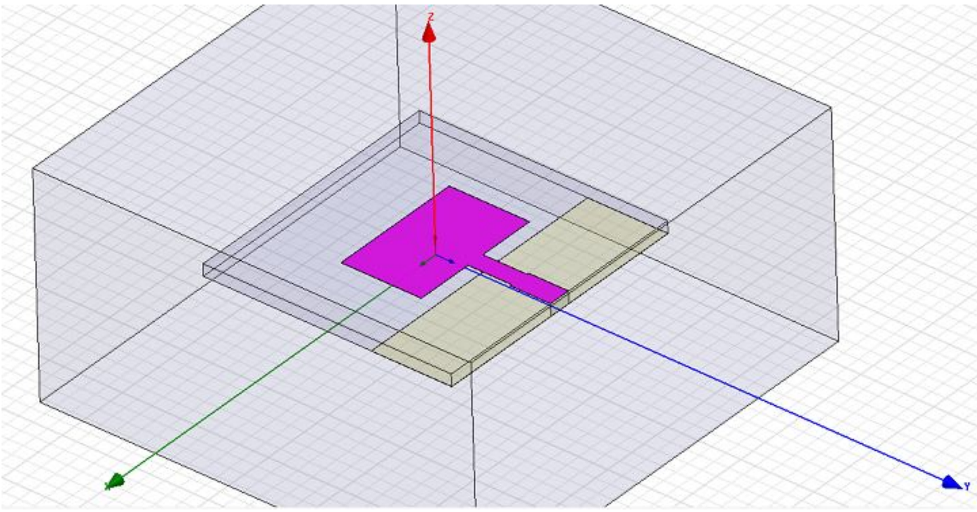

Figure 1: The Ultra Wideband antenna designed on Ansoft HFSS platform

## IV. RESULTS AND DISCUSSION

The Simulation results show satisfactory results for the designed Ultra wide band antenna. The electric field profile, gain, S11 plots are shown as follows. The current antenna also shows significant results with VSWR <2 within the (3.1- 10.6) GHz band.

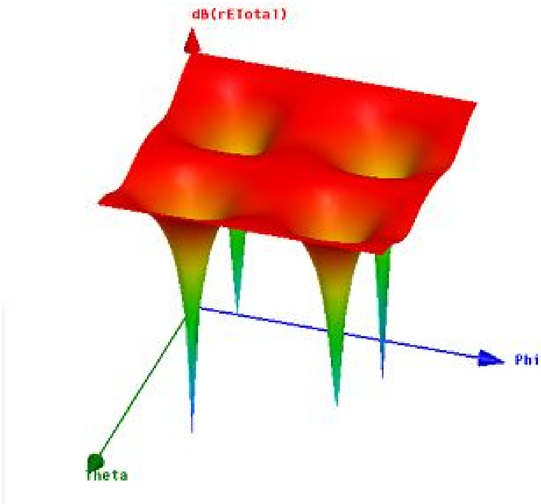


Figure 2: 3D Rectangular plot of Electric Field profile

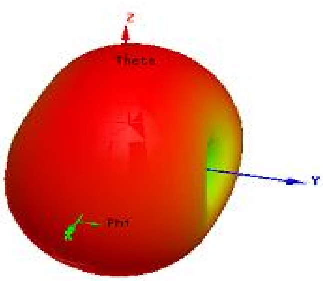

Figure 3: 3D Polar plot of Gain

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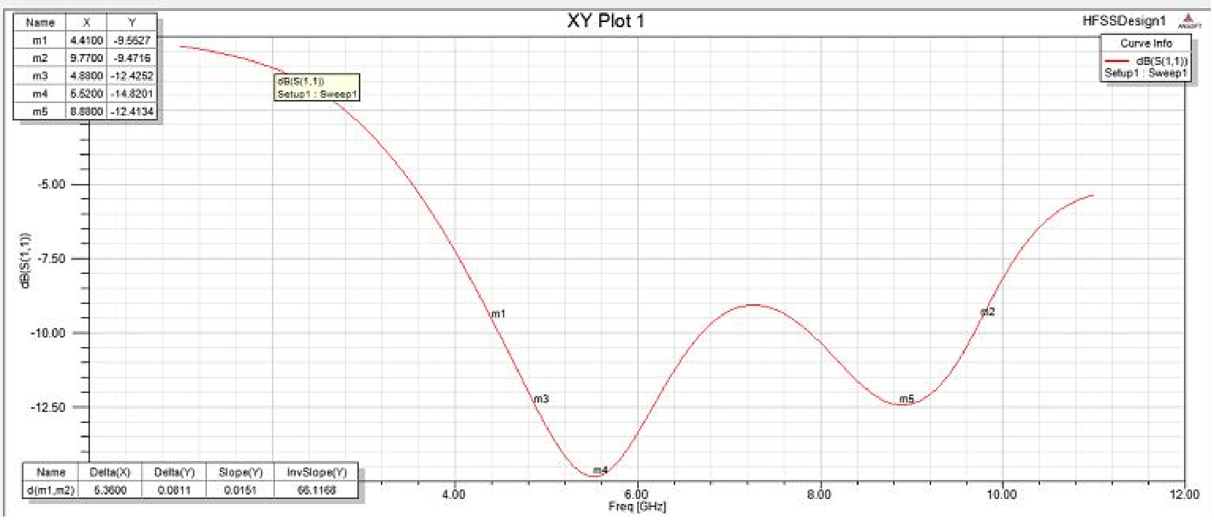


Figure 4: S11 plot of the designed antenna

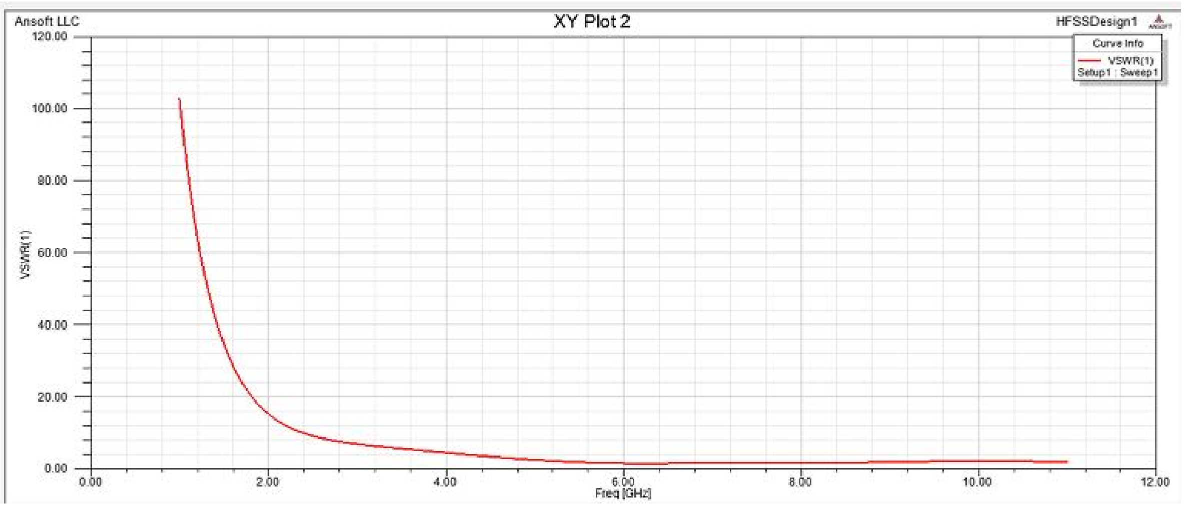


Figure 5: VSWR plot of the designed antenna shows better results with VSWR<2 within UWB frequency range.

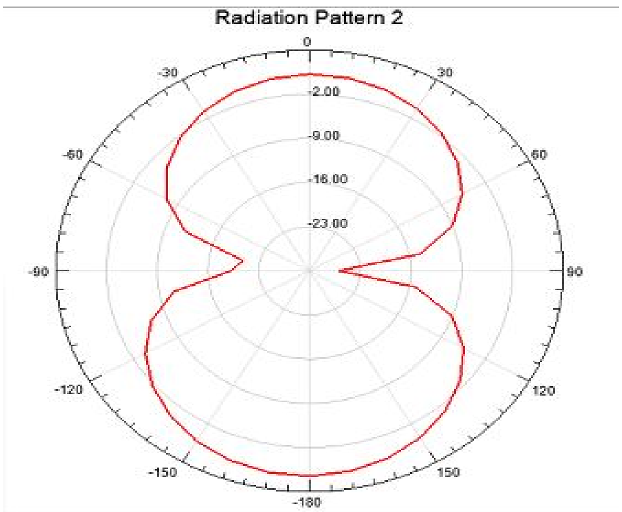


Figure 6: Radiation pattern of the designed antenna

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## V. CONCLUSION

A novel small UWB antenna has been designed and simulated. The simulation results obtained by Ansoft HFSS software show good agreement with results To miniaturize UWB antenna, tapering and truncated ground plains are used. It is seen from the results that very large bandwidth is obtained for the proposed antenna which can be used in UWB communication systems. So, a solution to the medical science may be achieved as the designed UWB antenna shows its capability in this domain.

## REFERENCES

[1] F. Dowla.. "Ultra-Wideband Communication." In Handbook of RF and Wireless Technologies, edited by F. Dowla. Burlington, MA. Newnes. 2004.
[2] Schantz H 2005 The Art and Science of Ultra Wideband Antennas (Norwood MA: Artech House Inc)
[3] Federal Communications Commission Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission System from 3.1 to 10.6 GHz 2002 Federal Communications Commission FCC (Washington DC: ET-Docket) pp 98–153
[4] C. Balanis 1982 Antenna Theory; Analysis and Design (second edition Wiley and Sons, New York)
[5] W. Srgel, W. Wiesbeck, "Influence of the antennas on the ultra wideband transmission", *EURASIP J. Appl. Signal Process. (Special Issue on UWBState of the Art)*, pp. 296-305, Mar. 2005.
[6] H. G. Schantz, "A brief history of UWB antennas", *IEEE Aerosp. Electron. Syst. Mag.*, vol. 19, pp. 22-26, Apr. 2004.

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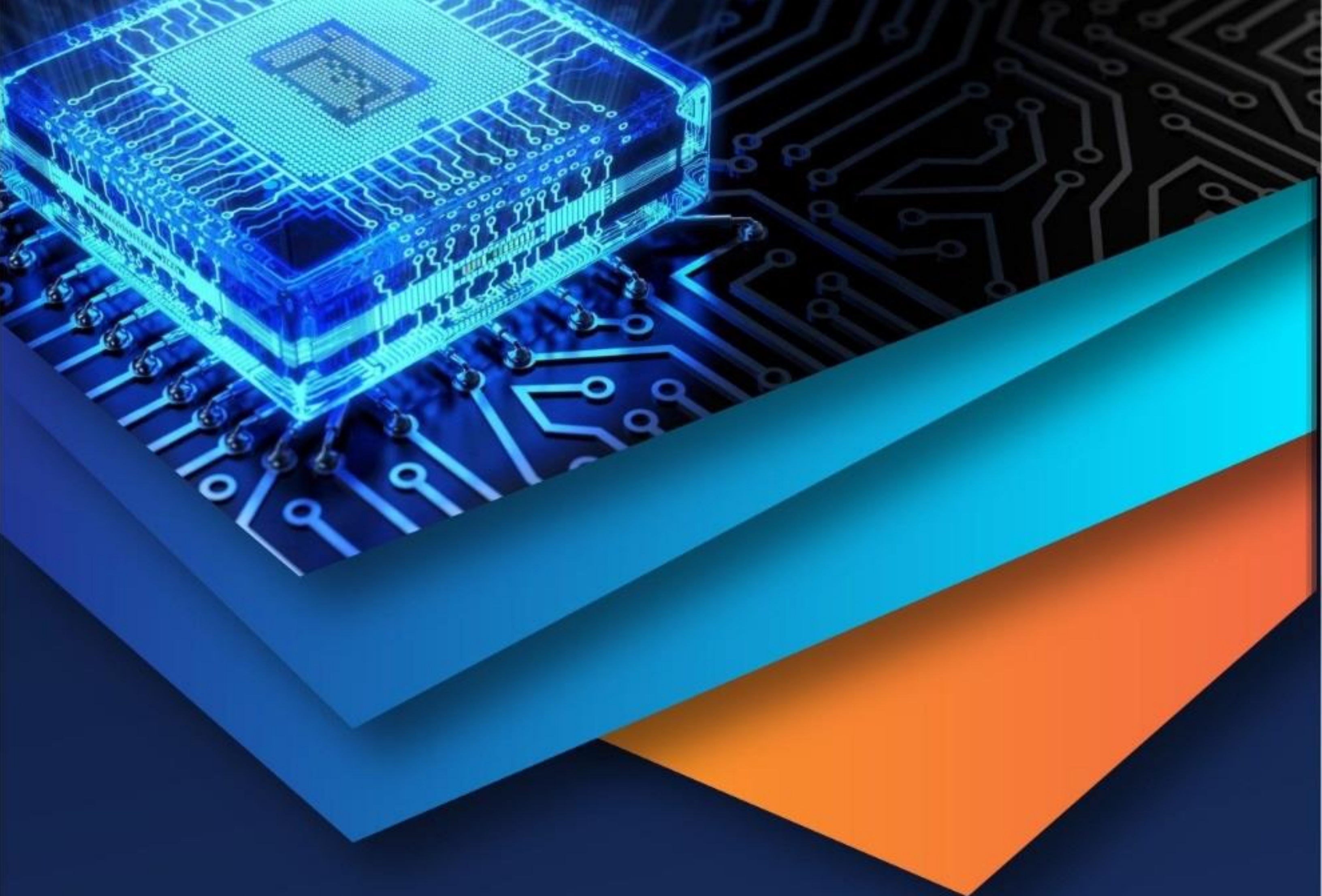

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