

DESIGN OF FORK AND SLOTTED CIRCULAR ULTRA WIDE BAND
(UWB) ANTENNA

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ABSTRACT

In this project, two different shapes of Ultra Wide-Band (UWB) antennas have been proposed. Low profile, light weight and reasonable cost microstrip fork shape and slotted circular patch antenna have been selected to meet UWB communication systems requirements. Large bandwidth is considered as main challenging factor in UWB antenna design. Many techniques have been used in proposed antenna designs such as slots, steps and partial ground. Omni direction radiation pattern makes the presented antennas are suitable for many communication systems. The designs are simulated by using High Frequency Structural Simulation (HFSS). Good agreement measured and simulated results have been achieved in this project. Finally, a brief comparison between both of them has been conducted to investigate the effect of patch shape on antenna performance.

ABSTRAK

Dalam projek ini, dua berbeza bentuk-bentuk Ultra Wide-Band (UWB) antena-antena telah dicadangkan. Sikap tidak menonjolkan diri, berat ringan dan kos berpatutan mikrostrip bentuk garpu dan antena tompok bulat celah telah terpilih untuk bertemu sistem telekomunikasi UWB syarat-syarat. Large bandwidth is considered as main challenging factor in UWB antenna design. Banyak teknik telah digunakan dalam mencadangkan antena rekaan-rekaan seperti slot, langkah-langkah dan tanah separa. Arah Omni pola sinaran membuat menyampaikan antena-antena adalah sesuai untuk banyak sistem telekomunikasi.

Rekaan-rekaan itu adalah dibuat-buat dengan menggunakan High Frequency Structural Simulation (HFSS). Perjanjian baik berhati-hati dan keputusan-keputusan tersimulasi telah dicapai dalam projek. Akhirnya, satu perbandingan singkat antara mereka berdua telah dikendalikan untuk menyiasat kesan bentuk tompok pada prestasi antena.

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CHAPTER 1

INTRODUCTION

1.1 Background of the project:

A great Equations of James Clerk Maxwell provide the foundation of classical electromagnetism which opened the door to prove of magnetic wave existence. These equations are confirmed later by many scientists like Heinrich Hertz or Guglielmo Marconi.

In 1901, Guglielmo Marconi was able to send signals over large distance. He succeeded to propose the first transatlantic transmission from Poldhu in Cornwall, England, to St. John's Newfound land. His transmitting Antenna consists of 50 vertical wires in the form of fan connected to ground through a spark Transmitter. The wires were supported horizontally by a guyed wire pulled and supported by kite. This was the down of Antenna era [1].

World War II was representing a new stage of antenna design and application. Digital and computerize system in the late of last century played a good role to push antenna design or applications forward.

"Antenna" or "Aerial" as English people like is the most visible element of radio system which typically consists of transmitter and receiver with additional element to ensure or guarantee of correct delivered information. According to webster's Dictionary definition, Antenna is defined as" a usually metallic device (as rod or wire) for radiating or receiving radio waves". It is a structure device between free space and wave guide which may take of co-axial or another form.

Recently, Wireless Data Transferring becomes popular due to the ability to service deployment in places that are difficult to connect and it proves that it has less loss in long distance in comparison with wire ability of deploying.

In Wireless system, Antenna is the key element to send and receive data across a specific distance in efficient way.

Day after day, wireless technologies attract more attention to fulfill increasing demands. Ultra Wide-Band (UWB) technology is one of best candidate for short range communication. The first UWB Antenna was proposed by Mr.Hertz from more than 100 years ago when he made an antenna works in high frequency. Nowadays, Human body becomes one of the interesting media to distribute communication nodes throw it. UWB has the ability to transmit high data rate in short distance which needs small amount of power. These specifications make UWB one of the best candidates for Personal Area Network (PAN).

1.2 Statement of problem:

In this project, many of problems should be concerned by designers as listed below:

- 1- Many wireless applications operate in high frequency where Ultra Wide-Band Antenna can be deployed effectively.
- 2- Size and profile are strongly considered in the antenna design.
- 3- Bandwidth is one of the challenges that UWB antenna designer should face.
- 4- Many techniques have been produced to improve Bandwidth for Ultra Wide-Band Application.

1.3 Scope of the project:

Small size, Low-profile and efficient Ultra Wide-Band antenna for communication applications are considered as main scope of the project. Simulate and verify antenna design in terms of Return loss, radiation pattern and gain by Electro magnetic Simulation Software High Frequency Structural Simulation (HFSS). And finally, optimize the propose antennas and compare simulation with measured results.

1.4 Objectives of the study:

The objectives of the project are to design two different shape UWB antennas and make a comparison between two of them.

Fork shape and slotted circular patch antenna are selected as the proposed UWB antennas where they are printed on dielectric constant of 4.7 with 1.6mm thickness and 0.019 loss tangent of FR4 substrate.

1.5 Research Outline:

This Thesis consists of seven chapters. These chapters are overviewed below:

Chapter 1: A brief Introduction, scope of the project and statement of problem.

Chapter 2: literature review of Ultra Wide-Band Technology.

Chapter 3: literature review Ultra wide Band antenna characteristics.

Chapter 4: project Design methodology and steps.

Chapter 5: propose Ultra Wide Band antennas design to fulfill UWB requirements.

Chapter 6: discuss simulation and measurement results.

Chapter 7: Conclusion and future work.

1.6 Project Work Plan:

The literature study was started by taking an over view about different types of antenna, The study then concentrated on selecting the appropriate antenna design to fulfill project requirements. Books, internet and journals were the major recourses of project information. High Frequency Structural Simulation (HFSS) has been used to verify and simulate the antennas design.

A planned schedule for the project is given in table 1:

	Jul 08	Aug 08	Sep 08	Oct 08	Nov 08	Dec 08	Jan 09	Feb 09	Mar 09
Literature Review	*	*	*						
Software Skill and Simulation		*	*	*					
Design Modeling				*	*	*			
Development Implementation						*	*	*	
Results evaluation and testing							*	*	*
Report writing and Presentation			*	*	*	*	*	*	*

Table 1.1: Planning Schedule of the project.

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