UNIVERSITI TEKNOLOGI MARA

SOLID SHARP-EDGED WIRE DIAMOND DIPOLE MICROSTRIP ANTENNA

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ABSTRACT

This thesis presents a solid sharp-edge wire diamond dipole microstrip antenna for UWB applications, operating within the range of 3.1-10.6 GHz. The work was carried out in four stages; literature review, design and simulation using a commercial software, fabrication and finally, testing and analysis. A 3D electromagnetic simulator was used for designing and simulation of the antenna, with the following parameters; radiation efficiency of 88.14%, VSWR of 1.239, return loss of -19.440dB and gain of 7.694dBi. The antenna was fabricated using RT Duroid 5870 substrate with a 2.33 relative permittivity and was fed by coaxial feed. An analysis of a prototype antenna was carried out by using Vector Network Analyzer (VNA). It was observed that the simulated and the measured parameters concur well.

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CHAPTER 1

OBJECTIVES AND LITERATURE REVIEW

1.1 Introduction

The antenna is defined as "a means for radiating or receiving radio waves" by the *IEEE Standard Definitions of Terms for Antennas*. It is also defined as a transitional structure between free-space and a guiding device, transporting electromagnetic energy from the transmitting source to the antenna, or from the antenna to the receiver [1]. One of the most recently used antennas are the microstrip antennas. These antennas consist of a metallic patch on a grounded substrate.

Microstrip antennas have several advantages, such as light weight, low profile, low cost and ease of fabrication. The metallic patch can be modeled for different varieties of configurations, such as the diamond shape. The diamond dipole antenna configuration is selected based on the theory that thickening a dipole increases its impedance bandwidth and spreads the energy throughout the dipole. Apart from that, adding sharp corners to a thick dipole antenna adds current nulls at anti-resonant frequencies, with the tendency of currents to concentrate on edges become more pronounced [2].

The proposed antenna was designed for the use in Ultra-wideband (UWB). This enables transmission over a wide frequency, where a low power spectral density can be received. UWB has promised to offer high data rates at short distances with low power, primarily due to wide resolution bandwidth. Compact and cheap ultra wideband antennas are needed for numerous UWB applications like wireless communications. Ultra-wideband allocation is set to be in 3.1-10.6GHz spectrum by the Federal Communications Commission [3], requires an antenna with VSWR ≤ 2 for proper impedance matching throughout the entire band. The focus of this work is