UNIVERSITI TEKNOLOGI MARA
CAWANGAN PULAU PINANG

DESIGN AND PERFORMANCE ANALYSIS OF ULTRA-WIDEBAND (UWB) ANTENNA FOR WIRELESS SYSTEM

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February 2025

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

This project identifies the signal penetration performance of ultra-wideband (UWB) antenna through different materials, focusing on wood and brick as barriers. The antenna, measuring 35 mm × 45 mm × 1 mm, uses Rogers RT-5880 as the substrate and operates within the 0–12 GHz range. The design process involved selecting microstrip patches, feeding techniques, and ground shapes, followed by simulations using CST Studio Suite software and antenna fabrication. Further analysis involved varying the distance between the antenna and wall materials (wood and brick) and observing the S11 parameters. This study highlights challenges in translating theoretical designs into practical applications, emphasizing the need for precise fabrication, material validation, and experimental optimization. Simulations confirmed the antenna met UWB standards, with a wide bandwidth and reflection coefficient of -10 dB. However, differences between simulated and measured results occurred, with the fabricated antenna exhibiting shifted resonance frequencies, reduced bandwidth, and diminished performance. These issues were attributed to fabrication flaws and environmental factors during measurements. While the simulated antenna performed well under ideal conditions, the fabricated version underperformed in real-world conditions. This project provides understanding on UWB signal penetration, highlighting the need of precise analysis and good antenna design. Future work will be focused on optimising antenna design, performance analysis, and integrating findings into practical applications.

ACKNOWLEDGEMENT

Firstly, I wish to express my deepest appreciation to my project supervisor, Dr. Aslina Abu Bakar for her invaluable guidance, feedback, and support throughout the project journey. Her experience and motivation left a powerful impact on completing this project.

I extend my gratitude to Universiti Teknologi Mara (UiTM) for providing an important research environment. A special note of appreciation goes to library and laboratory staff for their assistance in accessing the research materials and equipment at PCB laboratory.

Finally, this thesis is dedicated to the loving family for the support, vision, and determination to educate me. This piece of victory is dedicated to them. Alhamdulilah.

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