

UNIVERSITI TEKNOLOGI MARA

**CHARACTERIZATION OF LENS ANTENNA IN WIRELESS
COMMUNICATION APPLICATIONS**

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ABSTRACT

This paper presents a design of lens antenna in wireless communication system. The main focus of this project is to design lens and analyze the lens behavior in lens antenna. Besides, the factor that influence the design of lens and gain of lens antenna is investigated. Antenna is use to receive and transmit signal. Antenna with high gain will allow good signal to be transmitted. However, conventional antenna has low gain. Therefore, to increase the gain of the system lens antenna is designed. The performance of system gain is monitored. Simulation is performed in CST Microwave Software. There are three basic shape of lens is studied in this project and the lens are flat lens, concave lens and convex lens. Preliminary work is done in order to find out the best lens shape that will provide the higher gain. As a result, convex lens shows the highest gain and for that reason convex lens will be the project lens design. Next, optimization of the convex lens. The optimization parameters are distance between lens and feed, edge of lens and thickness of lens. Thickness of lens will be tested in two method. The first method is thickening the outer surface of lens. Then the second method is thickening the inner surface of lens. At the end of the experiment, the system gain showed an increment from 8.782 dB to 11.07 dB. The new lens design is obtained and those optimization parameters above influence the gain performance.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Today, the wireless communications systems have become an integral part of daily life and continue to evolve in providing a better quality and experience for users. The wireless communication systems experienced a progressive development in the most recent couple of decades. Many wireless products and service nowadays were introduced due to this invention such as wireless local area network, Global positioning System (GPS), mobile phone, bluetooth and etc. In wireless communication system, the demands for higher data rates of transmission keep increasing which includes high gain and high directivity [2-3]. Conventional antenna itself is not enough to provide the system with high gain. Therefore, lens antenna is one of the potential alternative to enhance gain [18][10].

Lens antenna can be divided into two main parts, primary and secondary. A primary part consists of feed antenna while the secondary part consists of lens. The lens used to directs the wave from the feed antenna and prevent the signal from spreading in undesired direction. This type of antenna works on the principle of refraction (Snell's Law) [2-4][8]. Generally, lens antenna are easy to design and assemble as they are