DESIGN OF MICROSTRIP PATCH ANTENNA ARRAYS AT 10 GHz

Thesis is presented in partial fulfilment for the award of
Bachelor of Engineering (Hons.) in Electrical

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ABSTRACT

The purpose of this project is to design microstrip patch antenna arrays with operating or resonant frequency at approximately 10 GHz. The voltage standing wave ratio (VSWR) should be less than 2 at the resonant frequency. The microstrip patch antenna arrays are the upgrade version of past semester's final project.

The main parameters concerned for this project are return loss S_{11} and VSWR. For the simulation, *HP EEsof LIBRA* Computer aided design (CAD) simulation package is used to determine the simulated response of the arrays.

The microstrip patch antenna arrays are fabricated on RT/duroid® 5870 microstrip. The dielectric constant ε_r of the microstrip is 2.33 and the substrate thickness h is 0.5 mm.

Finally, parameters of the microstrip patch antenna arrays are measured using *WILTRON 562* scalar network analyser (SNA). These measurement results are compared with the simulation results to observe the differences between them.

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1.1 Introduction

An antenna or aerial is defined by Oxford Dictionary as "a wire or rod for transmitting or receiving radio waves". The *IEEE Standard Definitions of Terms for Antennas (IEEE Std 145-1983)* defines the antenna as "a means for radiating or receiving radio waves". In other words, the antenna is the transitional structure between free space and a guiding device. The guiding device or transmission line may take the form of a coaxial line, a hollow pipe (waveguide) or a microstrip line and it is used to transport electromagnetic energy from the transmitting source to the antenna or from the antenna to the receiver.

Antenna is an important device in every wireless telecommunication systems. It can be found on televisions, radios, telephones and other telecommunication equipments. Without the invention of antenna, it would be impossible for humans to communicate in a long distance. This is based on the fact that wire cannot be used for long distance communications. Therefore the proper design of antennas is crucial to make sure that communications between two parties at different places can be achieved without any problems.

Microstrip antenna has been one of the most popular in antenna design in recent years. The numerous advantages of microstrip antenna such as its low weight, small volume and ease of fabrication using printed circuit technology led to the design of several configurations for various applications. With increasing requirements for personal and mobile applications, the demand for smaller and low profile antennas has brought the microstrip antenna to the forefront.