SIMULATION OF A THREE PROBE REFLECTOMETER SYSTEM

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NOR WAHIDAH BINTI MISRAN
Faculty of Electrical Engineering
UNIVERSITI TEKNOLOGI MARA
40450 SHAH ALAM
SELANGOR DARUL EHSAN
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ABSTRACT

The aim of this project is to do a simulation of a three probe reflectometer system. A slotted line is used to measure three standing wave voltages corresponding to three probe positions which are one-eight wavelengths apart. The output of this measurement can be used for obtaining the complex reflection coefficient of a material. This involves designing a circuit of transmission line measurement using Genesys software. This simulation can later be used to transform the existing bulky three probe reflectometer hardware onto a microstrip. The existing hardware consists of a Gunn diode source, 1 kHz modulator, attenuater, slotted line, A/D converter and a computer. Using software, it transforms the existing measurement system known as Reflectometer to Microstrip circuit. The simulation results and published data from Reflectometer measurement system are compared. The microstrip circuit was fabricated and the Reflectometer measurement system becomes smaller and portable.

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CHAPTER 1

INTRODUCTION

In this chapter, the background of the project is briefly discussed to provide an overview of the overall project. Also, some general information related to the design was included to give an insight of what radio frequency design is.

1.1 BACKGROUND OF THE PROJECT

Microstrips played an important role in radio frequency (RF) or microwave applications. Emerging application to challenge RF to operate in higher performance requirements, smaller size, and lighter weight and lower cost [2]. As circuits have been reduced in size with integrated semiconductor electron devices, a transmission structure was required that was compatible with circuit construction techniques to provide guided waves over limited distances. This was realized with a planar form of single wire transmission line over a ground plane, called microstrip. Microstrip employs a flat strip conductor suspended above a ground plane by a low-loss dielectric material. The advantages of microstrip have been well established, and it is a convenient form of transmission line structure for probe measurements of voltage, current and waves. Microstrip structures are also used in integrated semiconductor form, directly interconnected in microwave integrated circuits.

In this work, the design of the reflectometer was realized using circuit prototype. The design is then being simulated with known industrial software where we find the reflection coefficient and voltage standing wave ratio for the output of the design. Transformation is then applied to convert the prototype design to the desired frequency range. Reflectometer designing for microwave application based on the use of distributed element. It consists of transmission line section with specific arrangement. The prototype reflectometer was fabricated on