THE DESIGN OF SINGLE SECTION MICROSTRIP BRANCH LINE COUPLER

Presented in partial fulfillment for the award of the
Bachelor of Electrical Engineering (Honors)
UNIVERSITI TEKNOLOGI MARA

MARIA BINTI AWI
Faculty of Electrical Engineering
Universiti Teknologi Mara
40450 Shah Alam
Selangor Darul Ehsan
MAY 2006

ACKNOWLEDGEMENT

Above all, I would like to convey my most gratitude to the one and only one lord of ours, The Almighty ALLAH S.W.T for blessing me, besides giving me the strength and ability to complete this project as a requirement in my bachelor program.

Secondly, a deepest gratitude to my beloved parents and family as well as Mohd Razi B. Rahiman, for their pray, support and the tremendous effort they have put to materialize this thesis which you are holding now.

My appreciation also goes to my respectful supervisor, En. Mohd Nor B. Md. Tan for his responsibility in guiding me to complete this thesis. Thanks again for all those valuable advise, kindness and time to ensure the successfulness of this project.

I also would like to extend my millions of thanks to my RF Design lecturer, Prof. Madya Dr. Zaiki Awang for his assistance in completing this final year project, laboratory technician, En. Hisham B. Mohammad, En. Khalim and to all the people who is being involved directly or indirectly in finishing this thesis.

Thank you very much.

ABSTRACT

The objective of this project is to design a single section microstrip branch line coupler at operation frequency of 2.45 GHz with the coupling factor of 3.5 dB. The aim of the design is to provide a perfect match between all the connected lines of the coupler. The critical parameters that need to be investigated in this project are return loss, insertion loss, coupling and isolation. The coupler was design so that the power signals can be divided equally between the output and coupling port at the operation frequency for the used of several applications in microwave system.

The circuit design is simulated using *Eagleware Genesys* and *Eesof Libra* Microwave CAD package and finally is fabricated on a microstrip laminate '*RT/Duroid 5870*' with the thickness of 0.5 mm and relative permittivity of 2.33. The fabricated coupler is measured by using a vector network analyzer. Finally, both simulation and measurement results are compared.

LIST OF CONTENT

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Introduction

Microwave system can be easily considered as the ultimate limit to data communications. The network access is flexible and does not depend on the location. The beginning of the microwave system is actually has discovered late 1890s where Guglielmo Marconi, an Italian inventor, proved the feasibility of radio communication. However, before the invention, James Clerk Maxwell, a Scottish physicist, has found the existence of radio waves back in 1860. In 1886, Heinrich Rudolph Hertz, a German physicist, proved that the radiation and reception of electromagnetic energy through air. Marconi used both ideas to reveal radio and wireless telegraph technology. Since then, the advancement of this system progress rapidly.

Microwave system uses the radio frequency (RF) to operate. The range of this frequency is between 300 MHz and 300 MHz. Table 1.1 classifies the frequency spectrum which was created by the Institute of Electrical and Electronic Engineers (IEEE) and Fig. 1.1 shows the application involved above the microwave band.

Based on Table 1.1, as the frequency increases, the wavelength will be decreased and therefore, the available bandwidth also will be wider. That is the reason of why high frequency is suits for communication and radar applications. As such, 10% bandwidth system at 10 GHz provides a bandwidth of 1 GHz [1].