

CIRCULAR PATCH ANTENNA WITH
DUMBBELL DEFECTED GROUND
STRUCTURE (DGS) FOR WIMAX
APPLICATION

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JANUARY 2013

ACKNOWLEDGEMENT

Alhamdulillah Thanks to Allah who with His willing giving me the opportunity to complete this thesis. This thesis was prepared for my final year project 2 which about antenna design with the title of Circular Patch Antenna with Dumbbell Defected Ground Structure (DGS).

First of all, I would like to give a special thanks to Prof Madya Norasimah Khadri as my supervisor that guided me from beginning to the end of this project and thesis.

Deepest thanks and appreciation to my parents for their pray and give full of support to complete this thesis.

Last but not least, thanks a lot to all who involved directly or indirectly for their cooperation during completing the research report information, suggestion and guidance to make this project was done properly. Thanks a lot.

ABSTRACT

This paper presented the design of dumbbell shape defected ground structure (DGS) which implemented on circular patch microstrip antenna. The radiation performance of the antenna is characterized by varying the geometry and dimension of the DGS. Dumbbell shape DGS is placed at specific position which required in the ground plane. Then, this geometry structure will disturb the shield current distribution of ground plane. The geometry chosen for DGS was dumbbell shape. This structure permits smaller antenna element that is increased the value of gain and directivity of the antenna as well reduce the antenna size. This project presented the simulation and measurement result between conventional antenna and circular patch antenna with dumbbell Defected Ground Structure (DGS). Then, the performance between them was compared. The simulation result simulate by using CST Microwave Studio software while measurement result measured by Vector Network Analyzer (VNA). The simulation result have verified that the dumbbell shape DGS has improved the performance of conventional antenna. The return loss enhances about 56.8% for simulation and 50.52% for measured value. The gain and directivity improved by 0.05 dB and 0.09 dBi respectively.

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CHAPTER ONE

INTRODUCTION

This chapter consists of an introduction according to my project including of problem statement, objectives and scope of my study. This chapter highlighted the important part of my project and be a guideline of this thesis.

1.1 INTRODUCTION

An antenna is a device for transmitting or receiving radio waves [1]. Microstrip antennas consist of a metallic patch on grounded substrate. These antennas are low profile and low cost antenna, lightweight and conveniently to be integrated with RF device. The application is used in high-performance aircraft, spacecraft, missile applications and satellites. Recently they are widely used by government and commercial applications such as in the wireless communication [6]. Besides low profile, microstrip antenna are conformable to planar and non-planar surface, simple and inexpensive to manufacture using modern printed-circuit technology, compatible with Monolithic Microwave Integrated Circuit (MMIC) design and mechanically robust when mounted on rigid surfaces [22].

Microstrip patch antennas are attractive for their well-known efficient features such as compatibility with Monolithic Efficient Microwave Integrated Circuit (MMIC), *lightweight, less fragile and low profile* [23]. *By the way, it is also has disadvantage* associated with microstrip patch antenna is the narrow bandwidth, which is due to the resonant characteristics of the patch structure and surface that can reduce the antenna efficiency, gain and directivity. To suppress surface waves, there are two techniques that can apply which is defected ground structure (DGS) and electromagnetic band gap (EBG) structures [4]