

Proximity-Coupled Microstrip Patch Antenna for WiMAX using Low Dielectric Constant Substrate

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ABSTRACT

The purpose of this project is to design a proximity-coupled microstrip patch antenna operating at 3 different frequencies. Proximity-coupled microstrip patch antenna is a noncontact fed patch created in a multilayer antenna to overcome the shortcomings of the direct contact fed patch. Spurious radiation reduction is one of the most important advantages of this feed. This design also provides choices between two different dielectric substrates in order to optimize the antenna performance.

The important parameters in this project are return loss (S_{11}), voltage standing wave ratio ($VSWR$), bandwidth, gain and the directivity of the antenna. All the parameters are taken within 3 WiMAX frequencies which are 2.3GHz, 2.5GHz and 3.5 GHz in order to see the reliability of the antenna.

Specific details such as patch shape and feeding method influence patch antenna behavior, but the major factor influencing the performance of a microstrip antenna is the substrate upon which it resides. Most of the previous attempts were focused on the improvement of either the bandwidth or directivity. Thus, it would be useful to improve both of these parameters at the same time to enhance the flexibility of the patch antenna.

The bandwidth or directivity can be increased by using thick substrate which is by using the multilayer technique. The bandwidth of a microstrip antenna is best for low dielectric constant substrates and if the substrate thickness is increased in an attempt to improve bandwidth, spurious feed radiation increases and surface wave power increases.

Here two antennas with the combination of *Duroid*® 5880 ($\epsilon_r = 2.2$) and Foam ($\epsilon_r = 1.07$) and two layers of *Duroid*® 5880 ($\epsilon_r = 2.2$) are compared. The comparison shows that the antenna with Foam as one of its substrate is better than the other one which is composed of two layers of *Duroid*® 5880.

TABLE OF CONTENTS

CHAPTER	PAGE
DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	viii
LIST OF TABLES	x
ABBREVIATION	xi
1 INTRODUCTION	
1.1 Project fundamental	1
1.2 Objectives of the project	2
1.3 Scope of the project	2
1.4 Thesis Outline	3
2 LITERATURE REVIEW	
2.1 Introduction to microwave	4
2.2 Parameters definition	4
2.2.1 Reflection coefficient	4
2.2.2 Return Loss	4
2.2.3 Voltage Standing Wave Ratio	5
2.3 S-Parameters	5
2.4 Microwave frequencies	8
2.5 WiMAX	9

CHAPTER 1

INTRODUCTION

1.1 Project fundamentals

The proximity-coupled microstrip patch antenna using low dielectric constant substrate at WiMAX frequencies is a multilayer microstrip antenna with proximity-coupled feeding technique which resides on the substrates with a low dielectric constant and designed to be used at WiMAX frequency range.

The significant factor in this antenna design is the material that is used as the substrate, the operability and suitability of the antenna relating to the frequency, structure and types of feeding technique used. Low dielectric constant substrate is used in an attempt to improve the bandwidth.

This antenna designed plays a significant role in advancing the communication technology in Malaysia such as in the satellite, mobile and broadcast communication field. Its usage can exploit space diversity to help provide better bandwidth, increased gain and directivity and low loss transmission at an affordable cost.