

**PERFORMANCE ENHANCEMENT OF AN ANTENNA USING LOW TEMPERATURE  
CO-FIRED CERAMIC (LTCC) FOR WI-FI APPLICATIONS**

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## ABSTRACT

This paper presents the design of performances enhancement of an antenna using Low Temperature Co-fired Ceramic (LTCC) multilayer packaging technology with frequency of 2.4GHz for wireless communication (Wi-Fi) application using Computer Simulation Tool (CST). The LTCC antenna of 8 layers substrate is designed on the substrate type of Ferro A6S (lossy) with dielectric constant of 5.9, substrate thickness of 0.096mm and silver thickness of 0.01mm respectively. The parameters of the antenna need to be optimized in order to achieve better performances. The simulation results of return loss ( $S_{11}$ ), gain, directivity, bandwidth and Voltage Standing Wave Ratio (VSWR) are compared and analyzed between single element patch antenna, 1x2 planar array antenna, 2x2 planar array antenna and 2x2 planar array antenna with Defected Ground Structure (DGS). The performance of single element LTCC antenna gain increment by 65%. The gain has increased up to 3.43dB which is from 5.268dB to 8.698dB. In other hand, the directivity also increased by 3.333dB which is from 6.471dBi to 9.804dBi and denotes by 52%. All the designed LTCC antennas have return loss below than -10dB with VSWR approximately equal to 1.0.

## TABLE OF CONTENTS

CONTENTS	PAGE
DECLARATION .....	i
AKCNOWLEDGEMENT .....	ii
ABSTRACT .....	iii
TABLE OF CONTENTS .....	iv
LIST OF FIGURES .....	vii
LIST OF TABLES .....	ix
LIST OF SYMBOLS AND ABBREVIATIONS .....	x
CHAPTER 1 .....	1
INTRODUCTION .....	1
1.1 BACKGROUND OF STUDY .....	1
1.2 OBJECTIVES .....	2
1.3 SCOPE OF WORK .....	2
1.4 OUTLINE OF THESIS .....	3
CHAPTER 2 .....	4
LITERATURE REVIEW .....	4
2.1 ANTENNA THEORY .....	4
2.2 FUNDAMENTAL PARAMETERS OF ANTENNAS .....	5
2.2.1 Radiation Pattern .....	5
2.2.2 Beamwidth .....	6
2.2.3 Gain and Directivity .....	7
2.2.4 Return Loss ( $S_{11}$ ) and Bandwidth .....	8
2.2.5 Voltage Standing Wave Ratio (VSWR) .....	9
2.3 FEEDING METHODS .....	10
2.3.1 Microstrip Line Feed .....	10

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 BACKGROUND OF STUDY**

Nowadays, the developments of technology are opening up new markets besides making new applications possible. The growth of wireless communication systems leads to an increasing demand for high performances of antenna.

Almost everyone in a modernize country uses wireless internet on a daily basis. The 2.4GHz band is more popularly used than the 5.8GHz band in wireless communication system. 2.4GHz band can propagate better through objects such as walls than that of the 5.8GHz band and provides better coverage. Developing a new antenna with wireless application of low cost high gain antenna can increase the wireless coverage. Therefore, the performance of an antenna should be improved as well as minimizing the loss as small as possible.

In order to satisfy the demand of high and good performances of antennas, Low Temperature Co-fired Ceramic (LTCC) technology has been extensively studied to satisfy the current needs as the LTCC has many advantages. The advantages are including high temperature resistance, low dielectric loss, excellent characteristics for high frequency and high Q factor. LTCC multilayer substrate offers high dielectric constants which are 5.9 and 7.8 or even 14. However in the view point of the antenna, the high dielectric constant of LTCC material causes serious problems to the design of antennas with high gain and good radiation pattern.