

#### THE DESIGN OF THE PLANAR MICROSTRIP PATCH ANTENNA ARRAY

#### Caroline Ann Anak Mai

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#### Tajuk: The Design of The Planar Microstrip Patch Antenna Array

Nama penulis: Caroline Ann anak Mai

Matrik: 5309

telah dibaca dan disahkan oleh:



21.5.05

Tarikh

Pusat Khidmat Maklumat Akademik UNIVERSITI MALAYSIA SARAWAK 94300 Kota Samarahan



#### THE DESIGN OF THE PLANAR MICROSTRIP PATCH ANTENNA ARRAY

#### **CAROLINE ANN ANAK MAI**

This project is submitted in partial fulfilment of the requirements for the degree of Bachelor of Engineering with Honours (Electronic & Telecommunication Engineering)

#### Faculty of Engineering UNIVERSITI MALAYSIA SARAWAK 2004

Dedicated to my beloved family, lecturers and friends.

.

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#### ABSTRAK

#### Pembangunan yang pesat dalam bidang komunikasi telah menggalakkan

penggunaan antena untuk "base station"," mobile station" berkenderaan dan aplikasi

"hand-held". Oleh itu, tujuan utama projek ini adalah untuk mereka "antenna array"

menggunakan perisian Microwave Office 2002.

Focus projek ini adalah untuk mengkaji langkah untuk mereka bentuk antena

yang mana melibatkan proses pemilihan "substrate", jenis "feeding technique" antena dan susunan yang optimum.

Perisian "Microwave Office 2002" digunakan untuk mengkaji reka bentuk antenna dan menghasilkan graf "VSWR", carta smith, "return loss" dan "impedance".

Dengan itu, pereka dapat menbuat penilaian tentang keberkesanan antena bagi

memastikan ia berfungsi di tahap optima.

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### ABSTRACT

The rapid development of mobile communication systems has led to the use of

antennas for base station, mobile station vehicular and hand-held applications [1].

Therefore the aim of this project is to design an antenna array using the Microwave Office 2002 software.

The main intention of this project is to study the step of design of an antenna

which involve the process of choose the suitable substrate, feeding technique, optimum

single patch antenna and the array.

Microwave Office 2002 software was used to simulate the antenna design and

generate the VSWR, smith chart, return loss and impedance chart. From the charts,

designer evaluated the antenna to see the effectiveness of the antenna to ensure it

performed at the optimum level.

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# CHAPTER 1

# INTRODUCTION

#### 1.1 EVOLUTION OF ANTENNAS IN MOBILE COMMUNICATION SYSTEM

The evolution and development of antennas have a long and fascinating history which

start from the year 1887 by Hertz's in radiation experiments in order to confirm the Maxwell's

theories of 1864 although Henry is considered to have done initial radiation experiments with

discharges in 1842[1]

The first mobile communications was making the first move in 1885 with wireless

telegraph between trains and stations, developed by Thomas Edison [20]. The real mobile

communication services started with wireless telegraph on ships in 1898 developed by

Guglielmo Marconi using long vertical wire antennas in various form such as T, inverted L,

and umbrella shapes. The portable equipment appeared in 1910.

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Both world wars provided the need for advanced antenna design and the technology

surge [21]; wire antennas were firmly recognized in the 1920s, while microwave antenna

design and technology was established in the 1950s. A new antenna era emerged in 1960s,

which triggered by the revolutionary progress in semiconductor integrated circuits, attributed

at first to the cold war defense industry but then carried forward into the commercial

equipment sector.

The demand opened up designers to the possibilities of redesign, recreation, and transformation of known antenna types in less bulky, lightweight, low-cost, easy-tomanufacture radiating structures, compatible with the newly conceived integrated electronic

packages. This leads to the creation of printed antenna technology and the Global Positioning

Satellite (GPS).

#### Table 1.1: Factors influencing recent antenna technology and design [1].

Factor	Trends	
Spectral congestion and utilization	Wider bandwidth operation, improved performance, interference rejection, use of millimeter and submillimeter antennas	
Explosive growth in mobile/ personal communication systems	New compact user-friendly higher performance antennas for cellular terrestrial operation of handsets and vehicles.	
Escalating information and processing speeds	Wider bandwidth "smart" antenna with pattern agility and fast scan acquisition, antennas for microwaves.	
Growth in SATCOMS	Higher performance space-borne antennas offering multifunction operation and reduced payloads, small high-performance handset antennas	
Link with IN and ATM networks	Small high-performance antennas for mobile terminals	
Traffic information and control	Specifically designed antennas for systems	
New materials	Redesign of existing and creation of new, robust antenna structures to simplify manufacture and operation	
Impact of computer modeling and computer- controlled measurement	Strengths design methods to create higher performing equipment, compatible antennas at lower cost	
Public awareness of electromagnetic radiation	Preference for lower transmitted powers, environmentally friendly antennas, and antenna platform	

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