

Reflectarray Antennas for Strategic Defense Technology

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Muhammad Yusof Ismail
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2012

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First Edition 2012

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Cataloging in Publishing Data National Library of Malaysia

Muhammad Yusof Ismail
Reflectarray antennas for strategic defense technology/
Muhammad Yusof Ismail, Muhammad Inam Abbasi.
ISBN 978-967-0468-01-3

1. Antennas, Reflector. 2. Antenna arrays. I. Muhammad Inam Abbasi.
621.3824

Published by:
Penerbit UTHM
Universiti Tun Hussein Onn Malaysia
86400 Parit Raja,
Batu Pahat, Johor
Tel: 07-453 7051 / 7454
Fax: 07-453 6145

Website: <http://penerbit.uthm.edu.my>
E-mail: pt@uthm.edu.my

Penerbit UTHM is a member of
Majlis Penerbitan Ilmiah Malaysia
(MAPIM)

Printed by:
Penerbit UTHM
Universiti Tun Hussein Onn Malaysia
86400 Parit Raja,
Batu Pahat, Johor
Tel: 07-453 7051 / 7454
Fax: 07-453 6145

Preface

In the recent years, reflectarray antennas are being used extensively in radars and wireless systems which can be applied for defense technology. The rapid progress in the development of active reflectarray antenna technology has led to the various potential communications applications especially in military technology.

This book is intended for postgraduate students and researchers specializing in microwave propagation, antennas and radar systems. It will also serve as a reference material for engineers particularly in the wireless communications industry. The fundamental concepts and principles behind reflectarray antennas are thoroughly explained in a simpler manner. Each chapter contains different fundamental backgrounds which help the readers to understand the basic requirements of reflectarray antenna for defense applications.

Chapter 1 introduces the book with its background and applications. Fundamental concept of microwave propagation associated with Maxwell Equations is presented in this chapter in order to form the basis for the solution of plane waves that are used in the analysis of reflectarray antenna. Basic established electromagnetic energy equations are briefly derived to enable the background of microwave propagation in different spectrum of frequencies. The principles of plane waves in different mediums are also described which highlight the main sources of losses of propagation of wave energy. The study of loss mechanism of wave propagation provides an insight to understand the reflectarray losses which is explained in Chapter 3.

Chapter 2 presents the basic military technology which involves the general science of military systems. The essence of the need of advanced military systems are also described in detail which take into account branches of military science and different types of military technology that provides the fundamental concept of microwave propagation.

The emerging flat antenna systems called reflectarray as the main antenna technology are described in Chapter 3. Different analysis techniques used for microwave antenna design are explained. The fundamental comparison of reflectarray antennas

with the existing parabolic reflectors is generally given. Design considerations of passive reflectarray are also briefly covered.

The significant features of reconfigurable reflectarray antenna for beam shaping realization are highlighted in Chapter 4. The details of the mechanical systems of phased array antenna and parabolic reflectors are explained. The novel design of reconfigurable reflectarray antennas is also provided which concentrates on a simple technique based on electronic control systems. Latest design development of reconfigurable antennas which focuses on radar and defense applications is also given.

Chapter 5 is devoted to implementation of reflectarray antenna systems for strategic defense applications. The basic concept of radar cross section and the relationship with properties of passive and active microwave absorbers are presented. The strategy of radar cross section reduction using electronic control technique is also provided.

Authors are grateful to the Ministry of Higher Education of Malaysia for funding this research work under the Best Fundamental Research Grant Scheme award (FRGS VOT-0983) and Prototype Research Grant Scheme (PRGS VOT-0904). Special thanks to the staff of Wireless and Radio Science Centre (WARAS), University Tun Hussein Onn Malaysia for the technical support during this work.

Table of Contents

PREFACE	v
TABLE OF CONTENTS	vii
CHAPTER 1	1
FUNDAMENTALS OF MICROWAVE PROPAGATION AND ANTENNAS	1
1.1 Introduction	1
1.2 Wave propagation	2
1.3 Electromagnetic equations	4
1.4 Different types of materials in electromagnetic domain	6
1.4.1 Homogeneous and non homogeneous materials.	6
1.4.2 Isotropic and anisotropic materials	6
1.5 Transmission mediums	7
1.5.1 Guided mediums	8
1.5.2 Unguided mediums	9
1.6 Plane waves in different medium of transmissions	9
1.6.1 Plane waves in a lossless medium	10
1.6.2 Plane waves in a general lossy medium	12
1.6.3 Plane waves in a good conductor	13
1.7 Electromagnetic energy and power flow	14
1.8 Basic antenna properties	15
1.8.1 Gain	15
1.8.2 Beamwidth	16
1.8.3 Directivity	17
1.8.4 Bandwidth	18
REFERENCES	20

CHAPTER 2	21
BASIC MILITARY TECHNOLOGY	21
2.1 Introduction	21
2.2 General science of military technology	22
2.3 Essence of military technology	22
2.4 Branches of military technology	23
2.5 Types of military technology	23
2.5.1 Armour	23
2.5.2 Artillery	24
2.5.3 Fortifications	25
2.5.4 Martial arts	26
2.5.5 Military aviation and military aircraft	26
2.5.6 Military vehicles	27
2.5.7 Military communications	27
2.5.8 Military robots	28
REFERENCES	30
CHAPTER 3	31
REFLECTARRAY ANTENNAS	31
3.1 Introduction	31
3.2 Fundamentals of parabolic reflector antenna	32
3.3 Comparison between parabolic reflectors and reflectarrays	34
3.4 Passive reflectarrays	36
3.5 Phase distribution in passive reflectarrays	38
3.6 Design considerations of reflectarrays	40
3.6.1 Full wave analysis techniques	41
3.6.2 An overview of non conventional reflectarray designs	45
3.6.3 Design considerations based on computer models	50
3.6.4 Fabrication process	55
3.6.5 Equivalent circuit design	61
REFERENCES	63

CHAPTER 4	67
ACTIVE ANTENNAS FOR BEAM FORMING	67
4.1 Introduction	67
4.2 Basic of beam steering	68
4.3 Mechanical systems of beam steering antennas	69
4.4 Electronic systems of beam steering antennas	71
4.4.1 RF MEMS	71
4.4.1 Varactor diodes	72
4.4.1 Anisotropic material properties	73
4.5 Latest development of reconfigurable antennas	73
REFERENCES	78
CHAPTER 5	81
RECONFIGURABLE REFLECTARRAY ANTENNAS FOR DEFENSE APPLICATIONS	81
5.1 Introduction	81
5.2 Strategic defense systems	83
5.3 Reconfigurable reflectarray antennas for radar surveillance	88
5.4 Radar cross section	94
5.4.1 Factors of RCS optimization	96
5.4.2 RCS measurement	98
5.4.3 RCS calculation	98
5.5 RCS reduction	99
5.5.1 Purpose shaping	99
5.5.2 Active cancellation	100
5.5.3 Radar absorbent material	100
5.5.4 Optimization methods	101
5.5.5 Stealth technology	102
5.5.6 RCS reduction investigation	103
REFERENCES	108
INDEX	111