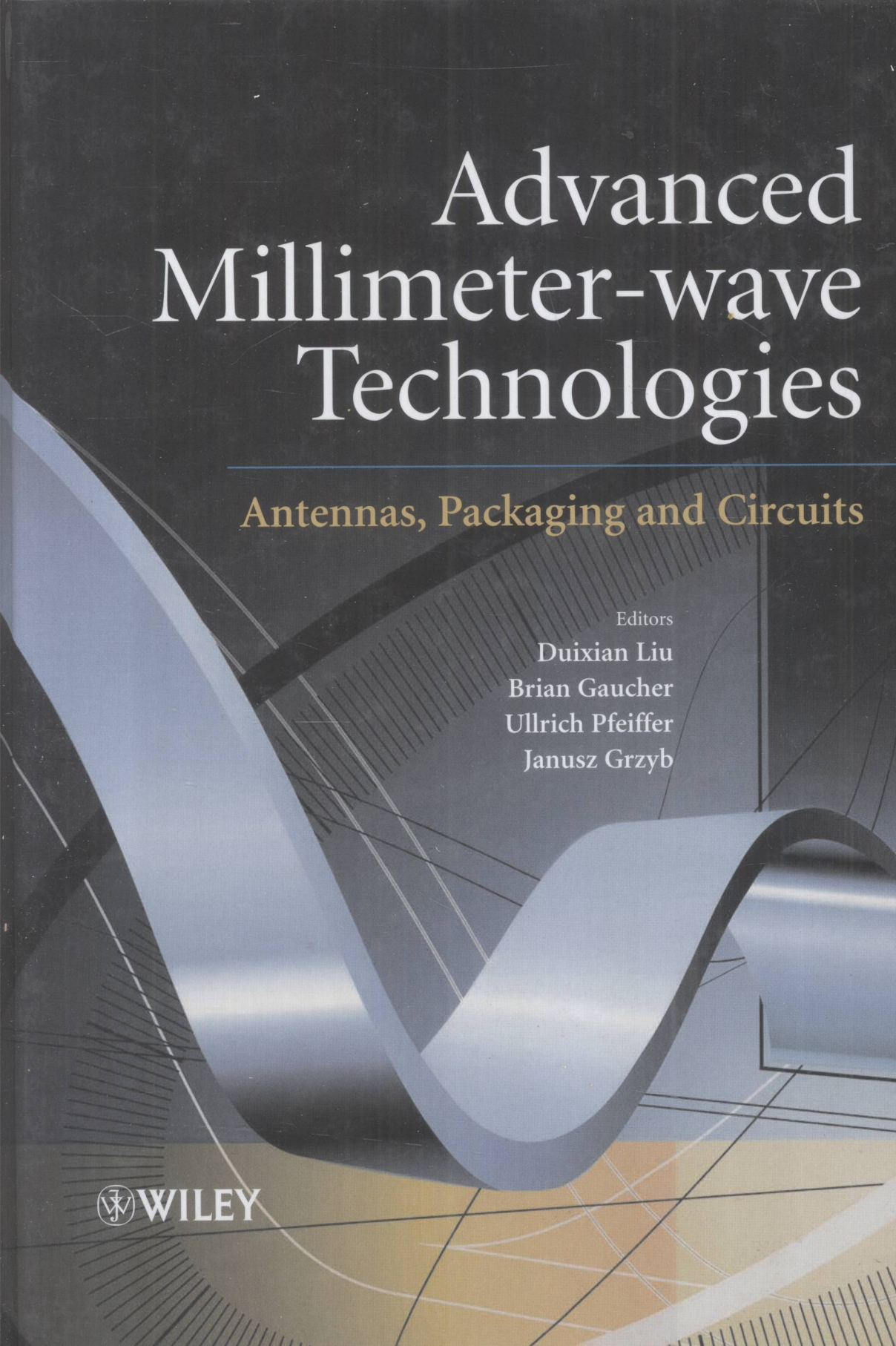


Advanced Millimeter-wave Technologies



Antennas, Packaging and Circuits

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Preface

This book is intended for a wide range of researchers, engineers, managers and the wireless industry at large who are interested to learn and influence the future direction of wireless. Its focus is on millimeter-wave (mmWave) antennas and packaging, but context and relevance is provided by including a systems perspective to give the reader an understanding of the importance of each element and the hidden depths beyond the seemingly simple topics. The goal of this book is not to showcase problems solved, but to educate everyone in this new and exciting area of research that holds the promise further to invigorate and fuel the wireless industry and pull together the brightest minds to solve some of the toughest technical challenges we have ever faced as a wireless industry. What the reader will find between these covers is the work of a small subset of people who have begun to scratch the surface enough for others to see the few brilliant gems hidden in the depths of granite-hard challenges.

At the time of writing, there were no books available on the subject of mmWave chip, antenna and packaging co-design. In order to fill this void, the authors decided to leverage some of the most recent efforts and pull them together into a coherent story that builds from a bottoms-up approach into useful and interesting systems.

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The authors would like to acknowledge the many people and organizations that made this work possible, especially seed funding from programs including NASA, under contract NAS3-03070, and DARPA, contracts N66001-02-C-8014 and N66001-05-C-8013. As in every field, there are pioneers who began in this area years ago. There is no clear delineation of by whom and when work in the mmWave field began, but there was a defining demonstration of its potential as early as 1895 with J.C. Bose, and the field has been rich with many contributors since. Likewise, Japan stands out as the first country to promote strongly the use of mmWaves, beginning decades ago. Therefore, it only seems fitting to mention from a very long list a few key people who helped to inspire this work: J.C. Bose [1], Johann-Friedrich Luy [2], Keiichi Ohata [3, 4], Peter F.M. Smulders [5], Herbert Zirath [6], Peter Russer [7], Hiroyo Ogowa [8, 9], Ted Rappaport [10], Larry Larson [11], John Cressler [12]. Also, fundamental to the success of any new technical area is university involvement. A few of the key researchers and their universities who took up this challenge early on and helped to make great strides, as seen in recent ISSCC and other symposia, journals and conferences, are: Professor Ali Hajimiri of California Institute of Technology; Professors Robert Brodersen and Ali Niknejad of UC Berkeley; Professors John Cressler and Joy Laskar of Georgia Institute of Technology; Professor Charles Sodini of the Massachusetts Institute of Technology (MIT); Professors Behzad Razavi, Frank Chang [8] and Tatsuo Itoh of UCLA; Professors Larry Larson, Gabriel Rabiz and Larry Milstein of UCSD; Professor John Long of Delft University; Professors Ken O of the University of Florida; Dr Efstratios Skafidas of Melbourne/NICT Australia; Professors Linda Katehi and Jennifer T. Bernhard of the University of Illinois; Professor John Volakis of Ohio State University; Professor Koichi Ito of Chiba University, Japan; Professor Yue Ping Zhang of Nanyang Technological University, Singapore; and Professor Jri Lee of Taiwan National University.

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Contents

List of Contributors	xv
Preface	xix
Acknowledgements	xxi
References	xxi
1 Introduction	1
<i>Brian Gaucher</i>	
1.1 Challenges	2
1.2 Discussion Framework	4
1.3 Circuits	4
1.4 Antenna	5
1.5 RF Electronics	6
1.5.1 Receiver	6
1.5.2 Transmitter	6
1.6 Packaging	7
1.7 Organization and Flow of this Book	9
References	13
2 Millimeter-wave Packaging	15
<i>Ullrich Pfeiffer</i>	
2.1 Introduction	18
2.1.1 Definition of Packaging	21
2.1.2 Packaging Challenges and Future Directions	23
2.2 Review of Microwave Packaging Technologies	27
2.2.1 MMICs	27
2.2.2 CNC Milled Metal Housings	29
2.2.3 Multi-chip Packages	30
2.3 Low-cost mmWave Packaging	31
2.3.1 Low-cost Plastic Molding at mmWaves	32
2.3.2 Chip-on-board at mmWaves	33
2.4 Emerging Packaging Technologies	34
2.4.1 Microcoaxial Wirebonds – Bridgewave	34

2.4.2	Glass Microwave Integrated Circuit (GMIC, HMIC) – TYCO, M/A-COM	34
2.4.3	Epsilon™ Packaging /MLMS™ Devices – Endwave	35
2.4.4	Plastic Molded MMICs – UMS	35
2.4.5	DCA with Integrated Antenna – IBM	36
2.4.6	LGA with Integrated Antenna – IBM	38
2.4.7	Wafer-level Packaging and Assembly of mmWave Devices	41
2.5	Package Codesign at mmWaves	42
2.5.1	Electromagnetic Modeling of mmWave Packages and Interconnects	43
2.5.2	Integrated Antennas	44
	References	45
3	Dielectric Properties at Millimeter-wave and THz Bands	49
	<i>Khalid Z. Rajab, Joseph P. Dougherty and Michael T. Lanagan</i>	
3.1	Introduction	49
3.2	Dielectric Characterization	50
3.3	Outside the THz Gap – Material Characterization Techniques	50
3.3.1	Parallel Plate (~DC–30 MHz)	52
3.3.2	Resonant Cavity (~0.5–50 GHz)	52
3.3.3	Transmission Line Methods (~0.01–300 GHz)	55
3.3.4	Fourier Transform Infrared Spectroscopy (~1–100 THz)	56
3.4	THz TDS (~0.1–10 THz)	57
3.4.1	Transmission	58
3.4.2	Error Analysis	62
3.5	Dielectric Properties	64
3.5.1	Semiconductors	64
3.5.2	Ceramic Materials	64
3.5.3	Thin Films	65
3.5.4	Metamaterials	65
3.5.5	Biomaterials	65
3.5.6	Material Needs	66
	References	66
4	Millimeter-wave Interconnects	71
	<i>Janusz Grzyb</i>	
4.1	Introduction	73
4.2	Interconnects at Millimeter-wave Frequencies	74
4.2.1	Printed Planar Transmission Lines	75
4.2.2	Metal Rectangular Waveguides	90
4.3	Interconnect Technology Options for Millimeter-wave Applications	91
4.3.1	Basic Technological Requirements	91
4.3.2	MCM-L	103
4.3.3	LTCC	105
4.3.4	MCM-D	107
4.3.5	Flexible Substrates	111
4.3.6	Silicon Micromachining	112

4.3.7	Plastic Injection Molding	117
4.4	Performance-oriented Interconnect Technology Optimization	118
4.4.1	Performance-oriented BCB Dielectric Thickness Optimization	119
4.4.2	Transmission Line Discontinuities and Distributed Passives	122
4.4.3	Bends	125
4.5	Chip-to-package Interconnects at Millimeter-wave Frequencies	134
4.5.1	Wirebonding	136
4.5.2	Flip-chip Bonding	140
4.5.3	Alternative Chip Interconnection Methods	145
	References	148
5	Printed Millimeter Antennas – Multilayer Technologies	163
	<i>O. Lafond and M. Himdi</i>	
5.1	Introduction and Considerations for Millimeter-wave Printed Antennas	163
5.1.1	Introduction	163
5.1.2	Results for Substrate Characterization Using Free Space and High- <i>Q</i> Techniques	166
5.1.3	Results of Substrate Characterization Using Printed Resonant Circuits	166
5.1.4	Substrate Choice: Impact on Antenna Efficiency	170
5.1.5	Feeding Line Influence on Radiating Patterns	173
5.2	Multilayer Interconnection Technology	176
5.2.1	Introduction	176
5.2.2	Multilayer Technologies on Soft Substrate with Thick Ground Plane	180
5.3	Multilayer Antenna Array with Shaped Beam	199
5.3.1	Directive Pattern with Passive Linear Array	199
5.3.2	Sector Beam with Linear Array	202
5.3.3	Cosecant Beam with Linear Array	206
5.3.4	Highly Directive Antennas	208
5.3.5	Multibeam Antenna	215
5.4	Measurement Disturbances: Connector and Diffraction Problems for Printed Antennas	219
5.4.1	Impact of Bonding Wire on Antenna Input Impedance	222
5.4.2	Impact of Diffraction Effects on the Ground Plane and on the Connecting Circuitry	224
5.5	Conclusion	229
	References	230
6	Planar Waveguide-type Slot Arrays	233
	<i>Jiro Hirokawa and Makoto Ando</i>	
6.1	Introduction	233
6.2	Equivalent Length of a Round-ended Straight Slot	234
6.2.1	Waveguide with a Round-ended Slot	234
6.2.2	Comparison Between Calculation and Measurement	235
6.2.3	Equal-area and Equal-perimeter Rectangular Slots for a Round-ended One	237
6.2.4	New Definition of an Equivalent Rectangular Slot	240

6.3	Alternating-phase Fed Single-layer Slotted Waveguide Array and its Sidelobe Suppression	240
6.3.1	Alternating-phase Fed Arrays	240
6.3.2	Array Design	241
6.3.3	Measurements	243
6.4	Center Feed Single Layer Slotted Waveguide Array	247
6.4.1	Structure of a Center Feed Array	247
6.4.2	Suppression of Sidelobes due to Aperture Blockage by Center Feed Waveguide	248
6.4.3	Experimental Results	249
6.4.4	Polarization Isolation between two Center-feed Single-layer Waveguide Arrays Arranged Side-by-Side	253
6.5	Single-layer Hollow-waveguide Eight-way Butler Matrix	256
6.5.1	Single-layer Eight-way Butler Matrix	256
6.5.2	Design of the Couplers	256
6.5.3	Design of Phase Shifters for the Eight-way Butler Matrix	259
6.5.4	Characteristics of the Butler Matrix	261
6.6	Radial Line Slot Antennas	266
6.6.1	High Gain Radial Line Slot Antennas with a Boresight Beam	266
6.6.2	Small Aperture Conical Beam Radial Line Slot Antennas	269
6.7	Post-wall Waveguide-fed Parallel Plate Slot Arrays	276
6.7.1	Transmission Loss in Post Waveguide	276
6.7.2	Structure	277
6.7.3	Antenna Efficiency as a Function of the Size	278
6.7.4	Sidelobe Suppression and 45° Linear Polarization	279
6.8	Coaxial-line to Post-wall Waveguide Transformers	280
6.8.1	Transformer Using a Quasi-coaxial Structure and a Post-wall Waveguide	280
6.8.2	Transformer between a Coaxial Line and a Post-wall Waveguide in PTFE Substrate	284
	References	291
7	Antenna Design for 60 GHz Packaging Applications	295
	<i>Duixian Liu</i>	
7.1	Introduction	295
7.1.1	Material Selection	296
7.1.2	Antenna Feed Line	297
7.1.3	Flip-chip Mount	298
7.1.4	Electromagnetic Interference Issues	299
7.1.5	Packaging Effects	300
7.1.6	Antenna Design	302
7.2	Air-suspended Superstrate Antenna	303
7.2.1	Air-suspended Superstrate Antenna Designs	305
7.2.2	Air-suspended Superstrate Antenna Evaluation	307
7.3	Packaged Antennas	309
7.3.1	Cavity Size Effects on Antenna Performances	315

7.3.2	Packaging Effects on Antenna Performance	316
7.3.3	Antenna in System Performance	323
7.4	A Patch Array	325
7.5	Circularly Polarized Antenna	328
7.6	Assembly Process	334
7.7	Advanced Packaging Application	335
7.7.1	LTCC-based Packages	336
7.7.2	Silicon-based Packages	342
	References	348

8 Monolithic Integrated Antennas 353

Erik Öjefors and Anders Rydberg

8.1	Introduction	353
8.2	Monolithic Antenna Integration Challenges	354
8.2.1	Antenna Size	354
8.2.2	Substrate Modes	356
8.2.3	Antenna Efficiency	356
8.3	Manufacturing Techniques for Enhanced Antenna Performance	357
8.4	Selection and Design of the On-chip Radiator	358
8.4.1	Patch Antennas	359
8.4.2	Dipole and Slot Antenna	362
8.4.3	Inverted-F Antenna	368
8.4.4	Loop Antennas	370
8.5	Circuit Integration	376
8.5.1	Cross-talk	376
8.5.2	Monolithic Integrated Antenna Examples	377
8.6	Packaging of Integrated Circuits with On-chip Antennas	379
8.7	Monolithic Antenna Measurement Techniques	380
8.8	Summary	381
	References	381

9 Metamaterials for Antenna Applications 385

Anthony Lai, Cheng Jung Lee and Tatsuo Itoh

9.1	Introduction	385
9.2	Left-handed Metamaterials: Transmission Line Approach	386
9.2.1	Composite Right/Left-handed Resonator Theory	387
9.2.2	Small Resonant CRLH TL Antennas	389
9.2.3	Infinite Wavelength Resonant Antennas	394
9.2.4	<i>N</i> -port Infinite Wavelength Series Feed Network	400
9.3	Left-handed Metamaterials: Evanescent-mode Approach	401
9.3.1	Leaky Wave Antennas Based on Evanescent-mode LH Metamaterials	403
9.4	mmWave Metamaterial Antenna Applications	405
9.4.1	94 GHz CRLH TL Feed Network	406
9.4.2	W-band CRLH TL Leaky Wave Antenna	407
9.5	Conclusions	410
	References	410

10 EBG Materials and Antennas 413

Andrew R. Weily, Trevor S. Bird, Karu P. Esselle and Barry C. Sanders

10.1	Introduction	413
10.2	EBG Materials and Components	414
10.2.1	One-dimensional, Two-dimensional and Three-dimensional EBG Materials	414
10.2.2	EBG Waveguides and Components	420
10.2.3	High Impedance Ground Planes	424
10.3	Printed Antennas on EBG Substrates	427
10.4	High Gain PRS, EBG and Metamaterial Antennas	429
10.4.1	High Gain PRS and Fabry–Perot Antennas	429
10.4.2	High-gain One-dimensional EBG Resonator Antennas	430
10.4.3	High-gain Two-dimensional EBG Resonator Antennas	433
10.4.4	High-gain Three-dimensional EBG Resonator Antennas	434
10.4.5	High-gain Metamaterial Antennas	437
10.5	Woodpile EBG Waveguides, Horn Antennas and Arrays	438
10.5.1	Woodpile EBG Sectoral Horn Antennas	438
10.5.2	Woodpile EBG Array Antennas	440
10.6	Miscellaneous EBG Antennas and Components	443
10.7	Summary	443
	References	444

11 Millimeter-wave Electronic Switches 451

Jean-Olivier Plouchart

11.1	Introduction	451
11.2	Switch Applications in mmWave Wireless Communication Systems	452
11.3	Switch Specifications	454
11.4	Impact of Switch Performance on Communication System	456
11.5	Small-signal mmWave Switch Design	457
11.5.1	Series SPST Switch First-order Model	457
11.5.2	Shunt SPST Switch First-order Model	458
11.5.3	Series–shunt SPST Switch First-order Model	458
11.5.4	Switch Figure-of-merit	458
11.5.5	SPDT with Series Switches	459
11.5.6	SPDT with Series and Shunt Switches	459
11.5.7	SPDT with Series and Shunt Switches and Matching Inductor	462
11.6	Solid-state Switch Implementation	467
11.6.1	PIN Diode Switch	467
11.6.2	NFET Switch	469
11.6.3	Small-signal 65 nm CMOS mmWave Switch Design	470
11.6.4	Large-signal 65 nm CMOS mmWave Switch Design	471
11.7	Comparison of Electronic Switch Implementations	474
11.7.1	Performance Comparison of PIN Diode Switches	474
11.7.2	Performance Comparison of CMOS Switches	474
11.7.3	Performance Comparison of III-V Switches	476

11.7.4 Performance Comparison of mmWave Switches	477
11.7.5 Power Handling for Different Semi-conductor Technologies	479
11.7.6 Solid-state Switch Technology Challenges	480
References	480

12 MEMS Devices for Antenna Applications 483

Nils Hoivik and Ramesh Ramadoss

12.1 Introduction	483
12.2 Micromachining Techniques	484
12.3 MEMS Switches – Principle of Operation	486
12.3.1 Mechanical Spring Constant	487
12.3.2 Electrostatic Force	488
12.3.3 Pull-in and Release Voltage	489
12.4 Contact and Capacitive MEMS Switches	491
12.4.1 Ohmic Contact MEMS Switches – Series Configuration	492
12.4.2 Broadband Capacitive MEMS Switches – Shunt Configuration	497
12.4.3 Switch Performance and Design Considerations	503
12.4.4 MEMS Varactors	506
12.5 MEMS Reliability and Power Handling	506
12.5.1 Reliability and Failure Modes	507
12.5.2 Power Handling	509
12.6 Integration of MEMS Switches with Antennas	512
12.6.1 Hybrid Integration	513
12.6.2 Monolithic Integration	514
12.6.3 Integration Issues	514
12.7 MEMS for Reconfigurable Antennas	516
12.7.1 MEMS-based Frequency Reconfigurable Antenna	517
12.7.2 Example Configurations	519
12.7.3 Frequency Tuning by Changing the Effective Dielectric Constant	522
12.8 MEMS-enabled Antenna Beam Scanning	525
12.8.1 Mechanical Beam Steering	525
12.8.2 Electronic Beam Scanning Using MEMS Phase Shifters	526
12.8.3 MEMS-enabled Antenna Pattern Reconfiguration	529
12.8.4 MEMS-enabled Reflect Array Antennas	530
12.9 Future Applications/Outlook	532
References	533

13 Phased Array 537

Hsueh-Yuan Pao and Jerry Aguirre

13.1 Phased Array Essentials	537
13.1.1 Introduction	537
13.1.2 Continuous Line Source Antenna	538
13.1.3 From Continuous Line Source Antenna to Phased Array Antenna	542
13.2 Antenna Element Design for Phased Arrays	548
13.2.1 Mutual Coupling	550
13.2.2 Large Array Design Methodology	551