

CONTENTS

LIST OF CONTRIBUTORS	vii
PREFACE	ix

Chapter 1 **Millimeter-Wave Integrated-Circuit Transducers** *Charles R. Seashore*

I. Introduction	1
II. Transducer Configurations	5
III. Integrated-Circuit Techniques	13
IV. Hybrid Microstrip Circuits	34
V. Monolithic GaAs Circuits	57
VI. Microstrip Planar Antennas	68
VII. Conclusions	74
References	75

Chapter 2 **Millimeter-Wave Planar Integrated Circuits and Subsystems** *Kai Chang*

I. Introduction	80
II. Integrated Transmission Media	81
III. Integrated-Circuit Substrate Materials	100
IV. Transitions	101
V. Integrated-Circuit Mixers	108
VI. Integrated-Circuit Active Sources	131
VII. Integrated-Circuit Frequency Multipliers	144
VIII. Integrated-Circuit Switches and Phase Shifters	150
IX. Other Components	159
X. Integrated-Circuit Subsystems	174
XI. Conclusions and Future Trends	182
References	183

Chapter 3 **Planar Millimeter-Wave Antenna Arrays** *James R. James and Ann Henderson*

I. Introduction	189
II. Antenna Types and Their Performances	192
III. Critical Aspects	205

IV. Hybrid Dielectric/Microstrip Array	223
V. Comparison of System Loss and Other Significant Factors	231
VI. Conclusions	244
References	245
Chapter 4 Optoelectronic Devices for Millimeter Waves	
<i>Aileen M. Yurek, Charles D. Striffler, and Chi H. Lee</i>	
I. Introduction	249
II. Description of the Measurement Techniques	252
III. Theoretical Model to Characterize Variations of Phase and Attenuation in Plasma-Controlled Semiconductor Waveguides	260
IV. Experimental Results	277
References	290
Chapter 5 Millimeter-Wave GaAs IMPATT Diodes	
<i>Daniel Massé, Michael G. Adlerstein, and Lowell H. Holway, Jr.</i>	
I. Introduction	291
II. The Physics of IMPATT Diodes	292
III. Thermal Analysis of Diodes	324
IV. Diode Operating Modes	339
V. Device–Circuit Interaction	350
VI. Reliability of GaAs IMPATT Diodes	362
VII. Conclusions	369
References	370
Chapter 6 Tunable Gyrotrons	
<i>G. F. Brand</i>	
I. Introduction	371
II. Gyrotron Cavities	373
III. Energy Transfer and Frequency Detuning	380
IV. Tunable Gyrotrons	392
V. Special Considerations	400
VI. Conclusions	406
References	407
INDEX	409