

CONTENTS

LIST OF CONTRIBUTORS	ix
PREFACE	xi
CONTENTS OF VOLUME 2	xiv

Chapter 1 Gyrotrons

J. L. Hirshfield

I. Introduction	1
II. The Linear Cyclotron Maser Gain Mechanism	2
III. Nonlinear Considerations	9
IV. Summary of Soviet Gyrotron Development	28
V. Recent Device Results in the U.S.A.	48
VI. Prospectus	52
References	53

Chapter 2 IMPATT Devices for Generation of Millimeter Waves

H. J. Kuno

I. Introduction	55
II. Device Physics	56
III. CW Oscillators	74
IV. Pulsed Oscillators	102
V. Power Amplifiers	113
VI. AM and FM Noise Characteristics	120
VII. Frequency and Phase Stabilization	123
VIII. Conclusion	125
References	126

Chapter 3 Pulsed Optically Pumped Far Infrared Lasers

Thomas A. DeTemple

I. Introduction	129
II. Theoretical Considerations	133

III. Specific Molecular Systems	142
IV. Operational Configurations	151
V. Additional Effects	165
VI. Summary	177
References	179

Chapter 4 Backward Wave Oscillators

G. Kantorowicz and P. Palluel

I. Electron Tubes for Millimeter or Far-Infrared Wavelengths	185
II. The Backward Wave Oscillator: Principle and Design	188
III. Millimeter Wave and Far-Infrared BWO's	200
IV. Conclusion	211
References	211

Chapter 5 The Ledatron

K. Mizuno and S. Ono

I. Introduction	213
II. Operational Principle	215
III. Fabry-Perot Mode Operation	217
IV. Surface-Wave Mode Operation	230
V. Summary and Conclusion	232
References	232

Chapter 6 Infrared and Submillimeter-Wave Waveguides

F. K. Kneubühl and E. Affolter

I. Introduction	235
II. Leaky Modes in Hollow Waveguides	241
III. Hollow Waveguides with Constant Cross Section	243
IV. Periodic Waveguide Structures	252
V. Waveguide-Laser Feedback	259
VI. Infrared and Submillimeter-Wave Lasers with Hollow Waveguides	267
VII. Future Aspects	273
References	274

Chapter 7 Free Electron Lasers and Stimulated Scattering from Relativistic Electron Beams

P. Sprangle, Robert A. Smith, and V. L. Granatstein

I. Introduction	279
II. Physical Model and Analysis	284

CONTENTS

vii

III. Gain and Saturation Level in Various FEL Regimes	292
IV. Discussion: A Visible Light Free Electron Laser	309
V. Laboratory Experiments	311
VI. Conclusions	323
Appendix	324
References	326

INDEX

328