

Millimeter and Submillimeter Wave Spectroscopy of Solids

Edited by G. Grüner

With Contributions by

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With 173 Figures



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Preface

Spectroscopies that utilize the millimeter-wave spectral range of the electromagnetic spectrum are gaining increased prominence. This is due to several factors. First, the frequency range where useful signal generation and detection becomes feasible is increasing and by now includes not only the microwave but also the millimeter- and submillimeter-wave frequencies. Second, in many fields in modern condensed-matter physics there is a clear need for the exploration of the low-energy tail of the electromagnetic response, the range where conventional optical spectroscopies become ineffective. Third, various applications also start to emerge, with devices and systems moving to higher frequencies, thus reducing the size of the hardware components.

This book discusses the various aspects of this modern and rapidly developing field. The different chapters cover the important technical developments in this area of basic and applied research. Time-domain spectroscopy is discussed along with spectroscopies performed in the frequency domain using either narrow-band, coherent or broad-band radiation sources, with Fourier transform spectroscopy as the tool of choice in the latter case. In the spectral range involving millimeter and submillimeter waves the propagation or radiation occurs either in free space or in waveguides. Techniques utilizing resonant or nonresonant measurement configurations, and also interferometric arrangements, are all standard tools used, and the advantages and disadvantages of the methods are discussed. Experiments conducted in the presence of external magnetic fields are also covered. Examples that demonstrate the utilization of the techniques include measurements on materials with known properties, but new, significant results obtained using the various techniques are also covered.

It is believed that the book will serve as an excellent source for not only readers intending to enter this developing area of science and technology, but also for those working on optical spectroscopy in other spectral ranges. Physicists in basic science and researchers and engineers will find this book equally useful and informative.

Los Angeles, January 1998

George Grüner

Contents

1. Introduction	
By G. Grüner (With 1 Figure).....	1
2. Terahertz Time-Domain Spectroscopy	
By M. C. Nuss and J. Orenstein (With 25 Figures).....	7
2.1 Historical Development.....	8
2.2 THz Time-Domain Spectrometers.....	9
2.2.1 Lasers.....	10
2.2.2 THz Transmitters and Detectors.....	10
a) Transmitter Structures.....	11
b) Speed of THz Transmitter.....	14
c) Detector Structure.....	15
d) Gated Detection.....	15
e) Frequency Limit of THz Detectors.....	16
f) Radiation Pattern and Substrate Lenses.....	17
g) Other THz Detectors.....	18
2.2.3 Collimating and Focusing Optics.....	19
2.3 THz Time-Domain Linear Spectroscopy:	
Characteristics and Advantages.....	20
2.3.1 Signal to Noise Ratio and Dynamic Range.....	20
2.3.2 Phase Sensitivity.....	21
2.3.3 Resolution and Time-Windowing of Data.....	21
2.4 Time-Domain Data Analysis.....	22
2.4.1 Thick Medium.....	22
2.4.2 Thin Conducting Sheet.....	24
2.4.3 Intermediate Film Thickness.....	28
2.5 Linear THz Spectroscopy.....	29
2.5.1 Insulators.....	29
a) Phonon-Polaritons.....	29
b) Optical Materials.....	29
2.5.2 Semiconductors.....	30
2.5.3 Quantized Levels in Confined Systems.....	31
2.5.4 Photonic Band Gaps.....	31
2.5.5 THz Spectroscopy of Superconductors.....	32
2.6 Time-Resolved Optical Pump – THz Probe Spectroscopy....	34
2.7 THz Correlation Spectroscopy.....	35

VIII Contents

2.8	THz Emission Spectroscopy	38
2.9	“T-Ray” Imaging	41
2.10	All-Electronic THz-TDS	42
2.11	Outlook and Summary	43
	References	43
3.	Coherent Source Submillimeter Wave Spectroscopy	
	By G. Kozlov and A. Volkov (With 40 Figures)	51
	List of Symbols	51
3.1	Submillimeter Quasi-optical Technique	53
3.1.1	Backward Wave Oscillators	53
3.1.2	Submillimeter BWO-Spectrometer “Epsilon”	57
	a) Apparatus	57
	b) Idea of Dielectronic Measurements	57
	c) Dielectric Measurement Procedure	59
3.1.3	Elements of Submillimeter Quasi-optics	63
	a) Detectors	63
	b) Focusers (Lenses and Parabolic Mirrors)	65
	c) Wire Grids and Meshes	68
	d) Fabry-Perot Interferometer	71
	e) Thin Metallic Films	72
	f) Plane Dielectric Slab	75
	g) Materials at MM-SBMM Waves	76
3.2	Dielectric BWO-Spectroscopy of Solids	78
3.2.1	Dielectric Spectra of Simple Dielectrics	79
3.2.2	Soft Modes in Ferroelectrics	81
3.2.3	Central Peak	89
3.2.4	Dynamics of Incommensurate Phases	90
3.2.5	Brillouin Zone Folding	91
3.2.6	Relaxors and Dipole Glasses	94
3.2.7	New Family of Ferroelectrics of TlGaSe ₂ Type	96
3.2.8	Superionic Conductors	98
3.2.9	Electronic Conductors	101
3.2.10	Antiferromagnets	103
3.3	Conclusion	106
	References	107
4.	Waveguide Configuration Optical Spectroscopy	
	By G. Grüner (With 32 Figures)	111
	List of Symbols	111
4.1	Optical Constants and Measured Parameters	114
4.2	Experimental Arrangements	118
4.2.1	Nonresonant Methods	118
	a) Post in a Waveguide	118
	b) Bridge Configurations	119

4.2.2	Resonant Methods	121
	a) Resonant Cavities: General Formalism	121
	b) Cavity Perturbation: The Principle	125
	c) Resonant Cavity Measurement Techniques	126
4.2.3	Evaluation of the Complex Conductivity from the Measured Impedance	131
4.2.4	Cavity Perturbation	138
	a) Cavity End-Plate Replacement	138
	b) Enclosed Perturbation: Sphere in a Maximum Electric Field	139
	c) Ellipsoid in an Electric Field	142
4.3	Experiments on Materials with Known Conductivity	143
4.3.1	Bridge Configuration Measurement	143
4.3.2	Cavity Perturbation Measurements	147
	a) Good Conductors: Surface Impedance Regime	147
	b) Poor Conductors: Depolarization Regime	149
4.4	Experiments in Correlated Metals	150
4.4.1	Heavy Fermion Materials	150
4.4.2	Density Waves	160
4.5	Conclusion	163
	References	166
5.	Far-Infrared Fourier Transform Spectroscopy	
	By L. Genzel (With 38 Figures)	169
5.1	General Aspects of Fourier Transform Spectroscopy	174
5.1.1	Basic Theory of Fourier Transform Spectroscopy	174
5.1.2	Resolution and Apodisation	176
5.1.3	Digital Analysis. Sampling: The Aliasing Problem	178
5.1.4	Realization of the Digital Fourier Transform	180
5.1.5	Errors in Fourier Transform Spectroscopy	180
5.1.6	Noise in Fourier Transform Spectroscopy	181
5.1.7	Advantages of Fourier Transform Spectroscopy	183
5.2	Interferometers for Fourier Transform Spectroscopy	185
5.3	Special Topics for Solid State Applications of Far Infrared Region-Fourier Transform Spectroscopy	189
5.3.1	Photothermal Ionization Spectroscopy	189
5.3.2	Amorphous Ge and Si	190
5.3.3	Far Infrared Region Spectra of InSb	191
5.3.4	Far Infrared Region Spectra of SrTiO ₃	193
5.3.5	Phonons of Crystalline YBa ₂ Cu ₃ O ₆	195
5.3.6	Spectra and Phonons of an YBa ₂ Cu ₃ O _{7-δ} Single Crystal	196
5.3.7	Gap Determination on YBa ₂ Cu ₃ O ₇ -Oriented Films	199
5.3.8	Extrapolation to Microwaves with Results from Sect. 5.3.7	206

5.3.9	Far Infrared Region – Fourier Transform Spectroscopy with Ellipsometry on $\text{La}_{1.87}\text{Sr}_{0.13}\text{CuO}_4$	211
Appendix	211
5.AI:	Kramers–Kronig Analysis	211
5.AII:	Formulas for Si-Reflection Fabry–Pérot	214
5.AIII:	Electrodynamic Response of Superconductors	216
References	218
6.	Magneto-Optical Millimeter-Wave Spectroscopy	
	By C. Dahl, P. Goy, and J. P. Kotthaus (With 37 Figures)	221
	List of Symbols	221
6.1	Vector Analyzer for Millimeter-Wave Frequencies	224
6.1.1	Broadband Sources via Harmonic Generation	225
6.1.2	Heterodyne Vector Detection	226
6.1.3	Extension to Submillimeter Frequencies and to High Dynamic Range	231
6.2	Coupling the Wave to the Sample	232
6.2.1	The Sample Environment	232
6.2.2	Propagation via Waveguides	233
6.2.3	Propagation in Free Space	237
6.3	General Applications	238
6.3.1	Interferometry	238
6.3.2	Dielectrics	240
6.3.3	Cavities and Superconductors	243
6.3.4	Bulk Semiconductors in High Magnetic Fields	245
6.4	Magnetspectroscopy of Low-Dimensional Electron Systems	248
6.4.1	Magnetoconductivity of the Two-Dimensional Electron System	248
a)	Relation Between Conductivity and Transmission, Cyclotron Resonance	248
b)	Hall Conductivity	252
6.4.2	Magnetoplasma Resonances in a Laterally Confined Electron System	253
a)	Circular Disks	255
b)	Rings	265
c)	Elliptic Disks	269
d)	Coulomb Coupling in Disk-Arrays	271
6.4.3	Towards Millimeter-Wave Spectroscopy of Mesoscopic Systems	274
a)	Coupling via Coaxial Cable and Microstripline	274
b)	Focussing with Diaphragms	277
6.5	Conclusion	280
References	280
Subject Index	283

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