

Progress in Nano-Electro-Optics II

Novel Devices and Atom Manipulation

Bearbeitet von
Motoichi Ohtsu

1. Auflage 2003. Buch. xiii, 192 S. Hardcover

ISBN 978 3 540 05042 1

Format (B x L): 15,5 x 23,5 cm

Gewicht: 1040 g

[Weitere Fachgebiete > Physik, Astronomie > Elektrodynamik, Optik > Quantenoptik,
Nichtlineare Optik, Laserphysik](#)

schnell und portofrei erhältlich bei

The logo for beck-shop.de features the text 'beck-shop.de' in a bold, red, sans-serif font. Above the 'i' in 'shop' are three red dots of increasing size. Below the main text, 'DIE FACHBUCHHANDLUNG' is written in a smaller, red, all-caps, sans-serif font.

beck-shop.de
DIE FACHBUCHHANDLUNG

Die Online-Fachbuchhandlung beck-shop.de ist spezialisiert auf Fachbücher, insbesondere Recht, Steuern und Wirtschaft. Im Sortiment finden Sie alle Medien (Bücher, Zeitschriften, CDs, eBooks, etc.) aller Verlage. Ergänzt wird das Programm durch Services wie Neuerscheinungsdienst oder Zusammenstellungen von Büchern zu Sonderpreisen. Der Shop führt mehr als 8 Millionen Produkte.

Contents

Classical Theory on Electromagnetic Near Field

I. Banno	1
1 Introduction	1
1.1 Studies of Pioneers	1
1.2 Purposes of This Chapter	2
1.3 Overview of This Chapter	3
2 Definition of Near Field and Far Field	4
2.1 A Naive Example of Super-Resolution	4
2.2 Retardation Effect as Wavenumber Dependence	5
2.3 Examination on Three Cases	6
2.4 Diffraction Limit in Terms of Retardation Effect	7
2.5 Definition of Near Field and Far Field	8
3 Boundary Scattering Formulation with Scalar Potential	8
3.1 Quasistatic Picture under Near-Field Condition	9
3.2 Poisson's Equation with Boundary Charge Density	10
3.3 Intuitive Picture of EM Near Field under Near-Field Condition	10
3.4 Notations Concerning Steep Interface	12
3.5 Boundary Value Problem for Scalar Potential	12
3.6 Boundary Scattering Problem Equivalent to Boundary Value Problem	14
3.7 Integral Equation for Source and Perturbative Treatment of MBC	15
3.8 Application to a Spherical System: Analytical Treatment	16
3.9 Application to a Spherical System: Numerical Treatment	18
3.10 Application to a Low Symmetric System	19
3.11 Summary	22
4 Boundary Scattering Formulation with Dual EM Potential	22
4.1 Dual EM Potential as Minimum Degree of Freedom	23
4.2 Wave Equation for Dual Vector Potential	24
4.3 Boundary Value Problem for Dual EM Potential	25
4.4 Boundary Scattering Problem Equivalent to the Boundary Value Problem	27

4.5	Integral Equation for Source and Perturbative Treatment of MBCs.....	29
4.6	Summary	30
5	Application of Boundary Scattering Formulation with Dual EM Potential to EM Near-Field Problem	31
5.1	Boundary Effect and Retardation Effect	31
5.2	Intuitive Picture Based on Dual Ampere Law under Near-field Condition	33
5.3	Application to a Spherical System: Numerical Treatment	35
5.4	Correction due to Retardation Effect	36
5.5	Summary	40
6	Summary and Remaining Problems	41
7	Theoretical Formula for Intensity of Far Field, Near Field and Signal in NOM	42
7.1	Field Intensity for Far/Near Field	42
7.2	Theoretical Formula for the Signal Intensity in NOM	43
8	Mathematical Basis of Boundary Scattering Formulation	44
8.1	Boundary Charge Density and Boundary Condition	44
8.2	Boundary Magnetic Current Density and Boundary Condition	49
9	Green's Function and Delta Function in Vector Field Analysis.....	52
9.1	Vector Helmholtz Equation	52
9.2	Decomposition into Longitudinal and Transversal Components	53
	References	56

Excitonic Polaritons in Quantum-Confined Systems and Their Applications to Optoelectronic Devices

	T. Katsuyama, K. Hosomi	59
1	Introduction	59
2	Fundamental Aspects of Excitonic Polaritons Propagating in Quantum-Confined Systems	61
2.1	The Concept of the Excitonic Polariton	61
2.2	Excitonic Polaritons in GaAs Quantum-Well Waveguides: Experimental Observations.....	63
2.3	Excitonic Polaritons in GaAs Quantum-Well Waveguides: Theoretical Calculations	68
2.4	Electric-Field-Induced Phase Modulation of Excitonic Polaritons in Quantum-Well Waveguides	74
2.5	Temperature Dependence of the Phase Modulation due to an Electric Field.....	82
2.6	Cavity Effect of Excitonic Polaritons in Quantum-Well Waveguides	85
3	Applications to Optoelectronic Devices	89

3.1	Mach–Zehnder-Type Modulators	90
3.2	Directional-Coupler-Type Switches	92
3.3	Spatial Confinement of Electromagnetic Field by an Excitonic Polariton Effect: Theoretical Considerations	94
3.4	Nanometer-Scale Switches	101
4	Summary and Future Prospects	105
	References	108

Nano-Optical Imaging and Spectroscopy of Single Semiconductor Quantum Constituents

	T. Saiki	111
1	Introduction	111
2	General Description of NSOM	112
3	Design, Fabrication, and Evaluation of NSOM Aperture Probes . . .	113
3.1	Basic Process of Aperture-Probe Fabrication	113
3.2	Tapered Structure and Optical Throughput	115
3.3	Simulation-Based Design of a Tapered Structure	115
3.4	Fabrication of a Double-Tapered Aperture Probe	119
3.5	Evaluation of Transmission Efficiency and Collection Efficiency	120
3.6	Evaluation of Spatial Resolution with Single Quantum Dots . .	123
4	Super-Resolution in Single-Molecule Detection	125
5	Single Quantum-Dot Spectroscopy	127
5.1	Homogeneous Linewidth and Carrier–Phonon Interaction . . .	128
5.2	Homogeneous Linewidth and Carrier–Carrier Interaction . . .	133
6	Real-Space Mapping of Exciton Wavefunction Confined in a QD . .	137
7	Carrier Localization in Cluster States in GaNAs	140
8	Perspectives	144
	References	145

Atom Deflector and Detector with Near-Field Light

	H. Ito, K. Totsuka, M. Ohtsu	149
1	Introduction	149
2	Slit-Type Deflector	152
2.1	Principle	152
2.2	Fabrication Process	153
2.3	Measurement of Light Distribution	155
2.4	Estimation of Deflection Angle	156
3	Slit-Type Detector	158
3.1	Principle	158
3.2	Fabrication Process	160
3.3	Measurement of Light Distribution	161

XII Contents

3.4	Two-Step Photoionization with Two-Color Near-Field Lights	163
3.5	Blue-Fluorescence Spectroscopy with Two-Color Near-Field Lights	168
4	Guiding Cold Atoms through Hollow Light with Sisyphus Cooling	171
4.1	Generation of Hollow Light	172
4.2	Sisyphus Cooling in Hollow Light	173
4.3	Experiment	176
4.4	Estimation of Atom Flux	178
5	Outlook	179
	References	181
	Index	187