1. Record Nr. UNINA9910830282703321

Autore	Ujihara Kikuo
Titolo	Output coupling in optical cavities and lasers [[electronic resource]] : a quantum theoretical approach / / Kikuo Ujihara
Pubbl/distr/stampa	Weinheim, : Wiley, c2010
ISBN	1-282-55034-9 9786612550348 3-527-63049-X 3-527-63050-3
Descrizione fisica	1 online resource (410 p.)
Disciplina	621.366 621.3661
Soggetti	Lasers Optical communications
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Output Coupling in Optical Cavities and Lasers; Contents; Preface; Acknowledgments; 1 A One-Dimensional Optical Cavity with Output Coupling: Classical Analysis; 1.1 Boundary Conditions at Perfect Conductor and Dielectric Surfaces; 1.2 Classical Cavity Analysis; 1.2.1 One-Sided Cavity; 1.2.2 Symmetric Two-Sided Cavity; 1.3 Normal Mode Analysis: Orthogonal Modes; 1.3.1 One-Sided Cavity; 1.3.2 Symmetric Two-Sided Cavity; 1.4 Discrete versus Continuous Mode Distribution; 1.5 Expansions of the Normalization Factor; 1.6 Completeness of the Modes of the "Universe" 2 A One-Dimensional Optical Cavity with Output Coupling: Quantum Analysis2.1 Quantization; 2.2 Energy Eigenstates; 2.3 Field Commutation Relation; 2.4 Thermal Radiation and the Fluctuation-Dissipation Theorem; 2.4.1 The Density Operator of the Thermal Radiation Field; 2.4.2 The Correlation Function and the Power Spectrum; 2.4.3 The Response Function and the Fluctuation-Dissipation Theorem; 2.4.4 Derivation of the Langevin Noise for a Single Cavity Resonant Mode; 2.4.5 Excitation of the Cavity Resonant Mode by a Current Impulse; 2.5 Extension to an Arbitrarily Stratified

Cavity

2.5.1 Description of the Cavity Structure2.5.2 The Modes of the "Universe"; 3 A One-Dimensional Quasimode Laser: General Formulation; 3.1 Cavity Resonant Modes; 3.2 The Atoms; 3.3 The Atom-Field Interaction; 3.4 Equations Governing the Atom-Field Interaction; 3.5 Laser Equation of Motion: Introducing the Langevin Forces; 3.5.1 The Field Decay; 3.5.2 Relaxation in Atomic Dipole and Atomic Inversion; 4 A One-Dimensional Quasimode Laser: Semiclassical and Quantum Analysis; 4.1 Semiclassical Linear Gain Analysis; 4.2 Semiclassical Nonlinear Gain Analysis; 4.3 Quantum Linear Gain Analysis

4.4 Quantum Nonlinear Gain Analysis5 A One-Dimensional Laser with Output Coupling: Derivation of the Laser Equation of Motion; 5.1 The Field; 5.2 The Atoms; 5.3 The Atom-Field Interaction; 5.4 Langevin Forces for the Atoms; 5.5 Laser Equation of Motion for a Laser with Output Coupling; 6 A One-Dimensional Laser with Output Coupling: Contour Integral Method; 6.1 Contour Integral Method: Semiclassical Linear Gain Analysis; 6.2 Contour Integral Method: Semiclassical Nonlinear Gain Analysis; 6.3 Contour Integral Method: Quantum Linear Gain Analysis

6.4 Contour Integral Method: Quantum Nonlinear Gain Analysis7 A One-Dimensional Laser with Output Coupling: Semiclassical Linear Gain Analysis; 7.1 The Field Equation Inside the Cavity; 7.2 Homogeneously Broadened Atoms and Uniform Atomic Inversion; 7.3 Solution of the Laser Equation of Motion; 7.3.1 The Field Equation for Inside the Cavity; 7.3.2 Laplace-Transformed Equations; 7.3.3 The Field Inside the Cavity; 7.3.4 The Field Outside the Cavity; 8 A One-Dimensional Laser with Output Coupling: Semiclassical Nonlinear Gain Analysis; 8.1 The Field Equation Inside the Cavity

8.2 Homogeneously Broadened Atoms and Uniform Pumping

Sommario/riassunto

Authored by one of the founders and major players in this field of research, this is a thorough and comprehensive approach to the quantum mechanical output coupling theory of lasers -- an important area of optical physics that has so far been neglected in the scientific literature. Clearly structured, the various sections cover one-dimensional optical cavity, laser, and microcavity laser with output coupling, atom-field interaction in a free-dimensional space, 3D analysis of spontaneous emission in a planar microcavity with output coupling, plus two-atom spontaneous emission.With numer