

1. Record Nr.	UNINA9910146053803321
Autore	Csele Mark
Titolo	Fundamentals of light sources and lasers [[electronic resource] /] / Mark Csele
Pubbl/distr/stampa	Hoboken, N.J., : J. Wiley, c2004
ISBN	1-280-55688-9 9786610556885 0-471-67522-9 0-471-67521-0
Descrizione fisica	1 online resource (362 p.)
Disciplina	621.36/6 621.366
Soggetti	Light sources Lasers
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	"A Wiley-Interscience publication." Includes index.
Nota di contenuto	FUNDAMENTALS OF LIGHT SOURCES AND LASERS; CONTENTS; Preface; 1. Light and Blackbody Emission; 1.1 Emission of Thermal Light; 1.2 Electromagnetic Spectrum; 1.3 Blackbody Radiation and the Stefan- Boltzmann Law; 1.4 Wein's Law; 1.5 Cavity Radiation and Cavity Modes; 1.6 Quantum Nature of Light; 1.7 Electromagnetic Spectrum Revisited; 1.8 Absorption and Emission Processes; 1.9 Boltzmann Distribution and Thermal Equilibrium; 1.10 Quantum View of Blackbody Radiation; 1.11 Blackbodies at Various Temperatures; 1.12 Applications; 1.13 Absorption and Color; 1.14 Efficiency of Light Sources; Problems 2. Atomic Emission2.1 Line Spectra; 2.2 Spectroscope; 2.3 Einstein and Planck: $E = h\nu$; 2.4 Photoelectric Effect; 2.5 Atomic Models and Light Emission; 2.6 Franck-Hertz Experiment; 2.7 Spontaneous Emission and Level Lifetime; 2.8 Fluorescence; 2.9 Semiconductor Devices; 2.10 Light-Emitting Diodes; Problems; 3. Quantum Mechanics; 3.1 Limitations of the Bohr Model; 3.2 Wave Properties of Particles (Duality); 3.3 Evidence of Wave Properties in Electrons; 3.4 Wavefunctions and the Particle-in-a-Box Model; 3.5 Reconciling Classical and Quantum

Mechanics; 3.6 Angular Momentum in Quantum States
 3.7 Spectroscopic Notation and Electron Configuration
 3.8 Energy Levels Described by Orbital Angular Momentum; 3.9 Magnetic Quantum Numbers; 3.10 Direct Evidence of Momentum: The Stern-Gerlach Experiment; 3.11 Electron Spin; 3.12 Summary of Quantum Numbers; 3.13 Example of Quantum Numbers: The Sodium Spectrum; 3.14 Multiple Electrons: The Mercury Spectrum; 3.15 Energy Levels and Transitions in Gas Lasers; 3.16 Molecular Energy Levels; 3.17 Infrared Spectroscopy Applications; Problems; 4. Lasing Processes; 4.1 Characteristics of Coherent Light; 4.2 Boltzmann Distribution and Thermal Equilibrium
 4.3 Creating an Inversion
 4.4 Stimulated Emission; 4.5 Rate Equations and Criteria for Lasing; 4.6 Laser Gain; 4.7 Linewidth; 4.8 Thresholds for Lasing; 4.9 Calculating Threshold Gain; Problems; 5. Lasing Transitions and Gain; 5.1 Selective Pumping; 5.2 Three- and Four-Level Lasers; 5.3 CW Lasing Action; 5.4 Thermal Population Effects; 5.5 Depopulation of Lower Energy Levels in Four-Level Lasers; 5.6 Rate Equation Analysis for Atomic Transitions; 5.7 Rate Equation Analysis for Three- and Four-Level Lasers; 5.8 Gain Revisited; 5.9 Saturation; 5.10 Required Pump Power and Efficiency
 5.11 Output Power
 Problems; 6. Cavity Optics; 6.1 Requirements for a Resonator; 6.2 Gain and Loss in a Cavity; 6.3 Resonator as an Interferometer; 6.4 Longitudinal Modes; 6.5 Wavelength Selection in Multiline Lasers; 6.6 Single-Frequency Operation; 6.7 Characterization of a Resonator; 6.8 Gaussian Beam; 6.9 Resonator Stability; 6.10 Common Cavity Configurations; 6.11 Spatial Energy Distributions: Transverse Modes; 6.12 Limiting Modes; 6.13 Resonator Alignment: A Practical Approach; Problems; 7. Fast-Pulse Production; 7.1 Concept of Q-Switching; 7.2 Intracavity Switches
 7.3 Energy Storage in Laser Media

Sommario/riassunto

A comprehensive introduction to the burgeoning field of photonics. The field of photonics is finding increasing applications across a broad range of industries. While many other books provide an overview of the subject, *Fundamentals of Light Sources and Lasers* closes a clear gap in the current literature by concentrating on the principles of laser operation as well as providing coverage of important concepts necessary to fully understand the principles involved. The scope of the book includes everything a professional needs to get up to speed in the field, as well as all the material necessary