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Nota di contenuto	Cavity Quantum Electrodynamics; Contents; Preface; Acknowledgments; 1 Introduction; 1.1 What is light?; 1.1.1 Geometrical optics; 1.1.2 Wave optics; 1.1.3 Classical electrodynamics and relativity; 1.1.4 Quantum mechanics and quantum electrodynamics; 1.2 A brief history of cavity QED; 1.3 A map of the book; 1.4 How to read this book; 2 Fiat Lux!; 2.1 How to quantize a theory; 2.2 Why the radiation field is special; 2.3 What is a cavity?; 2.3.1 What is resonance?; 2.3.2 Confinement is the key; 2.4 Canonical quantization of the radiation field; 2.4.1 Quantization in a cavity 2.4.2 Quantization in free space 2.5 The Casimir force; 2.5.1 Zero-point potential energy; 2.5.2 Maxwell stress tensor; 2.5.3 The vacuum catastrophe; Recommended reading; Problems; 3 The photon's wavefunction; 3.1 Position in relativistic quantum mechanics; 3.2 Extreme quantum theory of light with a twist; 3.3 The configuration space problem; 3.4 Back to vector notation; 3.5 The limit of vanishing rest mass; 3.6 Second quantization; Recommended reading; Problems; 4 A box of photons; 4.1 The classical limit; 4.1.1 Coherent states; 4.1.2 The density matrix

4.1.3 The diagonal coherent-state representation
 4.2 Squeezed states;
 4.2.1 The squeezing operator; 4.2.2 Generating squeezed states; 4.2.3 Geometrical picture; 4.2.4 Homodyne detection; Recommended reading; Problems; 5 Let matter be!
 5.1 A single point dipole; 5.2 An arbitrary charge distribution; 5.3 Matter-radiation coupling and gauge invariance; Recommended reading; 6 Spontaneous emission; 6.1 Emission in free space; 6.2 Emission in a cavity; Recommended reading; 7 Macroscopic QED; 7.1 The dielectric JCM; 7.2 Polariton-photon dressed excitations
 7.3 Quantum noise of matter and macroscopic averages
 7.4 How a macroscopic description is possible; 7.5 The Kramers-Kronig dispersion relation; 7.6 Including absorption in the dielectric JCM; 7.7 Dielectric permittivity; 7.8 Huttner-Barnett theory; 7.8.1 The matter Hamiltonian; 7.8.2 Diagonalization of the total Hamiltonian; Recommended reading; Problems; 8 The maser; the laser; and their cavity QED cousins; 8.1 The ASER idea; 8.2 How to add noise; 8.2.1 Einstein's approach to Brownian motion; 8.2.2 Langevin's approach to Brownian motion; 8.2.3 The modern form of Langevin's equation
 8.2.4 Ito's and Stratonovich's stochastic calculus
 8.3 Rate equations with noise; 8.4 Ideal laser light; 8.5 The single-atom maser; 8.6 The thresholdless laser; 8.7 The one-and-the-same atom laser; Recommended reading; Problems; 9 Open cavities; 9.1 The Gardiner-Collett Hamiltonian; 9.2 The radiation condition; 9.3 Natural modes; 9.4 Completeness in general; 9.4.1 Whittaker's scalar potentials; 9.4.2 General formulation of the problem; Recommended reading; Problems; Appendix A Perfect cavity modes; Appendix B Perfect cavity boundary conditions; Appendix C Quaternions and special relativity
 C.1 What are quaternions?

Sommario/riassunto

What happens to light when it is trapped in a box? Cavity Quantum Electrodynamics addresses a fascinating question in physics: what happens to light, and in particular to its interaction with matter, when it is trapped inside a box? With the aid of a model-building approach, readers discover the answer to this question and come to appreciate its important applications in computing, cryptography, quantum teleportation, and opto-electronics. Instead of taking a traditional approach that requires readers to first master a series of seemingly unconnected mathematical techniques, this book engag
