



Advances in Atomic Physics:An Overview

Claude Cohen-Tannoudji, David Guéry-Odelin

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This book presents a comprehensive overview of the spectacular advances seen in atomic physics during the last 50 years. The authors explain how such progress was possible by highlighting connections between developments that occurred at different times. They discuss the new perspectives and the new research fields that look promising. The emphasis is placed, not on detailed calculations, but rather on physical ideas. Combining both theoretical and experimental considerations, the book will be of interest to a wide range of students, teachers and researchers in quantum and atomic physics.

Contents:

- General Introduction
- General Background
- ***Light: A Source of Information on Atoms:***
 - Optical Methods
 - Linear Superpositions of Internal Atomic States
 - Resonance Fluorescence
 - Advances in High Resolution Spectroscopy
- ***Atom-Photon Interactions: A Source of Perturbations for Atoms Which Can Be Useful:***
 - Perturbations Due to a Quasi Resonant Optical Excitation
 - Perturbations Due to a High Frequency Excitation
- ***Atom-Photon Interactions: A Simple System for Studying Higher Order Effects:***
 - Multiphoton Processes Between Discrete States
 - Photoionization of Atoms in Intense Laser fields
- ***Atom-Photon Interactions: A Tool for Controlling and Manipulating Atomic Motion:***
 - Radiative Forces Exerted on a Two-Level Atom at Rest
 - Laser Cooling of Two-Level Atoms
 - Sub-Doppler Cooling. Sub-Recoil Cooling
 - Trapping of Particles
- ***Ultracold Interactions and Their Control:***
 - Two-Body Interactions at Low Temperatures
 - Controlling Atom-Atom Interactions
- ***Exploring Quantum Interferences with Few Atoms and Photons:***
 - Interference of Atomic de Broglie Waves
 - Ramsey Fringes Revisited and Atomic Interferometry
 - Quantum Correlations. Entangled States
- ***Degenerate Quantum Gases:***
 - Emergence of Quantum Effects in a Gas
 - The Long Quest for Bose-Einstein Condensation
 - Mean Field Description of a Bose-Einstein Condensate
 - Coherence Properties of Bose-Einstein Condensates
 - Elementary Excitations and Superfluidity in Bose-Einstein Condensates
- ***Frontiers of Atomic Physics:***
 - Testing Fundamental Symmetries. Parity Violation in Atoms
 - Quantum Gases as Simple Systems for Many-Body Physics

- Extreme Light
- General Conclusion

Readership: Graduate students, researchers and academics interested in quantum and atomic physics.

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