Advanced Nonlinear Optics

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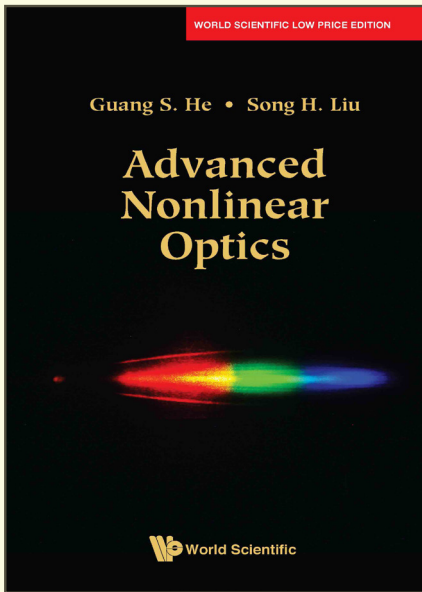
Guang S. He • Song H. Liu

Advanced Nonlinear Optics

World Scientific

By **Guang S. He**
(State University of New York at Buffalo, USA)

Song H. Liu
(South China Normal University, China)

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ABOUT THE BOOK

Advanced Nonlinear Optics is a revised and updated version of Physics of Nonlinear Optics (1999). This book mainly presents the physical principles of a great number of nonlinear optical effects discovered after the advent of lasers. All these nonlinear optical effects can find their special applications in modern optics and photonics. The major categories of nonlinear optical effects specifically covered in this book are as follows: 1) Second-order (three-wave) frequency mixing; 2) Third-order (four-wave) frequency mixing; 3) Nonlinear refractive-index changes; 4) Self-focusing, self-phase modulation, and spectral self-broadening; 5) Stimulated scattering effects; 6) Optical phase-conjugation; 7) Optical coherent transient effects; 8) Nonlinear spectroscopic effects; 9) Optical bistability; 10) Multi-photon nonlinear optical effects; 11) Fast and slow light effects; 12) Detailed theory of nonlinear susceptibilities.

READERSHIP

Graduate students and research scientists/engineers who work in optics, electro-optics, laser technology, opto-electronics, quantum electronics, photonics, engineering, chemistry and other multi-disciplinary fields.

CONTENTS

- Introduction to Nonlinear Optics
- Fundamental Knowledge of Nonlinear Polarization of a Medium
- Second-Order Nonlinear (Three-Wave) Frequency Mixing
- Third-Order Nonlinear (Four-Wave) Frequency Mixing
- Intense Light Induced Refractive-Index Changes
- Self-Focusing, Self-Phase Modulation, and Spectral Self-Broadening
- Stimulated Scattering of Intense Coherent Light
- Optical Phase Conjugation

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- Optical Coherent Transient Effects
- Nonlinear Laser Spectroscopic Effects
- Optical Bistability
- Multi-Photon Nonlinear Optical Effects
- Principles of Fast and Slow Light Propagation
- Detailed Theory of Nonlinear Susceptibilities
- **Appendices:**
  - Physical Constants Commonly Used in Nonlinear Optics
  - Numerical Estimates and Conversion of Units
  - Tensor-Elements of the Linear Susceptibility for Crystals and other Media
  - Tensor-Elements of the Second-Order Susceptibility for Various Crystal Classes
  - Tensor-Elements of the Susceptibility of Second-Harmonic Generation for Various Crystal Classes
  - Tensor-Elements of the Third-Order Susceptibility for Crystals and other Media
  - Tensor-Elements of the Nuclear Third-Order Susceptibility in Born-Oppenheimer Approximation
  - The Solution of Eq. (8.4–14)
  - Derivation of Formulae for Self-Induced Transparency of a 2π-Pulse
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