1. Record Nr. UNINA9910785962203321 Autore Agrawal Govind P **Titolo** Nonlinear fiber optics [[electronic resource] /] / Govind P. Agrawal Pubbl/distr/stampa Amsterdam,: Academic Press, 2013 **ISBN** 0-12-397307-4 Edizione [5th ed.] 1 online resource (653 p.) Descrizione fisica **Optics and Photonics** Collana Disciplina 621.3692 Soggetti Fiber optics Nonlinear optics Lingua di pubblicazione Inglese **Formato** Materiale a stampa Livello bibliografico Monografia Description based upon print version of record. Note generali Includes bibliographical references and index. Nota di bibliografia Nota di contenuto Nonlinear Fiber Optics; Copyright; Deditcation; Author Biography; Contents; Preface; 1 Introduction; 1.1 Historical Perspective; 1.2 Fiber Characteristics; 1.2.1 Material and Fabrication; 1.2.2 Fiber Losses; 1.2.3 Chromatic Dispersion; 1.2.4 Polarization-Mode Dispersion; 1.3 Fiber Nonlinearities; 1.3.1 Nonlinear Refraction; 1.3.2 Stimulated Inelastic Scattering; 1.3.3 Importance of Nonlinear Effects; 1.4 Overview; Problems; References; 2 Pulse Propagation in Fibers; 2.1 Maxwell's Equations; 2.2 Fiber Modes; 2.2.1 Eigenvalue Equation; 2.2.2 Single-Mode Condition 2.2.3 Characteristics of the Fundamental Mode2.3 Pulse-Propagation Equation; 2.3.1 Nonlinear Pulse Propagation; 2.3.2 Higher-Order Nonlinear Effects; 2.3.3 Raman Response Function and its Impact; 2.3.4 Extension to Multimode Fibers: 2.4 Numerical Methods: 2.4.1 Split-Step Fourier Method; 2.4.2 Finite-Difference Methods; Problems; References; 3 Group-Velocity Dispersion; 3.1 Different Propagation Regimes; 3.2 Dispersion-Induced Pulse Broadening; 3.2.1 Gaussian Pulses; 3.2.2 Chirped Gaussian Pulses; 3.2.3 Hyperbolic-Secant Pulses; 3.2.4 Super-Gaussian Pulses; 3.2.5 Experimental Results 3.3 Third-Order Dispersion 3.3.1 Evolution of Chirped Gaussian Pulses: 3.3.2 Broadening Factor; 3.3.3 Arbitrary-Shape Pulses; 3.3.4 Ultrashort-Pulse Measurements; 3.4 Dispersion Management; 3.4.1

GVD-Induced Limitations; 3.4.2 Dispersion Compensation; 3.4.3 Compensation of Third-Order Dispersion; Problems; References; 4 Self-Phase Modulation; 4.1 SPM-Induced Spectral Changes; 4.1.1

Nonlinear Phase Shift; 4.1.2 Changes in Pulse Spectra; 4.1.3 Effect of Pulse Shape and Initial Chirp; 4.1.4 Effect of Partial Coherence; 4.2 Effect of Group-Velocity Dispersion; 4.2.1 Pulse Evolution 4.2.2 Broadening Factor 4.2.3 Optical Wave Breaking; 4.2.4 Experimental Results; 4.2.5 Effect of Third-Order Dispersion; 4.2.6 SPM Effects in Fiber Amplifiers; 4.3 Semianalytic Techniques; 4.3.1 Moment Method; 4.3.2 Variational Method; 4.3.3 Specific Analytic Solutions; 4.4 Higher-Order Nonlinear Effects; 4.4.1 Self-Steepening; 4.4.2 Effect of GVD on Optical Shocks; 4.4.3 Intrapulse Raman Scattering; Problems; References: 5 Optical Solitons: 5.1 Modulation Instability: 5.1.1 Linear Stability Analysis; 5.1.2 Gain Spectrum; 5.1.3 Experimental Results; 5.1.4 Ultrashort Pulse Generation 5.1.5 Impact on Lightwave Systems 5.2 Fiber Solitons; 5.2.1 Inverse Scattering Method; 5.2.2 Fundamental Soliton; 5.2.3 Second and Higher-Order Solitons; 5.2.4 Experimental Confirmation; 5.2.5 Soliton Stability; 5.3 Other Types of Solitons; 5.3.1 Dark Solitons; 5.3.2 Bistable Solitons; 5.3.3 Dispersion-Managed Solitons; 5.3.4 Optical Similaritons; 5.4 Perturbation of Solitons; 5.4.1 Perturbation Methods; 5.4.2 Fiber Losses; 5.4.3 Soliton Amplification; 5.4.4 Soliton Interaction; 5.5 Higher-Order Effects; 5.5.1 Moment Equations for Pulse Parameters; 5.5.2 Third-Order Dispersion 5.5.3 Self-Steepening

Sommario/riassunto

Since the 4e appeared, a fast evolution of the field has occurred. The 5e of this classic work provides an up-to-date account of the nonlinear phenomena occurring inside optical fibers, the basis of all our telecommunications infastructure as well as being used in the medical field. Reflecting the big developments in research, this new edition includes major new content: slow light effects, which offers a reduction in noise and power consumption and more ordered network traffic-stimulated Brillouin scattering; vectorial treatment of highly nonlinear fibers; and a brand new chapter o