

1. Record Nr.	UNINA9910830748403321
Autore	Rafaliiov Edik U
Titolo	Ultrafast lasers based on quantum dot structures [[electronic resource]] : physics and devices // Edik U. Rafailov, Maria Ana Cataluna, and Eugene A. Avrutin
Pubbl/distr/stampa	Weinheim, Germany, : Wiley-VCH, 2011
ISBN	1-283-37051-4 9786613370518 3-527-63449-5 3-527-63450-9 3-527-63448-7
Descrizione fisica	1 online resource (264 p.)
Altri autori (Persone)	CatalunaMaria Ana AvrutinEugene A
Disciplina	621.366 621.3661
Soggetti	Lasers Quantum dots Laser pulses, Ultrashort Laser beams
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Ultrafast Lasers Based on Quantum Dot Structures: Physics and Devices; Contents; Introduction; Acknowledgments; 1 Semiconductor Quantum Dots for Ultrafast Optoelectronics; 1.1 The Role of Dimensionality in Semiconductor Materials; 1.2 Material Systems Used; 1.2.1 III-V Epitaxially Grown Quantum Dots; 1.2.2 QD-Doped Glasses; 1.2.3 Quantum Dashes; 1.3 Quantum Dots: Distinctive Properties for Ultrafast Devices; 1.3.1 Inhomogeneous Broadening; 1.3.2 Ultrafast Carrier Dynamics; 2 Foundations of Quantum Dot Theory; 2.1 Energy Structure and Matrix Elements 2.2 Theoretical Approaches to Calculating Absorption and Gain in Quantum Dots 2.3 Kinetic Theory of Quantum Dots; 2.4 Light-Matter Interactions in Quantum Dots; 2.5 The Nonlinearity Coefficient; 3

Quantum Dots in Amplifiers of Ultrashort Pulses; 3.1 Optical Amplifiers for High-Speed Applications: Requirements and Problems; 3.2 Quantum Dot Optical Amplifiers: Short-Pulse Operating Regime; 3.3 Quantum Dot Optical Amplifiers at High Bit Rates: Low Distortions and Patterning-Free Operation; 3.4 Nonlinear Operation and Limiting Function Using QD Optical Amplifiers; 4 Quantum Dot Saturable Absorbers
4.1 Foundations of Saturable Absorber Operation 4.2 The General Physical Principles of Saturable Absorption in Semiconductors; 4.2.1 Physical Processes in a Saturable Absorber; 4.2.2 Geometry of Saturable Absorber: SESAM versus Waveguide Absorber - The Cavity Enhancement of Saturable Absorption and the Standing Wave Factor in SESAMs; 4.3 The Main Special Features of a Quantum Dot Saturable Absorber Operation; 4.3.1 Bandwidth of QD SAs; 4.3.2 Dynamics of Carrier Relaxation: Ultrafast Recovery of Absorption; 4.3.3 Saturation Fluence; 5 Monolithic Quantum Dot Mode-Locked Lasers
5.1 Introduction to Semiconductor Mode-Locked Lasers 5.1.1 Place of Semiconductor Mode-Locked Lasers Among Other Ultrashort Pulse Sources; 5.1.2 Mode-Locking Techniques in Laser Diodes: The Main Principles; 5.1.3 Passive Mode Locking: The Qualitative Picture, Physics, and Devices; 5.2 Theoretical Models of Mode Locking in Semiconductor Lasers; 5.2.1 Small-Signal Time Domain Models: Self-Consistent Pulse Profile; 5.2.2 Large-Signal Time Domain Approach: Delay Differential Equations Model; 5.2.3 Traveling Wave Models
5.2.4 Frequency and Time-Frequency Treatment of Mode Locking: Dynamic Modal Analysis 5.3 Main Predictions of Generic Mode-Locked Laser Models and their Implication for Quantum Dot Lasers; 5.3.1 Laser Performance Depending on the Operating Point; 5.3.2 Main Parameters that Affect Mode-Locked Laser Behavior; 5.4 Specific Features of Quantum Dot Mode-Locked Lasers in Theory and Modeling; 5.4.1 Delay Differential Equation Model for Quantum Dot Mode-Locked Lasers; 5.4.2 Traveling Wave Modeling of Quantum Dot Mode-Locked Lasers: Effects of Multiple Levels and Inhomogeneous Broadening
5.4.3 Modal Analysis for QD Mode-Locked Lasers

Sommario/riassunto

In this monograph, the authors address the physics and engineering together with the latest achievements of efficient and compact ultrafast lasers based on novel quantum-dot structures and devices. Their approach encompasses a broad range of laser systems, while taking into consideration not only the physical and experimental aspects but also the much needed modeling tools, thus providing a holistic understanding of this hot topic.
