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High Energy and Short Pulse Lasers Short Pulse Laser Systems for Biomedical Applications *Short Pulse Laser Interactions with Matter* **Ultrashort Pulse Laser Technology** *High Energy, Short Pulse Lasers High Energy and Short Pulse Lasers: Technological Advances Ultrashort Laser Pulse Phenomena* High Power Ultra-short Pulse Lasers Based on Fiber Driven OPCPA **Special Issue on "short Pulse Lasers for Materials Processing and Diagnostics" High Energy, Short Pulse Lasers Numerical Simulation of Interaction of Short Pulse Lasers with Plasma Femtosecond Laser Pulses** Ultrashort Laser Pulses and Applications **Ultrafast Lasers and Optics for Experimentalists Few-Cycle Laser Pulse Generation and Its Applications** *Frequency-Resolved Optical Gating: The Measurement of Ultrashort Laser Pulses* **Energy Deposition and Transport During High-power and Short-pulse Laser-metal Interactions Thermal Aspects of High-intensity, Short-pulse Laser-liquid Interactions** High-power gas lasers, 1975 **Evaluation of Three Techniques for Producing Laser Pulses of Nanosecond Duration** *Laser Heating Applications* **Electronic Desorption and Microstructure Adhesion Reduction Using Ultrashort-pulse Lasers** *Photoionization and Photo-Induced Processes in Mass Spectrometry* Development, Characterization, and Application of Excimer-Based Short-Pulse Laser Systems **Field Guide to Laser Pulse Generation Short Pulse Laser Interactions With Matter: An Introduction Short Pulse Laser Systems for Biomedical Applications** Femtosecond-Scale Optics **Pulsed Laser Ablation Ultra-Short Pulsed Laser Engineered Metal-Glass Nanocomposites Lasers for Medical Applications Handbook of Molecular Lasers Efficient material laser beam ablation with a picosecond laser Short Pulse Generation with Semiconductor Lasers The Physics and Engineering of Compact Quantum Dot-based Lasers for Biophotonics** Ultra-Fast Fiber Lasers Opportunities in Intense Ultrafast Lasers Beam Acceleration In Crystals And Nanostructures - Proceedings Of The Workshop **GaN-Based Laser Diodes** *Laser Pulses*

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Short Pulse Laser Interactions With Matter: An Introduction Sep 05 2020 This book represents the first comprehensive treatment of the subject, covering the theoretical principles, present experimental status and important applications of short-pulse laser-matter

interactions.Femtosecond lasers have undergone dramatic technological advances over the last fifteen years, generating a whole host of new research activities under the theme of “ultrafast science”. The focused light from these devices is so intense that ordinary matter is torn apart within a few laser cycles. This book takes a close-up look at the exotic physical phenomena which arise as a result of this new form of “light-matter” interaction, covering a diverse set of topics including multiphoton ionization, rapid heatwaves, fast particle generation and relativistic self-channeling. These processes are central to a number of exciting new applications in other fields, such as microholography, optical particle accelerators and photonuclear physics.Repository for numerical models described in Chapter 6 can be found at www.fz-juelich.de/zam/cams/plasma/SPLIM/./a

Few-Cycle Laser Pulse Generation and Its Applications Aug 17 2021 This book covers the physics, technology and applications of short pulse laser sources that generate pulses with durations of only a few optical cycles. The basic design considerations for the different systems such as lasers, parametric amplifiers and external compression techniques which have emerged over the last decade are discussed to give researchers and graduate students a thorough introduction to this field. The existence of these sources has opened many new fields of research that were not possible before. These are UV and EUV generation from table-top systems using high-harmonic generation, frequency metrology enabling optical frequency counting, high-resolution optical coherence tomography, strong-field ultrafast solid-state processes and ultrafast spectroscopy, to mention only a few. Many new applications will follow. The book attempts to give a comprehensive, while not excessive, introduction to this exciting new field that serves both experienced researchers and graduate students entering the field. The first half of the book covers the current physical principles, processes and design guidelines to generate pulses in the optical range comprising only a few cycles of light. Such as the generation of relatively low energy pulses at high repetition rates directly from the laser, parametric generation of medium energy pulses and high-energy pulses at low repetition rates using external compression in hollow fibers. The applications cover the revolution in frequency metrology and high-resolution laser spectroscopy to electric field synthesis in the optical range as well as the emerging field of high-harmonic generation and attosecond science, high-resolution optical imaging and novel ultrafast dynamics in semiconductors. These fields benefit from the strong electric fields accompanying these pulses in solids and gases during events comprising only a few cycles of light.

Femtosecond-Scale Optics Jul 04 2020 A femtosecond laser is a laser which emits optical pulses with a duration well below 1 ps (¬ ultrashort pulses), i.e., in the domain of femtoseconds. It thus also belongs to the category of ultrafast lasers or ultrashort pulse lasers. The generation of such short pulses is nearly always achieved with the technique of passive mode locking. The growth of the femtosecond duration range is certainly one of the most brilliant achievements of laser physics. With progress in ultrashort ultraintense laser technologies the peak power of a laser pulse increases year by year. These new instruments accessible to a large community of researchers revolutionized experiments in nonlinear optics because when laser pulse intensity exceeds or even approaches intra-atomic field strength the new physical picture of light-matter interaction appears. Laser radiation is efficiently transformed into fluxes of charged or neutral particles and the very wide band of electromagnetic emission (from THz up to x-rays) is observed. Ultrashort laser pulses, with durations approaching the timescales of fundamental atomic and molecular processes, are useful in a range of scientific disciplines. They deliver energy so quickly that new processes and observations are possible. Their short duration allows them to probe delicate living structures without destroying them and make material modifications on the micron scale with minimal or precisely controllable heat effects. This field of researches is in rapid progress now.Femtosecond-Scale Optics provides depicts of current developments and original results in some specific areas of this very wide scientific field. This text will be of interest for those specialized in the subject of laser-matter interactions.

Ultrashort Laser Pulses and Applications Oct 19 2021 Ten years ago, Stanley L. Shapiro edited the book entitled Ultrashort Light Pulses (Topics Appl. Phys., Vol. 18), which was written by eight

experts in the field. Six years later, Charles V. Shank added a bibliography (1980-1983) in the second edition with approximately one thousand new references. During the past decade the field has grown so rapidly that a completely new book had to be written. In particular, the reduction of the time scale of light pulses into the femtosecond range has opened up new experimental possibilities never even foreseen in the preceding literature. The vast literature with countless ideas and applications makes it impossible for a single person to write a comprehensive review. Nine scientists, actively working in the field since its beginning, have decided to join forces to prepare a new book describing the present state of the art. Emphasis is placed on the generation and numerous applications of ultrashort laser pulses. This book covers a wide area of science: physics, engineering, chemistry, and biology. The various chapters and sections are prepared in each case such that the reader is given a brief introduction to the specific subject. Ample references for a more detailed study are given at the end of each chapter.

High-power gas lasers, 1975 Apr 12 2021 This book presents lectures and seminars given at a Summer School, organized by the International College of Applied Physics, on the physics and technology and the industrial applications of high-power gas lasers.

Laser Pulses Jun 22 2019 This book discusses aspects of laser pulses generation, characterization, and practical applications. Some new achievements in theory, experiments, and design are demonstrated. The introductive chapter shortly overviews the physical principles of pulsed lasers operation with pulse durations from seconds to yoctoseconds. A theory of mode-locking, based on the optical noise concept, is discussed. With this approximation, all paradoxes of ultrashort laser pulse formation have been explained. The book includes examples of very delicate laser operation in biomedical areas and extremely high power systems used for material processing and water purification. We hope this book will be useful for engineers and managers, for professors and students, and for those who are interested in laser science and technologies.

Ultrafast Lasers and Optics for Experimentalists Sep 17 2021

Handbook of Molecular Lasers Feb 29 2020 Optical science, engineering, and technology have grown rapidly in the last decade so that today optical engineering has emerged as an important discipline in its own right. This series is devoted to discussing topics in optical engineering at a level that will be useful to those working in the field or attempting to design systems that are based on optical techniques or that have significant optical subsystems.

GaN-Based Laser Diodes Jul 24 2019 The emergence of highly efficient short-wavelength laser diodes based on the III-V compound semiconductor GaN has not only enabled high-density optical data storage, but is also expected to revolutionize display applications. Moreover, a variety of scientific applications in biophotonics, materials research and quantum optics can benefit from these versatile and cost-efficient laser light sources in the near-UV to green spectral range. This thesis describes the device physics of GaN-based laser diodes, together with recent efforts to achieve longer emission wavelengths and short-pulse emission. Experimental and theoretical approaches are employed to address the individual device properties and optimize the laser diodes toward the requirements of specific applications.

Frequency-Resolved Optical Gating: The Measurement of Ultrashort Laser Pulses Jul 16 2021 The Frequency-Resolved Optical-Gating (FROG) technique has revolutionized our ability to measure and understand ultrashort laser pulses. This book contains everything you need to know to measure even the shortest, weakest, or most complex ultrashort laser pulses. Whether you're an undergrad or an advanced researcher, you'll find easy-to-understand descriptions of all the key ideas behind all the FROG techniques, all the practical details of pulse measurement, and many new directions of research. This book is not like any other scientific book. It is a lively discussion of the basic concepts. It is an advanced treatment of research-level issues.

Femtosecond Laser Pulses Nov 19 2021 This smooth introduction for advanced undergraduates starts with the fundamentals of lasers and pulsed optics. Thus prepared, the student is introduced to short and ultrashort laser pulses, and learns how to generate, manipulate, and measure them. Spectroscopic implications are also discussed. The second edition has been completely revised and

includes two new chapters on some of the most promising and fast-developing applications in ultrafast phenomena: coherent control and attosecond pulses.

High Power Ultra-short Pulse Lasers Based on Fiber Driven OPCPA Mar 24 2022

Electronic Desorption and Microstructure Adhesion Reduction Using Ultrashort-pulse Lasers Jan 10 2021

Beam Acceleration In Crystals And Nanostructures - Proceedings Of The Workshop Aug 24 2019

Evaluation of Three Techniques for Producing Laser Pulses of Nanosecond Duration Mar 12 2021 Three devices, a short-pulse laser, a coaxial Pockel cell shutter, and a single-crystal transmission-line Pockel cell, have been evaluated as techniques for producing laser pulses approximately 1 nsec in duration. The short-pulse laser has produced pulses that range from 0.5 nsec to 2.0 nsec in duration with peak powers from 25 to 300 kW. Pulses 1.8 nsec in duration FWHM (full width at half maximum) with risetime of less than 0.4 nsec have been gated from Q-switched ruby laser pulses by the coaxial shutter, while pulses 1.3 nsec FWHM have been obtained in the same fashion with a transmission-line shutter. (Author).

Opportunities in Intense Ultrafast Lasers Sep 25 2019 The laser has revolutionized many areas of science and society, providing bright and versatile light sources that transform the ways we investigate science and enables trillions of dollars of commerce. Now a second laser revolution is underway with pulsed petawatt-class lasers (1 petawatt: 1 million billion watts) that deliver nearly 100 times the total world's power concentrated into a pulse that lasts less than one-trillionth of a second. Such light sources create unique, extreme laboratory conditions that can accelerate and collide intense beams of elementary particles, drive nuclear reactions, heat matter to conditions found in stars, or even create matter out of the empty vacuum. These powerful lasers came largely from U.S. engineering, and the science and technology opportunities they enable were discussed in several previous National Academies' reports. Based on these advances, the principal research funding agencies in Europe and Asia began in the last decade to invest heavily in new facilities that will employ these high-intensity lasers for fundamental and applied science. No similar programs exist in the United States. Opportunities in Intense Ultrafast Lasers assesses the opportunities and recommends a path forward for possible U.S. investments in this area of science.

Photoionization and Photo-Induced Processes in Mass Spectrometry Dec 09 2020 Provides comprehensive coverage of laser-induced ionization processes for mass spectrometry analysis Drawing on the expertise of the leading academic and industrial research groups involved in the development of photoionization methods for mass spectrometry, this reference for analytical scientists covers both the theory and current applications of photo-induced ionization processes. It places widely used techniques such as MALDI side by side with more specialist approaches such as REMPI and RIMS, and discusses leading edge developments in ultrashort laser pulse desorption, to give readers a complete picture of the state of the technology. Photoionization and Photo-Induced Processes in Mass Spectrometry: Fundamentals and Applications starts with a complete overview of the fundamentals of the technique, covering the basics of the gas phase ionization as well as those of laser desorption and ablation, pulse photoionization, and single particle ionization. Numerous application examples from different analytical fields are described that showcase the power and the wide scope of photo ionization in mass spectrometry. -The first general reference book on photoionization techniques for mass spectrometry -Examines technologies and applications of gas phase resonance-enhanced multiphoton ionization mass spectrometry (REMPI-MS) and gas phase resonance ionization mass spectrometry (RIMS) -Provides complete coverage of popular techniques like MALDI -Discusses the current and potential applications of each technology, focusing on process and environmental analysis Photoionization and Photo-Induced Processes in Mass Spectrometry: Fundamentals and Applications is an excellent book for spectroscopists, analytical chemists, photochemists, physical chemists, and laser specialists.

Pulsed Laser Ablation Jun 02 2020 Pulsed laser–based techniques for depositing and processing materials are an important area of modern experimental and theoretical scientific research and development, with promising, challenging opportunities in the fields of nanofabrication and

nanostructuring. Understanding the interplay between deposition/processing conditions, laser parameters, as well as material properties and dimensionality is demanding for improved fundamental knowledge and novel applications. This book introduces and discusses the basic principles of pulsed laser–matter interaction, with a focus on its peculiarities and perspectives compared to other conventional techniques and state-of-the-art applications. The book starts with an overview of the growth topics, followed by a discussion of laser–matter interaction depending on laser pulse duration, background conditions, materials, and combination of materials and structures. The information outlines the foundation to introduce examples of laser nanostructuring/processing of materials, pointing out the importance of pulsed laser–based technologies in modern (nano)science. With respect to similar texts and monographs, the book offers a comprehensive review including bottom-up and top-down laser-induced processes for nanoparticles and nanomicrostructure generation. Theoretical models are discussed by correlation with advanced experimental protocols in order to account for the fundamentals and underline physical mechanisms of laser–matter interaction. Reputed, internationally recognized experts in the field have contributed to this book. In particular, this book is suitable for a reader (graduate students as well as postgraduates and more generally researchers) new to the subject of pulsed laser ablation in order to gain physical insight into and advanced knowledge of mechanisms and processes involved in any deposition/processing experiment based on pulsed laser–matter interaction. Since knowledge in the field is given step by step comprehensively, this book serves as a valid introduction to the field as well as a foundation for further specific readings.

Laser Heating Applications Feb 08 2021 "This book describes those areas of thermodynamics which prove conductive to equilibrium and non-equilibrium heating theories in addition to yielding results that serve as data for further theories"--

High Energy and Short Pulse Lasers Oct 31 2022 This book gives the readers an introduction to experimental and theoretical knowledge acquired by large-scale laser laboratories that are dealing with extra-high peak power and ultrashort laser pulses for research of terawatt (TW), petawatt (PW), or near-future exawatt (EW) laser interactions, for soft X-ray sources, for acceleration of particles, or for generation of hot dense thermal plasma for the laser fusion. The other part of this book is dealing with the small-scale laser laboratories that are using for its research on commercial sources of laser radiation, nanosecond (ns), picosecond (ps), or femtosecond (fs) laser pulses, either for basic research or for more advanced applications. This book is divided into six main sections dealing with short and ultrashort laser pulses, laser-produced soft X-ray sources, large-scale high-power laser systems, free-electron lasers, fiber-based sources of short optical pulse, and applications of short pulse lasers. In each chapter readers can find fascinating topics related to the high energy and/or short pulse laser technique. Individual chapters should serve the broad spectrum of readers of different expertise, layman, undergraduate and postgraduate students, scientists, and engineers, who may in this book find easily explained fundamentals as well as advanced principles of particular subjects related to these phenomena.

Energy Deposition and Transport During High-power and Short-pulse Laser-metal Interactions Jun 14 2021

Short Pulse Laser Interactions with Matter Aug 29 2022 This book represents the first comprehensive treatment of the subject, covering the theoretical principles, present experimental status and important applications of short-pulse laser-matter interactions. Femtosecond lasers have undergone dramatic technological advances over the last fifteen years, generating a whole host of new research activities under the theme of ?ultrafast science?. The focused light from these devices is so intense that ordinary matter is torn apart within a few laser cycles. This book takes a close-up look at the exotic physical phenomena which arise as a result of this new form of ?light-matter? interaction, covering a diverse set of topics including multiphoton ionization, rapid heatwaves, fast particle generation and relativistic self-channeling. These processes are central to a number of exciting new applications in other fields, such as microholography, optical particle accelerators and photonuclear physics.

Ultrashort Laser Pulse Phenomena Apr 24 2022 Ultrashort Laser Pulse Phenomena, Second Edition serves as an introduction to the phenomena of ultra short laser pulses and describes how this technology can be used to examine problems in areas such as electromagnetism, optics, and quantum mechanics. Ultrashort Laser Pulse Phenomena combines theoretical backgrounds and experimental techniques and will serve as a manual on designing and constructing femtosecond ("faster than electronics") systems or experiments from scratch. Beyond the simple optical system, the various sources of ultrashort pulses are presented, again with emphasis on the basic concepts and how they apply to the design of particular sources (dye lasers, solid state lasers, semiconductor lasers, fiber lasers, and sources based on frequency conversion). Provides an easy to follow guide through "faster than electronics" probing and detection methods THE manual on designing and constructing femtosecond systems and experiments Discusses essential technology for applications in micro-machining, femtochemistry, and medical imaging

High Energy, Short Pulse Lasers Jan 22 2022 This work has been selected by scholars as being culturally important and is part of the knowledge base of civilization as we know it. This work is in the public domain in the United States of America, and possibly other nations. Within the United States, you may freely copy and distribute this work, as no entity (individual or corporate) has a copyright on the body of the work. Scholars believe, and we concur, that this work is important enough to be preserved, reproduced, and made generally available to the public. To ensure a quality reading experience, this work has been proofread and republished using a format that seamlessly blends the original graphical elements with text in an easy-to-read typeface. We appreciate your support of the preservation process, and thank you for being an important part of keeping this knowledge alive and relevant.

Short Pulse Generation with Semiconductor Lasers Dec 29 2019

Efficient material laser beam ablation with a picosecond laser Jan 28 2020 Ultra-short pulse laser processing of ultra-hard materials requires an accurate and agile experimental and analytical investigation to determine an efficient choice of parameters and settings to optimize ablation. Therefore, this work presents a quality-oriented experimental approach and an analytical approach for the modeling and validation of multi-pulse picosecond laser beam ablation on cemented tungsten carbide. This work starts with a review of literature and state-of-the-art theories of four relevant areas for this research: picosecond lasers, laser beam ablation process, cemented tungsten carbide (WC) and quality-oriented tools. Subsequently, a concept for an efficient material laser beam ablation with a picosecond laser was introduced. Furthermore, two approaches for the investigation are presented from an experimental and analytical perspective, respectively. The first approach introduced a methodology for the identification of influential parameters. It executes a quality-oriented methodology based on the SWOT analysis, cause-and-effect diagram and the variable search methodology. The conclusion of the methodology gave the interaction of pulse repetition rate and scanner speed in the form of pulse overlap and track overlap PO/TO as the most influential parameter in the maximization of the ablation rate. The second most influential factors resulted laser beam power and burst-mode. The second approach, description of the model, executes a theoretical analysis of the picosecond laser beam ablation of cemented WC by the application of the Beer-Lambert law and multi-pulse ablation modeling. The unavailable material properties were obtained by experimental investigations, like in the cases of the incubation factor and the reflectivity factor. Threshold fluence for cemented WC was determined by the application of the heat transfer theory and input power intensity was adapted to a Gaussian beam profile. At the end of the approach, power density visualizations of a picosecond laser pulse under the five available pulse repetition rates were modeled and validated. The findings from the adaptation of the Beer-Lambert law acted as basis for development of the multi-pulse laser ablation model for both single-pulse mode and burst-mode, respectively. Based on the definition of the number of pulses N irradiating the same area, the corresponding threshold fluence for N, the input fluence and incubation factor, ablation depth was modeled and experimentally validated. Finally, results and conclusions of both approaches were discussed and a framework for an efficient laser beam ablation was presented.

Recommendations for further actions on research and industry were introduced at the end of the work.

Lasers for Medical Applications Mar 31 2020 Lasers have a wide and growing range of applications in medicine. Lasers for Medical Applications summarises the wealth of recent research on the principles, technologies and application of lasers in diagnostics, therapy and surgery. Part one gives an overview of the use of lasers in medicine, key principles of lasers and radiation interactions with tissue. To understand the wide diversity and therefore the large possible choice of these devices for a specific diagnosis or treatment, the respective types of the laser (solid state, gas, dye, and semiconductor) are reviewed in part two. Part three describes diagnostic laser methods, for example optical coherence tomography, spectroscopy, optical biopsy, and time-resolved fluorescence polarization spectroscopy. Those methods help doctors to refine the scope of involvement of the particular body part or, for example, to specify the extent of a tumor. Part four concentrates on the therapeutic applications of laser radiation in particular branches of medicine, including ophthalmology, dermatology, cardiology, urology, gynecology, otorhinolaryngology (ORL), neurology, dentistry, orthopaedic surgery and cancer therapy, as well as laser coatings of implants. The final chapter includes the safety precautions with which the staff working with laser instruments must be familiar. With its distinguished editor and international team of contributors, this important book summarizes international achievements in the field of laser applications in medicine in the past 50 years. It provides a valuable contribution to laser medicine by outstanding experts in medicine and engineering. Describes the interaction of laser light with tissue Reviews every type of laser used in medicine: solid state, gas, dye and semiconductor Describes the use of lasers for diagnostics

The Physics and Engineering of Compact Quantum Dot-based Lasers for Biophotonics Nov 27 2019 Written by a team of European experts in the field, this book addresses the physics, the principles, the engineering methods, and the latest developments of efficient and compact ultrafast lasers based on novel quantum-dot structures and devices, as well as their applications in biophotonics. Recommended reading for physicists, engineers, students and lecturers in the fields of photonics, optics, laser physics, optoelectronics, and biophotonics.

Short Pulse Laser Systems for Biomedical Applications Aug 05 2020 This book presents practical information on the clinical applications of short pulse laser systems and the techniques for optimizing these applications in a manner that will be relevant to a broad audience, including engineering and medical students as well as researchers, clinicians, and technicians. Short pulse laser systems are useful for both subsurface tissue imaging and laser induced thermal therapy (LITT), which hold great promise in cancer diagnostics and treatment. Such laser systems may be used alone or in combination with optically active nanoparticles specifically administered to the tissues of interest for enhanced contrast in imaging and precise heating during LITT. Mathematical and computational models of short pulse laser-tissue interactions that consider the transient radiative transport equation coupled with a bio-heat equation considering the initial transients of laser heating were developed to analyze the laser-tissue interaction during imaging and therapy. Experiments were first performed to characterize the tissue optical properties needed to optimize the dose for thermal therapy. Experiments were then performed on animal models to characterize the heat affected zone for LITT. The experimental measurements were also validated using the computational models.

Ultra-Short Pulsed Laser Engineered Metal-Glass Nanocomposites May 02 2020 Glasses containing metallic nanoparticles exhibit very promising linear and nonlinear optical properties, mainly due to the surface plasmon resonances (SPRs) of the nanoparticles. The spectral position in the visible and near-infrared range and polarization dependence of the SPR are characteristically determined by the nanoparticles' shapes. The focus of Ultra-Short Pulsed Laser Engineered Metal-Glass Nanocomposites is the interaction of intense ultra-short laser pulses with glass containing silver nanoparticles embedded in soda-lime glass, and nanostructural modifications in metal-glass nanocomposites induced by such laser pulses. In order to provide a comprehensive physical picture of the processes leading to laser-induced persistent shape transformation of the nanoparticles,

series of experimental results investigating the dependences of laser assisted shape modifications of nanoparticles with laser pulse intensity, excitation wavelength, temperature are considered. In addition, the resulting local optical dichroism allows producing very flexibly polarizing optical (sub-) microstructures with well-specified optical properties. The achieved considerable progress towards technological application of this technique, in particular also for long-term optical data storage, is also discussed.

Special Issue on "short Pulse Lasers for Materials Processing and Diagnostics" Feb 20 2022

Short Pulse Laser Systems for Biomedical Applications Sep 29 2022 This book presents practical information on the clinical applications of short pulse laser systems and the techniques for optimizing these applications in a manner that will be relevant to a broad audience, including engineering and medical students as well as researchers, clinicians, and technicians. Short pulse laser systems are useful for both subsurface tissue imaging and laser induced thermal therapy (LITT), which hold great promise in cancer diagnostics and treatment. Such laser systems may be used alone or in combination with optically active nanoparticles specifically administered to the tissues of interest for enhanced contrast in imaging and precise heating during LITT. Mathematical and computational models of short pulse laser-tissue interactions that consider the transient radiative transport equation coupled with a bio-heat equation considering the initial transients of laser heating were developed to analyze the laser-tissue interaction during imaging and therapy. Experiments were first performed to characterize the tissue optical properties needed to optimize the dose for thermal therapy. Experiments were then performed on animal models to characterize the heat affected zone for LITT. The experimental measurements were also validated using the computational models.

Ultrashort Pulse Laser Technology Jul 28 2022 Ultrashort laser pulses with durations in the femtosecond range up to a few picoseconds provide a unique method for precise materials processing or medical applications. Paired with the recent developments in ultrashort pulse lasers, this technology is finding its way into various application fields. The book gives a comprehensive overview of the principles and applications of ultrashort pulse lasers, especially applied to medicine and production technology. Recent advances in laser technology are discussed in detail. This covers the development of reliable and cheap low power laser sources as well as high average power ultrashort pulse lasers for large scale manufacturing. The fundamentals of laser-matter-interaction as well as processing strategies and the required system technology are discussed for these laser sources with respect to precise materials processing. Finally, different applications within medicine, measurement technology or materials processing are highlighted.

Field Guide to Laser Pulse Generation Oct 07 2020 This guide provides the essential information on laser pulse generation, including Q switching, gain switching, mode locking, and the amplification of ultrashort pulses to high energies. Pulse characterization is also covered, along with the physical aspects and various technical limitations. This guide is designed for industry practitioners, researchers, users of pulsed and ultrafast laser systems, and anyone wanting to learn more about the potential of different pulse generation methods.

Numerical Simulation of Interaction of Short Pulse Lasers with Plasma Dec 21 2021 Development of high power lasers opened a new era of scientific innovations. Now it is possible to study the matter properties under extreme conditions applicable to large number of potential applications. The field of laser-plasma interaction is very vast and wealthy in content. In this thesis we present three basic aspects related to the subject.We have developed a new model for laser interaction with solid targets which is applicable for the laser pulse duration ranging from femtoseconds to picoseconds. The benchmarking of the model is done by testing various special cases. The absorption model is coupled with one dimension radiation hydrodynamics, opacity and equation of state data in order to simulate various experiments. The interaction of laser with atomic cluster is also investigated in this monograph. A new hydrodynamic model for laser cluster interaction is presented. Our model takes into account the radial non-uniformity of the expanding cluster under the influence of incident laser. Finally the laser induced ion acceleration is also

studied using one dimensional particle-in-cell code.

Thermal Aspects of High-intensity, Short-pulse Laser-liquid Interactions May 14 2021

Ultra-Fast Fiber Lasers Oct 26 2019 Ultrashort pulses in mode-locked lasers are receiving focused attention from researchers looking to apply them in a variety of fields, from optical clock technology to measurements of the fundamental constants of nature and ultrahigh-speed optical communications. Ultrashort pulses are especially important for the next generation of ultrahigh-speed optical systems and networks operating at 100 Gbps per carrier. Ultra Fast Fiber Lasers: Principles and Applications with MATLAB® Models is a self-contained reference for engineers and others in the fields of applied photonics and optical communications. Covering both fundamentals and advanced research, this book includes both theoretical and experimental results. MATLAB files are included to provide a basic grounding in the simulation of the generation of short pulses and the propagation or circulation around nonlinear fiber rings. With its unique and extensive content, this volume— Covers fundamental principles involved in the generation of ultrashort pulses employing fiber ring lasers, particularly those that incorporate active optical modulators of amplitude or phase types Presents experimental techniques for the generation, detection, and characterization of ultrashort pulse sequences derived from several current schemes Describes the multiplication of ultrashort pulse sequences using the Talbot diffraction effects in the time domain via the use of highly dispersive media Discusses developments of multiple short pulses in the form of solitons binding together by phase states Elucidates the generation of short pulse sequences and multiple wavelength channels from a single fiber laser The most practical short pulse sources are always found in the form of guided wave photonic structures. This minimizes problems with alignment and eases coupling into fiber transmission systems. In meeting these requirements, fiber ring lasers operating in active mode serve well as suitable ultrashort pulse sources. It is only a matter of time before scientists building on this research develop the practical and easy-to-use applications that will make ultrahigh-speed optical systems universally available.

Development, Characterization, and Application of Excimer-Based Short-Pulse Laser Systems Nov 07 2020

High Energy, Short Pulse Lasers Jun 26 2022

High Energy and Short Pulse Lasers: Technological Advances May 26 2022 The device which emits light with the help of processes such as optical amplification which is based on the stimulated emission of electromagnetic radiation is termed as a laser. They are classified into high energy lasers and short pulse lasers. They are used in weapons, laser printers, barcode scanners, DNA sequencing instruments, optical disk drives, laser surgery, etc. High energy lasers are used in weapons. The lasers that emit light in the form of optical pulses, and this light is not emitted in a continuous mode are referred as pulsed lasers. This book traces the progress of this field and highlights some of its key concepts and applications. The various advancements in lasers are glanced at and their applications as well as ramifications are looked at in detail. Researchers and students in this field will be assisted by this book.