Volume 6, Issue 2 ■ Q2 ■ APR2016

S&T In-Depth

THE LATEST IN SCIENCE AND TECHNOLOGY RESEARCH LITERATURE

FEATURE TOPIC: HIGH POWER LASER

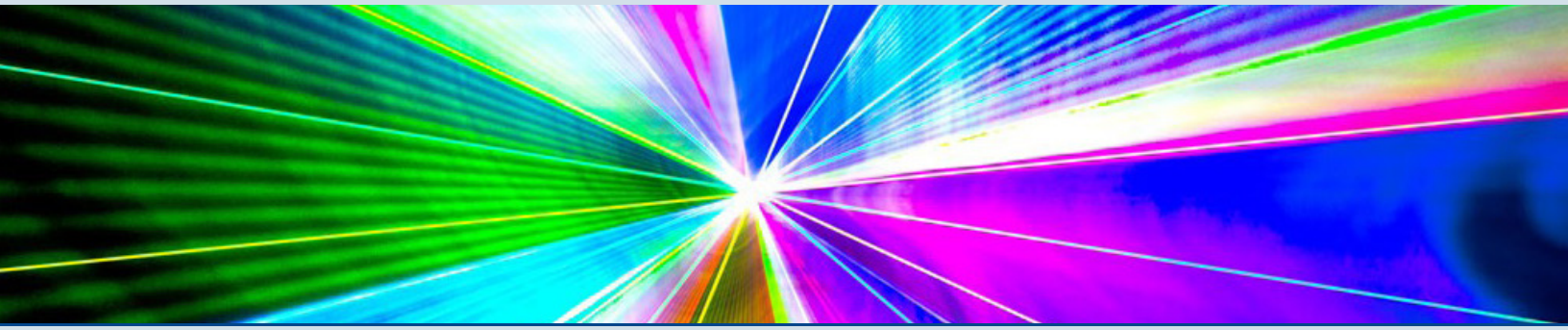

TABLE OF CONTENTS

REVIEW ARTICLES

- ICAN as a new laser paradigm for high energy, high average power femtosecond pulses (France) 2014
- The IZEST Framework (France) 2014
- Low-Temperature and High-Energy-Resolution Laser Photoemission Spectroscopy (Japan) 2015
- Overview of transparent optical ceramics for high-energy lasers at NRL (USA) 2015
- Progress in high average power ultrafast lasers (England) 2015
- Space-based application of the CAN laser to LIDAR and orbital debris remediation (France) 2015

HIGH ENERGY LASER

- Array detector for high energy laser based on diffuse transmission sampling (China) 2014
- Beam control for high-energy laser devices (USA) 2013
- Continuous-Wave and Passive Q-Switching Laser Performance of Yb:YCa4O(BO3)(3) Crystal (China) 2015
- Enhanced, fast-running scaling law model of thermal blooming and turbulence effects on high energy laser propagation(USA) 2013
- Enhancement of resistance against high energy laser pulse injection with chevron beam dump (Japan) 2015
- High-energy laser-pulse self-compression in short gas-filled fibers (England) 2014
- High-energy laser shock processing for a rectangular HSLA steel plate considering solid-liquid-vapor phase change (China) 2016
- High-energy laser-summator based on Raman scattering principle (Russia) 2013
- High-power passively Q-switched Yb:YCa4O(BO3)(3) laser with a GaAs crystal plate as saturable absorber (China) 2015
- Increase of the density, temperature and velocity of plasma jets driven by a ring of high energy laser beams (USA) 2013
- Passive Q-Switching Laser Performance of Yb:YVO4 Crystal (China) 2014
- Phase transition model of water flow irradiated by high-energy laser in a chamber (China) 2014
- Research on Laser Peening of TC21 Titanium Alloy with High Energy Laser (China) 2014
- Ruggedizing high-energy lasers for the battlefield (USA) 2014
- Technical requirements and uncertainty of far field laser spot centroid measurement using array detection method (China) 2015
- Technology for radiation efficiency measurement of high-power halogen tungsten lamp used in calibration of high-energy laser energy meter (China) 2015
- Trans-reflection thermal driven deformable mirror with flexible bonding in high energy laser system (China) 2014
- Transmissive high-energy laser optics: Manufacturing and testing considerations (USA) 2014
- Ultra-Large Core Size Hypocycloid-Shape Inhibited Coupling Kagome Fibers for High-Energy Laser Beam Handling (France) 2015
- Variable high-energy-laser attenuator based on the interference on a transparent plate (Slovenia) 2011

continued

HIGH ENERGY LASER - APPLICATIONS

- High-energy laser weapons since the early 1960s (USA) 2013
- High-energy laser windows: case of fused silica (USA) 2010
- Is this the time for a high-energy laser weapon program? (USA) 2013
- Low absorption magnesium aluminate spinel windows for high energy laser applications (USA) 2014
- Near-IR absorption in high-purity photothermorefractive glass and holographic optical elements: measurement and application for high-energy lasers (USA) 2011
- A new Thomson Spectrometer for high energy laser-driven beams diagnostic (Italy) 2014
- Study on the influence of the response characteristics of a temperature sensor on the measurement accuracy of a water-absorption-based high-energy laser energy meter (China) 2013
- Volume absorption laser energy meter for high energy laser by water absorption (China) 2013

HIGH ENERGY LASER - GENERATION

- Compact repetitively Q-switched Yb:YCa4O(BO3)(3) laser with an acousto-optic modulator (China) 2015
- Fiber Front End With Multiple Phase Modulations and High-Bandwidth Pulse Shaping for High-Energy Laser-Beam Smoothing (USA) 2013
- Generation of 2.6-mJ 400-kW pulses from a compact Yb:Gd3Ga5O12 laser repetitively Q-switched by an acousto-optic modulator (China) 2013
- Investigation of the arbitrary waveform semiconductor laser as seed light source for high energy laser (China) 2012
- Multistage fiber preamplifier employing spectral compression for generation of high-energy laser pulses (Russia) 2016
- Photoionized plasmas induced in neon with extreme ultraviolet and soft X-ray pulses produced using low and high energy laser systems (Poland) 2015
- Single-shot fluctuations in waveguided high-harmonic generation (The Netherlands) 2015
- Spatio-temporal modeling and optimization of a deformable-grating compressor for short high-energy laser pulses (USA) 2015
- Spectroscopic study of the discoloration of transparent MgAl2O4 spinel fabricated by spark-plasma-sintering (SPS) processing (Japan) 2015

HIGH ENERGY LASER - MATERIALS

- Ceramic windows and gain media for high-energy lasers (USA) 2013
- Characterization of material ablation driven by laser generated intense extreme ultraviolet light (Japan) 2015
- Extremely Nonlinear Optics Using Shaped Pulses Spectrally Broadened in an Argon- or Sulfur Hexafluoride-Filled Hollow-Core Fiber (Germany) 2016
- High-Energy Laser Systems and Components (USA) 2013
- High-power CW and passively Q-switched laser operation of Yb:GdCa4O(BO3)(3) crystal (China) 2016
- An Insight into the Various Defects-Induced Emission in MgAl2O4 and Their Tunability with Phase Behavior: Combined Experimental and Theoretical Approach (India) 2016
- The potential of Yb:YCa4O(BO3)(3) crystal in generating high-energy laser pulses (China) 2013

continued

Review Articles

ICAN as a new laser paradigm for high energy, high average power femtosecond pulses (France) 2014

Author(s): Brocklesby, WS (Brocklesby, W. S.); Nilsson, J (Nilsson, J.); Schreiber, T (Schreiber, T.); Limpert, J (Limpert, J.); Brignon, A (Brignon, A.); Bourderionnet, J (Bourderionnet, J.); Lombard, L (Lombard, L.); Michau, V (Michau, V.); Hanna, M (Hanna, M.); Zaouter, Y (Zaouter, Y.); Tajima, T (Tajima, T.); Mourou, G (Mourou, Gerard)

Source: EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS Volume: 223 Issue: 6 Pages: 1189-1195 DOI: 10.1140/epjst/e2014-02172-4 Published: MAY 2014

ABSTRACT: The application of petawatt lasers to scientific and technological problems is advancing rapidly. The usefulness of these applications will depend on being able to produce petawatt pulses at much higher repetition rates than is presently possible. The International Coherent Amplification Network (ICAN) consortium seeks to design high repetition rate petawatt lasers using large scale coherent beam combination of femtosecond pulse amplifiers built from optical fibres. This combination of technologies has the potential to overcome many of the hurdles to high energy, high average power pulsed lasers, opening up applications and meeting societal challenges.

Author affiliation:
[Mourou, Gerard] Ecole Polytech, Palaiseau, France.
[Schreiber, T.; Limpert, J.] Fraunhofer IOF Jena, Jena, Germany.
[Brocklesby, W. S.; Nilsson, J.] ORC Optoelect Res Ctr, Southampton, Hants, England.
[Hanna, M.] Inst Opt, Lab Charles Fabry, Palaiseau, France.
[Brignon, A.; Bourderionnet, J.] TRT Fr THALES Res & Technol, Palaiseau, France.
[Zaouter, Y.] Amplitude Syst, Pessac, France.
[Tajima, T.] Univ Calif Irvine, Irvine, CA 92717 USA.
Reprint Address: Brocklesby, WS (reprint author), ORC Optoelect Res Ctr, Southampton, Hants, England.

Times Cited: 6
Number of references: 22
Tags: Review article

The IZEST Framework (France) 2014

Author(s): Quinn, MN (Quinn, M. N.); Wheeler, JA (Wheeler, J. A.); Miquel, JL (Miquel, J. L.); Zamfir, V (Zamfir, V.); Sergeev, AM (Sergeev, A. M.)

Source: EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS Volume: 223 Issue: 6 Pages: 985-992 DOI: 10.1140/epjst/e2014-02149-3 Published: MAY 2014

ABSTRACT: The past decade has seen a significant development of high energy laser facilities across Europe, Asia and North America. With these investments exceeding billions of euros, there is strong incentive to extend the applicability of such Big-Science infrastructure and pursue new possibilities for laser-based high energy physics. Many of these international laboratories have joined the IZEST collaboration as partners and thus will provide the facilities to carry out future pertinent experimental investigations.

Addresses: [Quinn, M. N.; Wheeler, J. A.] CEA Saclay, Lab Interact & Dynam Lasers, IZEST PHI, F-91191 Gif Sur Yvette, France.
[Miquel, J. L.] CEA, DAM, DIF, F-91297 Arpajon, France.
[Zamfir, V.] Horia Hulubei Natl Inst Phys & Nucl Engn, ELI NP, Bucharest, Romania.
[Sergeev, A. M.] Russian Acad Sci, Inst Appl Phys, Nizhnii Novgorod 603950, Russia.
Reprint Address: Quinn, MN (reprint author), CEA Saclay, Lab Interact & Dynam Lasers, IZEST PHI, F-91191 Gif Sur Yvette, France.
E-mail Addresses: mark.quinn@cea.fr

Times Cited: 3
Number of references: 16
Tags: Review article

Low-Temperature and High-Energy-Resolution Laser Photoemission Spectroscopy (Japan) 2015

Author(s): Shimojima, T (Shimojima, Takahiro); Okazaki, K (Okazaki, Kozo); Shin, S (Shin, Shik)

Source: JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN Volume: 84 Issue: 7 Article Number: 072001 DOI: 10.7566/JPSJ.84.072001 Published: JUL 15 2015

ABSTRACT: We present a review on the developments in the photoemission spectrometer with a vacuum ultraviolet laser at Institute for Solid State Physics at the University of Tokyo. The advantages of high energy resolution, high cooling ability, and bulk sensitivity enable applications with a wide range of materials. We introduce some examples of fine electronic structures detected by

continued

laser photoemission spectroscopy and discuss the prospects of research on low-transition-temperature superconductors exhibiting unconventional superconductivity.

Addresses: [Shimojima, Takahiro] Univ Tokyo, QPEC, Bunkyo Ku, Tokyo 1138656, Japan.
[Shimojima, Takahiro] Univ Tokyo, Dept Appl Phys, Bunkyo Ku, Tokyo 1138656, Japan.
[Okazaki, Kozo; Shin, Shik] Univ Tokyo, ISSP, Kashiwa, Chiba 2778581, Japan.
Reprint Address: Shimojima, T (reprint author), Univ Tokyo, QPEC, Bunkyo Ku, Tokyo 1138656, Japan.
Times Cited: 0
Number of references: 217
Tags: Review article

Overview of transparent optical ceramics for high-energy lasers at NRL (USA) 2015

Author(s): Kim, W (Kim, Woohong); Villalobos, G (Villalobos, Guillermo); Baker, C (Baker, Colin); Frantz, J (Frantz, Jesse); Shaw, B (Shaw, Brandon); Bayya, S (Bayya, Shyam); Sadowski, B (Sadowski, Bryan); Hunt, M (Hunt, Michael); Rock, B (Rock, Benjamin); Aggarwal, I (Aggarwal, Ishwar); Sanghera, J (Sanghera, Jasbinder)

Source: APPLIED OPTICS Volume: 54 Issue: 31 Pages: F210-F221 DOI: 10.1364/AO.54.00F210 Published: NOV 1 2015

ABSTRACT: In this review, we present our recent research progress at the Naval Research Laboratory in the development of highly transparent and rugged ceramic window materials such as MgAl2O4 spinel and beta-SiC; high-power solidstate laser gain materials based on sesquioxide such as Yb3+:Y2O3, Yb3+:Lu2O3, and Ho3+:Lu2O3; and composite ceramics in the application for high-energy lasers. Various powder synthesis/purification methods and powder post-process techniques necessary to create high-purity powders are described. Ceramic fabrication processes and chemical, morphological, and optical properties of the ceramics developed at the Naval Research Laboratory (NRL) are highlighted. We also report high-efficiency lasing from a hot-pressed rare-earth sesquioxide single layer and composite ceramics made from coprecipitated powder. (C) 2015 Optical Society of America

Addresses: [Kim, Woohong; Villalobos, Guillermo; Baker, Colin; Frantz, Jesse; Shaw, Brandon; Bayya, Shyam; Rock, Benjamin; Sanghera, Jasbinder] Naval Res Lab, Washington, DC 20375 USA.
[Sadowski, Bryan; Aggarwal, Ishwar] Sotera Def Solut, Crofton, MD 21114 USA.
[Hunt, Michael] Univ Res Fdn, Greenbelt, MD 20770 USA.
Reprint Address: Kim, W (reprint author), Naval Res Lab, Washington, DC 20375 USA.
Times Cited: 1
Number of references: 54
Tags: Review article

Progress in high average power ultrafast lasers (England) 2015

Author(s): Brocklesby, WS (Brocklesby, W. S.)

Source: EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS Volume: 224 Issue: 13 Pages: 2529-2543 DOI: 10.1140/epjst/e2015-02562-0 Published: OCT 2015

ABSTRACT: The impact of femtosecond lasers across science and engineering has been significant. The one area which has so far proved hard to access for femtosecond lasers has been the combination of high peak power and high average power. This review seeks to highlight the issues which make high average power hard to achieve in many femtosecond systems, and looks at the routes that are now being taken to achieve the goal of high peak and high average power.

Addresses: Univ Southampton, Optoelect Res Ctr, Southampton SO17 1BJ, Hants, England.
Reprint Address: Brocklesby, WS (reprint author), Univ Southampton, Optoelect Res Ctr, Southampton SO17 1BJ, Hants, England.
E-mail Addresses: wsb@orc.soton.ac.uk
Times Cited: 0
Number of references: 59
Tags: Review article

Space-based application of the CAN laser to LIDAR and orbital debris remediation (France) 2015

Author(s): Quinn, MN (Quinn, M. N.); Jukna, V (Jukna, V.); Ebisuzaki, T (Ebisuzaki, T.); Dicaire, I (Dicaire, I.); Soulard, R (Soulard, R.); Summerer, L (Summerer, L.); Couairon, A (Couairon, A.); Mourou, G (Mourou, G.)

Source: EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS Volume: 224 Issue: 13 Pages: 2645-2655 DOI: 10.1140/epjst/e2015-02577-5 Published: OCT 2015

ABSTRACT: Development of pulsed lasers for space-based science missions entail many additional challenges compared to terrestrial experiments. For systems requiring short pulses a parts per thousand(a)1 ns with energies > 100 mJ and fast repetition rates > 10 kHz there are currently few if no laser architectures capable of operating with high electrical efficiency > 20% and have good system stability. The emergence of a mulit-channel fiber-based Coherent-Amplifying-Network or CAN laser potentially enables such capability for space based missions. Here in this article we present an analysis of two such missions scaling up in pulse energy from

continued

a parts per thousand 100 mJ for a supercontinuum LIDAR application utilising atmospheric filamentation to the higher energy demands needed for space debris remediation requiring a parts per thousand 10 J pulses. This scalability of the CAN laser provides pathways for development of the core science and technology where many new novel space applications can be made possible.

Addresses: [Quinn, M. N.; Soulard, R.; Mourou, G.] Ecole Polytech, IZEST, F-91128 Palaiseau, France.
[Jukna, V.; Couairon, A.] Univ Paris Saclay, CNRS, Ecole Polytech, Ctr Phys Theor, F-91128 Palaiseau, France.
[Ebisuzaki, T.] RIKEN, Wako, Saitama 3510198, Japan.
[Dicaire, I.] European Space Agcy, Adv Concepts Team, NL-2200 AG Noordwijk, Netherlands.
Reprint Address: Quinn, MN (reprint author), Ecole Polytech, IZEST, F-91128 Palaiseau, France.
E-mail Addresses: mark.quinn@polytechnique.edu

Times Cited: 0
Number of references: 34
Tags: Review article

High Energy Laser

Array detector for high energy laser based on diffuse transmission sampling (China) 2014

Author(s): Pang, M (Pang, Miao); Rong, J (Rong, Jian); Zhou, S (Zhou, Shan); Wu, J (Wu, Juan); Fan, GB (Fan, Guobin); Zhang, W (Zhang, Wei); Hu, XY (Hu, Xiaoyang)

Source: REVIEW OF SCIENTIFIC INSTRUMENTS Volume: 85 Issue: 1 Article Number: 013105 DOI: 10.1063/1.4861390 Published: JAN 2014

ABSTRACT: In order to improve the ability and accuracy of measuring the temporal-spatial distribution of the intensity of a large-size, high-energy laser beam, a novel array detecting method based on diffuse transmission sampling is proposed. The measurement principle and the design of the sampling and attenuating unit are presented. High-temperature-resistant diffuse transmission material is used to sample and attenuate a high energy laser beam. Pure copper, whose surface is first sand-blasted and then gold-plated, is applied to scatter the incident high-energy laser beam. The formula for the attenuation ratio was derived in detail. We developed two large-aperture array detectors with spatial resolution of 5 mm, spatial duty ratio of 20%, and useable angle range of +/- 30 degrees without varying the responsivity, the non-uniformity in the laser profile measurement is below 1%, and the repeatability error in the laser power measurement is approximately 1%. The maximal energy density that the array detector can endure is more than 10 kJ/cm(2). (C) 2014 AIP Publishing LLC.

Addresses: [Pang, Miao; Rong, Jian] Univ Elect Sci & Technol China, Sch Phys Elect, Chengdu 610054, Peoples R China.
[Pang, Miao; Zhou, Shan; Wu, Juan; Zhang, Wei; Hu, Xiaoyang] China Acad Engn Phys, Inst Appl Elect, Mianyang 621900, Peoples R China.
[Pang, Miao; Fan, Guobin] CAEP, Key Lab High Energy Laser, Mianyang 621900, Peoples R China.
Reprint Address: Pang, M (reprint author), Univ Elect Sci & Technol China, Sch Phys Elect, Chengdu 610054, Peoples R China.

Times Cited: 2
Number of references: 15
Tags: High enery laser

Beam control for high-energy laser devices (USA) 2013

Author(s): Merritt, PH (Merritt, Paul H.); Albertine, JR (Albertine, John R.)

Source: OPTICAL ENGINEERING Volume: 52 Issue: 2 Article Number: 021005 DOI: 10.1117/1.OE.52.2.021005 Published: FEB 2013

ABSTRACT: Beam-control systems for high-average-power lasers began in the late 1960s and early 1970s. Early systems propagated the beams across laboratories using heavy-water-cooled copper optics and open-beam trains with commercial fans to provide fresh air. They have evolved in the intervening 40-plus years to include highly sophisticated gimbaled-control systems with extremely high-reflectance uncooled optics and adaptive optics to compensate for less-than-ideal laser beams and for atmospheric distortions. An overview of that evolution is presented. (c) 2012 Society of Photo-Optical Instrumentation Engineers (SPIE). [DOI: 10.1117/1.OE.52.2.021005]

Addresses: [Merritt, Paul H.] Kirtland AFB, AF Civil Serv, Albuquerque, NM USA.
[Merritt, Paul H.] Boeing SVS, Albuquerque, NM USA.
[Merritt, Paul H.] Univ New Mexico, Albuquerque, NM 87131 USA.
[Merritt, Paul H.] SPIE, Bellingham, WA USA.
[Merritt, Paul H.] Boeing, Chicago, IL USA.
[Merritt, Paul H.; Albertine, John R.] DEPS, Albuquerque, NM USA.

continued

[Merritt, Paul H.] DEPS Symposiums, Albuquerque, NM USA.
[Albertine, John R.] Johns Hopkins Appl Phys Lab, Space Div, Baltimore, MD USA.
[Albertine, John R.] Navys High Energy Laser Program Off, Arlington, VA USA.
[Albertine, John R.] US Dept Def, Arlington, VA USA.
[Albertine, John R.] High Energy Laser Joint Technol Off, Arlington, VA USA.
Reprint Address: Merritt, PH (reprint author), 5608 Fair Oak Trail, Albuquerque, NM 87109 USA.
E-mail Addresses: paulhmerritt@msn.com
Times Cited: 0
Number of references: 5
Tags: High enery laser

Continuous-Wave and Passive Q-Switching Laser Performance of Yb:YCa4O(BO3)(3) Crystal (China) 2015

Author(s): Liu, JH (Liu, Junhai); Han, WJ (Han, Wenjuan); Chen, XW (Chen, Xiaowen); Dai, QB (Dai, Qibiao); Yu, HH (Yu, Haohai); Zhang, HJ (Zhang, Huaijin)

Source: IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS Volume: 21 Issue: 1 Article Number: 1600808 DOI: 10.1109/JSTQE.2014.2336534 Published: JAN-FEB 2015

ABSTRACT: We have conducted an investigation into the continuous-wave (CW) and passive Q-switching laser performance of the Yb:YCa4O(BO3)(3) (Yb:YCOB) crystal, aiming to evaluate its capability of power or energy scaling in compact end-pumped lasers. Efficient CW laser operation was realized with output coupling changed over a wide range from 0.4% to 60%. Operating in CW mode in the long-wavelength sideband around 1085 nm, the Z-cut Yb: YCOB laser produced an output power of 10.7 W with an optical-to-optical efficiency of 56%; in CW operation of the Y-cut Yb: YCOB laser oscillating in the main emission band, an output power of 17.0 W was reached, with optical-to-optical and slope efficiencies being respectively 62% and 78% (with respect to incident pump power). In passive Q-switching regime, the Xcut crystal proved to be the most advantageous in generating high average power and high pulse energy. With a Cr4+ : YAG crystal plate serving as saturable absorber whose initial transmission was T-0 = 97.5%, and with an output coupling of T = 20%, an average output of 10.72 W was generated at a pulse repetition rate of 26.3 kHz, the resulting pulse duration was 22.3 ns. While under Q-switching operational conditions of T-0 = 90.0% and T = 40%, a maximum average output power of 4.13 W could be reached at a rather low repetition rate of 3.23 kHz, yielding a pulse energy that was as high as 1.28 mJ, the resulting pulse duration and peak power being 5.0 ns and 256 kW, respectively.

Addresses: [Liu, Junhai; Han, Wenjuan; Chen, Xiaowen; Dai, Qibiao] Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
[Yu, Haohai; Zhang, Huaijin] Shandong Univ, State Key Lab Crystal Mat, Jinan 250100, Peoples R China.
Reprint Address: Liu, JH (reprint author), Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
E-mail Addresses: junhai_liu@hotmail.com; jane_hwj@hotmail.com; xiaowen123_chen@hotmail.com; qibiao_dai@hotmail.com; haohaiyu@sdu.edu.cn; huaijinzhang@sdu.edu.cn
Times Cited: 2
Number of references: 21
Tags: High enery laser

Enhanced, fast-running scaling law model of thermal blooming and turbulence effects on high energy laser propagation(USA) 2013

Author(s): Van Zandt, NR (Van Zandt, Noah R.); Fiorino, ST (Fiorino, Steven T.); Keefer, KJ (Keefer, Kevin J.)

Source: OPTICS EXPRESS Volume: 21 Issue: 12 Pages: 14789-14798 DOI: 10.1364/OE.21.014789 Published: JUN 17 2013

ABSTRACT: A new scaling law model is presented to rapidly simulate thermal blooming and turbulence effects on high energy laser propagation, producing results approaching the quality normally only available using wave-optics code, but at much faster speed. The model convolves irradiance patterns originating from two distinct scaling law models, one with a proficiency in thermal blooming effects and the other in turbulence. To underscore the power of the new model, results are verified for typical, realistic scenarios by direct comparison with wave optics simulation. (C)2013 Optical Society of America

Addresses: [Van Zandt, Noah R.; Fiorino, Steven T.; Keefer, Kevin J.] Air Force Inst Technol, Dept Engn Phys, Ctr Directed Energy, Wright Patterson AFB, OH 45433 USA.
Reprint Address: Van Zandt, NR (reprint author), Air Force Inst Technol, Dept Engn Phys, Ctr Directed Energy, 2950 Hobson Way, Wright Patterson AFB, OH 45433 USA.
E-mail Addresses: Steven.Fiorino@afit.edu
Times Cited: 1
Number of references: 17
Tags: High energy laser

continued

Enhancement of resistance against high energy laser pulse injection with chevron beam dump (Japan) 2015

Author(s): Yatsuka, E (Yatsuka, Eiichi); Hatae, T (Hatae, Takaki); Bassan, M (Bassan, Michele); Vayakis, G (Vayakis, George); Walsh, M (Walsh, Michael); Itami, K (Itami, Kiyoshi)

Source: FUSION ENGINEERING AND DESIGN Volume: 100 Pages: 461-467 DOI: 10.1016/j.fusengdes.2015.07.018 Published: NOV 2015

ABSTRACT: The laser beam dump of the Edge Thomson scattering (ETS) in ITER is being developed and a new type of beam dump called the chevron beam dump was proposed recently. The laser-induced damage on the surface is one of the most severe issues to be overcome. The key concept of the chevron beam dump is to reduce the laser energy absorption per unit area and to absorb the laser beam gradually. The laser irradiation tests onto flat-mirror-molybdenum sample were carried out. It was clarified that the absorbed (rather than incident) energy density of the laser pulses should be the correct figure of merit for the laser-induced damage. Therefore, the concept of the chevron beam dump design, that minimizes the absorbed laser energy density per unit area, was validated experimentally. The chevron beam dump enables us to extend its lifetime drastically relative to conventional beam dumps. Potential methods to improve the laser-induced damage threshold (LIDT) are also discussed in this paper. (C) 2015 Elsevier B.V. All rights reserved.

Addresses: [Yatsuka, Eiichi; Hatae, Takaki; Itami, Kiyoshi] Japan Atom Energy Agcy, Naka, Ibaraki 3110193, Japan.
[Bassan, Michele; Vayakis, George; Walsh, Michael] ITER Org, F-13067 Provence, France.
Reprint Address: Yatsuka, E (reprint author), Japan Atom Energy Agcy, Naka, Ibaraki 3110193, Japan.

Times Cited: 0
Number of references: 17

Tags: High enery laser

High-energy laser-pulse self-compression in short gas-filled fibers (England) 2014

Author(s): Anderson, PN (Anderson, P. N.); Horak, P (Horak, P.); Frey, JG (Frey, J. G.); Brocklesby, WS (Brocklesby, W. S.)

Source: PHYSICAL REVIEW A Volume: 89 Issue: 1 Article Number: 013819 DOI: 10.1103/PhysRevA.89.013819 Published: JAN 16 2014

ABSTRACT: We examine the spatiotemporal compression of energetic femtosecond laser pules within short gas-filled fibers. The study is undertaken using an advanced nonlinear pulse propagation model based on a multimode generalized nonlinear Schrodinger equation that has been modified to include plasma effects. Plasma defocusing and linear propagation effects are shown to be the dominant processes within a highly dynamical mechanism that enables 100-fs pulses to be compressed into the few-cycle regime after <50 mm of propagation. Once the mechanism has been introduced, parameter spaces are explored and compressor designs suitable for performing high-field experiments in situ are presented. We finish by showing how these designs may be extended to novel wavelengths and driving pulses delivered by state-of-the-art high-repetition-rate lasers.

Addresses: [Anderson, P. N.; Horak, P.; Brocklesby, W. S.] Univ Southampton, Optoelect Res Ctr, Fac Phys Sci & Engn, Southampton SO17 1BJ, Hants, England.
[Frey, J. G.] Univ Southampton, Fac Nat & Environm Sci, Southampton SO17 1BJ, Hants, England.
Reprint Address: Anderson, PN (reprint author), Univ Southampton, Optoelect Res Ctr, Fac Phys Sci & Engn, Southampton SO17 1BJ, Hants, England.

Times Cited: 3
Number of references: 40

Tags: High enery laser

High-energy laser shock processing for a rectangular HSLA steel plate considering solid-liquid-vapor phase change (China) 2016

Author(s): Jiang, HJ (Jiang, Hao-Jie); Dai, HL (Dai, Hong-Liang); Gao, NH (Gao, Ning-Hua)

Source: APPLIED THERMAL ENGINEERING Volume: 93 Pages: 384-396 DOI: 10.1016/j.applthermaleng.2015.09.115 Published: JAN 25 2016

ABSTRACT: Three-dimensional thermodynamic analysis of a high strength and low alloy (HSLA) rectangular steel plate under high-energy laser shock processing is carried out in this paper. Considering the solid-liquid-vapor phase-change process, three-dimensional transient temperature field, mass fraction of liquid phase and vapor phase for the rectangular HSLA steel plate are solved by the method of separation of variables. Meanwhile, the displacement and stress fields are derived by using the state-space method. It could be found that laser shock processing time increases the three-phase temperature a lot. The greater the coordinate x and y are, the larger is the mass fraction of liquid phase. The laser moving speed and length to thickness ratio also have great influences on the displacement and stress fields. Variation of deflection curve across the thickness of plate is no longer smooth from

continued

top surface to bottom surface because of high-energy laser shock processing at instantaneous time which could be ignored. (C) 2015 Elsevier Ltd. All rights reserved.

Addresses: [Jiang, Hao-Jie; Dai, Hong-Liang] Hunan Univ, State Key Lab Adv Design & Mfg Vehicle Body, Changsha 410082, Hunan, Peoples R China.
[Jiang, Hao-Jie] Zhejiang Univ Technol, Coll Mech Engn, Hangzhou 310032, Zhejiang, Peoples R China.
[Gao, Ning-Hua] Hunan Univ, Coll Math & Econometr, Changsha 410082, Hunan, Peoples R China.
Reprint Address: Dai, HL (reprint author), Hunan Univ, State Key Lab Adv Design & Mfg Vehicle Body, Changsha 410082, Hunan, Peoples R China.
E-mail Addresses: hldai520@sina.com

Times Cited: 0

Number of references: 21

Tags: High enery laser

High-energy laser-summator based on Raman scattering principle (Russia) 2013

Author(s): Mikhalovich, ZE (Mikhalovich, Zemskov Eugeniy)

Source: OPTICAL ENGINEERING Volume: 52 Issue: 2 Article Number: 021004 DOI: 10.1117/1.OE.52.2.021004 Published: FEB 2013

ABSTRACT: This paper is a summary of the history, theory, and development efforts of summator, an all-in-one device that coherently combines multiple high-power laser beams, lowers the beam divergence, and shifts the wavelength based on stimulated Raman scattering principle in USSR from early 1960s to late 1970s. This was a part of the Terra-3 program, which was an umbrella program of highly classified high-energy laser weapons development efforts. Some parts of the Terra-3 program, specifically the terminal missile defense portion, were declassified recently, including the information on summator development efforts. (c) 2012 Society of Photo-Optical Instrumentation Engineers (SPIE). [DOI: 10.1117/1.OE.52.2.021004]

Addresses: [Mikhalovich, Zemskov Eugeniy] Astrofizika, Nonlinear Opt, Moscow, Russia.
[Mikhalovich, Zemskov Eugeniy] All Union Res Inst Physicotech & Radio Engn Measu, Moscow, Russia.
[Mikhalovich, Zemskov Eugeniy] Vympel Design Bur Laser Syst, Moscow, Russia.
[Mikhalovich, Zemskov Eugeniy] Astrofizika Sci & Prod Assoc, Moscow, Russia.
[Mikhalovich, Zemskov Eugeniy] High Energy Stimulated Raman Scattering Laser Res, Moscow, Russia.
[Mikhalovich, Zemskov Eugeniy] Tech Univ, Moscow Aviat Inst, Moscow, Russia.

Times Cited: 0

Number of references: 9

Tags: High enery laser

High-power passively Q-switched Yb:YCa4O(BO3)(3) laser with a GaAs crystal plate as saturable absorber (China) 2015

Author(s): Chen, XW (Chen, Xiaowen); Han, WJ (Han, Wenjuan); Xu, HH (Xu, Honghao); Jia, MH (Jia, Minghui); Yu, HH (Yu, Haohai); Zhang, HJ (Zhang, Huaijin); Liu, JH (Liu, Junhai)

Source: APPLIED OPTICS Volume: 54 Issue: 11 Pages: 3225-3230 DOI: 10.1364/AO.54.003225 Published: APR 10 2015

ABSTRACT: We report on efficient high-power passively Q-switched operation of a Yb:YCa4O(BO3)(3) laser with a GaAs crystal plate acting as the saturable absorber. An average output power of 5.7 W at 1032 nm is generated at a pulse repetition rate of 166.7 kHz when the incident pump power is 26.8 W, with a slope efficiency determined to be 24.5%. The averaged pulse energy achieved is roughly 30 mu J and is increased to about 40 mu J when the output coupling used changes from 30% to 50%, while the shortest pulse width is measured to be 153 ns. (C) 2015 Optical Society of America

Addresses: [Chen, Xiaowen; Han, Wenjuan; Xu, Honghao; Jia, Minghui; Liu, Junhai] Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
[Chen, Xiaowen; Han, Wenjuan; Xu, Honghao; Jia, Minghui; Liu, Junhai] Qingdao Univ, Shandong Univ, Key Lab Photon Mat & Technol, Qingdao 266071, Peoples R China.
[Yu, Haohai; Zhang, Huaijin] Shandong Univ, State Key Lab Crystal Mat, Jinan 250100, Peoples R China.
Reprint Address: Liu, JH (reprint author), Qingdao Univ, Coll Phys, 308 Ning Xia Rd, Qingdao 266071, Peoples R China.
E-mail Addresses: junhai_liu@hotmail.com

Times Cited: 1

Number of references: 17

Tags: High enery laser

continued

Increase of the density, temperature and velocity of plasma jets driven by a ring of high energy laser beams (USA) 2013

Author(s): Fu, W (Fu, Wen); Liang, EP (Liang, Edison P.); Fatenejad, M (Fatenejad, Milad); Lamb, DQ (Lamb, Donald Q.); Grosskopf, M (Grosskopf, Michael); Park, HS (Park, Hye-Sook); Remington, B (Remington, Bruce); Spitkovsky, A (Spitkovsky, Anatoly)

Source: HIGH ENERGY DENSITY PHYSICS Volume: 9 Issue: 2 Pages: 336-340 DOI: 10.1016/j.hedp.2013.03.004 Published: JUN 2013

ABSTRACT: Supersonic plasma outflows driven by multi-beam, high-energy lasers, such as Omega and NIF, have been and will be used as platforms for a variety of laboratory astrophysics experiments. Here we propose a new way of launching high density and high velocity, plasma jets using multiple intense laser beams in a hollow ring formation. We show that such jets provide a more flexible and versatile platform for future laboratory astrophysics experiments. Using high resolution hydrodynamic simulations, we demonstrate that the collimated jets can achieve much higher density, temperature and velocity when multiple laser beams are focused to form a hollow ring pattern at the target, instead of focused onto a single spot. We carried out simulations with different ring radii and studied their effects on the jet properties. Implications for laboratory collisionless shock experiments are discussed.

Addresses: [Fu, Wen; Liang, Edison P.] Rice Univ, Dept Phys & Astron, Houston, TX 77005 USA.
[Fatenejad, Milad; Lamb, Donald Q.] Univ Chicago, Flash Ctr Computat Sci, Chicago, IL 60637 USA.
[Grosskopf, Michael] Univ Michigan, Dept Atmospher Ocean & Space Sci, Ann Arbor, MI 48109 USA.
[Park, Hye-Sook; Remington, Bruce] Lawrence Livermore Natl Lab, Livermore, CA 94550 USA.
[Spitkovsky, Anatoly] Princeton Univ, Dept Astrophys Sci, Princeton, NJ 08544 USA.
Reprint Address: Fu, W (reprint author), Rice Univ, Dept Phys & Astron, Houston, TX 77005 USA.
E-mail Addresses: Wen.Fu@rice.edu

Times Cited: 1
Number of references: 18
Tags: High energy laser

Passive Q-Switching Laser Performance of Yb:YVO4 Crystal (China) 2014

Author(s): Li, XH (Li Xiao-Hong); Chen, XW (Chen Xiao-Wen); Han, WJ (Han Wen-Juan); Kong, WJ (Kong Wei-Jin); Liu, JH (Liu Jun-Hai)

Source: CHINESE PHYSICS LETTERS Volume: 31 Issue: 12 Article Number: 124202 DOI: 10.1088/0256-307X/31/12/124202 Published: DEC 2014

ABSTRACT: We report on the passive Q-switching laser performance of Yb: YVO4 crystal. Utilizing a Cr4+: YAG crystal plate as the saturable absorber, which is of an initial transmission as high as 99.3%, we demonstrate a stable passively Q-switched laser operation at 1017.2 nm, producing an average output power of 0.87W at a pulse repetition rate of 71.4 kHz, with a slope efficiency of 30%. The resulting pulse energy, duration, and peak power are 12.2 mu J, 87 ns, and 0.14 kW, respectively.

Addresses: [Li Xiao-Hong; Chen Xiao-Wen; Han Wen-Juan; Kong Wei-Jin; Liu Jun-Hai] Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
[Li Xiao-Hong; Chen Xiao-Wen; Han Wen-Juan; Kong Wei-Jin; Liu Jun-Hai] Qingdao Univ, Shandong Univ, Key Lab Photon Mat & Technol, Qingdao 266071, Peoples R China.
Reprint Address: Kong, WJ (reprint author), Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
E-mail Addresses: kwjsd@163.com; junhai_liu@hotmail.com

Times Cited: 1
Number of references: 10
Tags: High enery laser

Phase transition model of water flow irradiated by high-energy laser in a chamber (China) 2014

Author(s): Wei, JF (Wei Ji-Feng); Sun, LQ (Sun Li-Qun); Zhang, K (Zhang Kai); Hu, XY (Hu Xiao-Yang)

Source: CHINESE PHYSICS B Volume: 23 Issue: 7 Article Number: 074209 DOI: 10.1088/1674-1056/23/7/074209 Published: JUL 2014

ABSTRACT: In the absorption chamber of a high-energy laser energy meter, water is directly used as an absorbing medium and the interaction of the high-power laser and the water flow can produce a variety of physical phenomena such as phase transitions. The unit difference method is adopted to deduce the phase transition model for water flow irradiated by a high-energy laser. In addition, the model is simulated and verified through experiments. Among them, the experimental verification uses the photographic method, shooting the distribution and the form of the air mass of water flow in different operating conditions, which are compared

continued

with the simulation results. The research shows that it is achievable to reduce the intensity of the phase transition by increasing the water flow, reducing the power intensity of the beam, shortening the distance the beam covers, reducing the initial water temperature or adopting a shorter wavelength laser. The study's results will provide the reference for the design of a water-direct-absorption-type high-energy laser energy meter as well as an analysis of the interaction processes of other similar high-power lasers and water flow.

Addresses: [Wei Ji-Feng; Sun Li-Qun] Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.
[Wei Ji-Feng; Zhang Kai; Hu Xiao-Yang] China Acad Engn Phys, Inst Appl Elect, Mianyang 621900, Peoples R China.
[Wei Ji-Feng] China Acad Engn Phys, Grad Sch, Beijing 100088, Peoples R China.
[Wei Ji-Feng; Zhang Kai; Hu Xiao-Yang] China Acad Engn Phys, Key Lab Laser Sci & Technol, Mianyang 621900, Peoples R China.
Reprint Address: Wei, JF (reprint author), Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.

E-mail Addresses: wjfcom2000@163.com

Times Cited: 4
Number of references: 26
Tags: High enery laser

Research on Laser Peening of TC21 Titanium Alloy with High Energy Laser (China) 2014

Author(s): Che, ZG (Che Zhigang); Yang, J (Yang Jie); Tang, N (Tang Nan); Gong, SL (Gong Shuili)

Source: RARE METAL MATERIALS AND ENGINEERING Volume: 43 Issue: 12 Pages: 2962-2965 Published: DEC 2014

ABSTRACT: Laser peening (LP) also known as laser shock processing (LSP), is a surface enhancement technique that induces intensive plastic deformation, high dislocation density and deeper compressive residual stress to improve the surface performance of materials. The microhardness, surface profiles, roughness, and the residual stress of TC21 alloy were tested by LSP with high energy laser. The results show that the microhardness of the shocked area is improved apparently compared with that of unshocked area. The magnitude of dent is related with the diameter and the distribution of laser spot. The roughness R-a of shocked area is less than 0.8 mu m. The compressive residual stress is enhanced greatly. The investigations show that the technology of LSP could further improve the performance of TC21 alloy.

Addresses: [Che Zhigang; Gong Shuili] Beijing Aeronaut Mfg Technol Res Inst, Sci & Technol Power Beam Proc Lab, Beijing 100024, Peoples R China.
[Yang Jie] North China Univ Water Resources & Elect Power, Zhengzhou 450045, Peoples R China.
[Tang Nan] Renmin Univ China, Chaoyang Sch, High Sch, Beijing 100028, Peoples R China.
Reprint Address: Che, ZG (reprint author), Beijing Aeronaut Mfg Technol Res Inst, Beijing 100024, Peoples R China.
E-mail Addresses: meczgang@163.com

Times Cited: 0
Number of references: 8
Tags: High enery laser

Ruggedizing high-energy lasers for the battlefield (USA) 2014

Author(s): Hecht, J (Hecht, Jeff)

Source: LASER FOCUS WORLD Volume: 50 Issue: 7 Pages: 29-32 Published: JUL 2014

Solid-state lasers have reached the 100 kW class, and demonstrated that they can shoot down militarily important targets. The next challenge is to harden laser systems enough to withstand the rigors of operating in warplanes, on battleships, and on the battlefield. The focus is on diode-pumped solid-state lasers powered by generators burning jet fuel. Those lasers have come a long way. "Fifteen years ago, we would have said that the number one source of unreliability was pump diodes," says Kelly Hammett, chief engineer for the directed energy directorate at AFRL. A dozen years ago, he adds, "we were saying we could never get more than 100 watts from a fiber laser." Now diode reliability is not a major issue, and multikilowatt industrial fiber lasers are standard industrial products. The challenge is keeping them working in the difficult military environment.

Times Cited: 0
Number of references: 0
Tags: High enery laser

continued

Technical requirements and uncertainty of far field laser spot centroid measurement using array detection method (China) 2015

Author(s): Pang, M (Pang, Miao); Gao, XY (Gao, Xueyan); Rong, J (Rong, Jian)

Source: OPTIK Volume: 126 Issue: 24 Pages: 5881-5885 DOI: 10.1016/j.ijleo.2015.08.143 Published: 2015

ABSTRACT: Array detection method is widely used for measuring the far field laser centroids. The influence of array detector's aperture and dynamic range on the far field laser power was analyzed on the basis of the measurement method and measurement process for the laser spot centroid. The effect of array detector's spatial resolution and spatial duty ratio on the far field laser spot centroid was simulated, and the results were verified by performing experiments, enabling the determination of the technology requirements for the array detector. The expression for the laser spot centroid uncertainty was deduced on the basis of the uncertainty theory and laser spot centroid expression, and the sources of uncertainty were analyzed. The results will be of great importance for measuring the far field laser spot centroids and designing array detectors. (C) 2015 Elsevier GmbH. All rights reserved.

Addresses: [Pang, Miao; Rong, Jian] Univ Elect Sci & Technol China, Sch Phys Elect, Chengdu 610054, Peoples R China.
[Pang, Miao; Gao, Xueyan] China Acad Engn Phys, Inst Appl Elect, Mianyang 621900, Peoples R China.
[Pang, Miao; Gao, Xueyan] CAEP, Key Lab High Energy Laser, Mianyang 621900, Peoples R China.
Reprint Address: Pang, M (reprint author), Univ Elect Sci & Technol China, Sch Phys Elect, Chengdu 610054, Peoples R China.
E-mail Addresses: pangmiao@sina.com

Times Cited: 0
Number of references: 9
Tags: High enery laser

Technology for radiation efficiency measurement of high-power halogen tungsten lamp used in calibration of high-energy laser energy meter (China) 2015

Author(s): Wei, JF (Wei, Ji Feng); Hu, XY (Hu, Xiao Yang); Sun, LQ (Sun, Li Qun); Zhang, K (Zhang, Kai); Chang, Y (Chang, Yan)

Source: APPLIED OPTICS Volume: 54 Issue: 9 Pages: 2289-2295 DOI: 10.1364/AO.54.002289 Published: MAR 20 2015

ABSTRACT: The calibration method using a high-power halogen tungsten lamp as a calibration source has many advantages such as strong equivalence and high power, so it is very fit for the calibration of high-energy laser energy meters. However, high-power halogen tungsten lamps after power-off still reserve much residual energy and continually radiate energy, which is difficult to be measured. Two measuring systems were found to solve the problems. One system is composed of an integrating sphere and two optical spectrometers, which can accurately characterize the radiative spectra and power-time variation of the halogen tungsten lamp. This measuring system was then calibrated using a normal halogen tungsten lamp made of the same material as the high-power halogen tungsten lamp. In this way, the radiation efficiency of the halogen tungsten lamp after power-off can be quantitatively measured. (c) 2015 Optical Society of America

Addresses: [Wei, Ji Feng; Sun, Li Qun] Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.
[Wei, Ji Feng; Hu, Xiao Yang; Zhang, Kai; Chang, Yan] China Acad Engn Phys, Inst Appl Elect, Mianyang 621900, Peoples R China.
[Wei, Ji Feng] China Acad Engn Phys, Grad Sch, Beijing 100088, Peoples R China.
[Wei, Ji Feng; Hu, Xiao Yang; Zhang, Kai] China Acad Engn Phys, Key Lab Laser Sci & Technol, Mianyang 621900, Peoples R China.
Reprint Address: Wei, JF (reprint author), Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.
E-mail Addresses: wjfcom2000@163.com

Times Cited: 1
Number of references: 11
Tags: High enery laser

Trans-reflection thermal driven deformable mirror with flexible bonding in high energy laser system (China) 2014

Author(s): Ma, XK (Ma, Xingkun); Huang, L (Huang, Lei); Gong, ML (Gong, Mali); Xue, Q (Xue, Qiao)

Source: OPTICS COMMUNICATIONS Volume: 326 Pages: 166-169 DOI: 10.1016/j.optcom.2014.04.029 Published: SEP 1 2014

ABSTRACT: Deformable mirrors used in high energy laser system suffer from problems like the stress from adhesive solidification or the relatively expensive unit price of piezoceramic actuator. The thermal driven deformable mirror (TDDM) investigated here provided a promising prospect to solve these problems. Four scenarios of TDDM were studied and compared. Results showed that the trans-reflection TDDM with flexible bonding best met the requirement in practical use. The flexible bonding excluded the stress

continued

problem in the solidification of adhesives, trans-reflection brought about enough correction range, and the choice of thermo-electric cooler as actuator could greatly bring down the cost of adaptive optics apparatus as well. (C) 2014 Elsevier B.V. All rights reserved.

Addresses: [Ma, Xingkun; Huang, Lei; Gong, Mali; Xue, Qiao] Tsinghua Univ, Dept Precis Instruments, Ctr Photon & Elect, Beijing 100084, Peoples R China.
Reprint Address: Huang, L (reprint author), Tsinghua Univ, Dept Precis Instruments, Ctr Photon & Elect, Beijing 100084, Peoples R China.
E-mail Addresses: mxk_mkk@163.com; hl@mail.tsinghua.edu.cn

Times Cited: 1
Number of references: 16
Tags: High enery laser

Transmissive high-energy laser optics: Manufacturing and testing considerations (USA) 2014

Author(s): Kupinski, P (Kupinski, Pete); Thomas, M (Thomas, Michael)

Source: LASER FOCUS WORLD Volume: 50 Issue: 9 Pages: 51-+ Published: SEP 2014

ABSTRACT: There are many decisions to make when designing, specifying, manufacturing, and testing optical components for high-energy laser systems each is a potential failure mechanism that must be understood and controlled.

Addresses: [Kupinski, Pete] Optimax Syst, Opt Coating Grp, Ontario, NY 14519 USA.
[Thomas, Michael] Spica Technol, Hollis, NH USA.
Reprint Address: Kupinski, P (reprint author), Optimax Syst, Opt Coating Grp, Ontario, NY 14519 USA.
E-mail Addresses: pkupinski@optimaxsi.com; MDThomas@spicatech.com

Times Cited: 0
Number of references: 9
Tags: High enery laser

Ultra-Large Core Size Hypocycloid-Shape Inhibited Coupling Kagome Fibers for High-Energy Laser Beam Handling (France) 2015

Author(s): Debord, B (Debord, Benoit); Amsanpally, A (Amsanpally, Abhilash); Alharbi, M (Alharbi, Meshaal); Vincetti, L (Vincetti, Luca); Blondy, JM (Blondy, Jean-Marc); Gerome, F (Gerome, Frederic); Benabid, F (Benabid, Fetah)

Source: JOURNAL OF LIGHTWAVE TECHNOLOGY Volume: 33 Issue: 17 Pages: 3630-3634 DOI: 10.1109/JLT.2015.2448794 Published: SEP 1 2015

ABSTRACT: We report on the fabrication and characterization of 19-cell hypocycloid-shape Kagome fibers with core size larger than 100 mu m. These inhibited coupling fibers present low propagation loss (100 dB/km) over broad transmission range with low chromatic dispersion combined with ultra-low power overlap with silica surround, making them an efficient solution for ultra-high power laser handling, ultra-fast laser delivery, and plasma photonics applications.

Addresses: [Debord, Benoit; Amsanpally, Abhilash; Alharbi, Meshaal; Blondy, Jean-Marc; Gerome, Frederic; Benabid, Fetah] Univ Limoges, UMR CNRS, Xlim Res Inst, GPPMM Grp, F-87060 Limoges, France.
[Vincetti, Luca] Univ Modena & Reggio Emilia, Dept Engn Enzo Ferrari, I-41125 Modena, Italy.
Reprint Address: Debord, B (reprint author), Univ Limoges, UMR CNRS, Xlim Res Inst, GPPMM Grp, F-87060 Limoges, France.
E-mail Addresses: benoit.debord@xlim.fr; abhilash.amsanpally@xlim.fr; meshaal04@yahoo.com; luca.vincetti@unimore.it; jean-marc.blondy@xlim.fr; frederic.gerome@xlim.fr; f.benabid@xlim.fr

Times Cited: 0
Number of references: 23
Tags: High enery laser

Variable high-energy-laser attenuator based on the interference on a transparent plate (Slovenia) 2011

Author(s): Gregorcic, P (Gregorcic, P.); Babnik, A (Babnik, A.); Mozina, J (Mozina, J.)

Source: APPLIED PHYSICS B-LASERS AND OPTICS Volume: 105 Issue: 3 Pages: 607-612 DOI: 10.1007/s00340-011-4500-9 Published: NOV 2011

ABSTRACT: The transmittance of a transparent plate is theoretically and experimentally investigated, taking into account Fabry-Perot effects due to Fresnel reflections of a Gaussian beam on the boundaries of a plate. On the basis of these theoretical and experimental predictions, we present the application of a variable laser attenuator based on a thin transparent plate and a temperature regulation. Here, the absorption of the laser energy in the plate should be as low as possible, and its transmittance is changed by the interference due to the different thicknesses and refractive indices for the different temperatures of the plate.

continued

Therefore, such an attenuator can be used for a broad range of wavelengths and high-energy laser applications.
Addresses: [Gregorcic, P.; Babnik, A.; Mozina, J.] Univ Ljubljana, Fac Mech Engn, Ljubljana 1000, Slovenia.
Reprint Address: Gregorcic, P (reprint author), Univ Ljubljana, Fac Mech Engn, Askerceva 6, Ljubljana 1000, Slovenia.
E-mail Addresses: peter.gregorcic@fs.uni-lj.si
Times Cited: 0
Number of references: 8
Tags: High energy laser

High Energy Laser - Applications

High-energy laser weapons since the early 1960s (USA) 2013

Author(s): Cook, J (Cook, Joung)

Source: OPTICAL ENGINEERING Volume: 52 Issue: 2 Article Number: 021007 DOI: 10.1117/1.OE.52.2.021007 Published: FEB 2013

ABSTRACT: Both the U.S. and Russia/USSR have made great strides toward developing high-energy laser weapons for their future national defense systems since the early 1960s. Many billions of dollars and rubles were invested in the effort. Many hundreds of gifted scientists and engineers devoted their careers to working on the problems. They achieved major technological advances and made impressive and successful demonstrations. After more than half a century, however, neither side has yet adapted the first laser weapon for a military use. Why? This paper discusses the history of key technological advancements and successes, as well as some of the difficulties encountered. It also discusses fundamental technological advantages and limitations of high-energy laser weapons, and also the unique social, cultural, and political environments that have contributed to the history. The high-energy laser technical community is in the process of finding ways to adapt to the new warfare environment by taking advantage of the lessons learned in the past while incorporating the new technologies and ideas evolved in recent years. (c) 2012 Society of Photo-Optical Instrumentation Engineers (SPIE). [DOI: 10.1117/1.OE.52.2.021007]

Author Keywords: high energy laser; laser weapon; laser; weapon system
Addresses: J Cook & Associates LLC, Vienna, VA 22182 USA.
Reprint Address: Cook, J (reprint author), J Cook & Associates LLC, Vienna, VA 22182 USA.
E-mail Addresses: joung.cook@gmail.com
Times Cited: 2
Number of references: 16
Tags: High enery laser - applications

High-energy laser windows: case of fused silica (USA) 2010

Author(s): Klein, CA (Klein, Claude A.)

Source: OPTICAL ENGINEERING Volume: 49 Issue: 9 Article Number: 091006 DOI: 10.1117/1.3484946 Published: SEP 2010

ABSTRACT: The engineering of high-energy lasers for applications such as the AirBorne Laser (ABL) system requires optical windows capable of handling megajoule pulse energies. The selection and/or evaluation of a suitable window material involves considerations relating to thermal lensing, i.e., the beam distortion caused by thermally induced phase aberrations, in addition to issues arising from the thermal stresses generated by beam-induced temperature gradients. We document analytical methods for evaluating the impact of beam-induced optical distortions and beam-induced mechanical stresses, which may enable the designer to properly assess the performance of window-material candidates. We illustrate the procedure in the light of an evaluation of the performance of the leading candidate for operation in the near-infrared, i.e., fused silica (SiO(2)). In terms of allowable peak intensities, and based on available material properties, the limiting factor is seen to be related to shear stresses generated by coating-induced axial compression that may lead to plastic deformation. The allowable beam fluence is controlled by thermally induced phase distortions rather than planar or axial stresses, thus reflecting the unusually small alpha E/chi ratio of fused SiO(2), where alpha E represents the thermal stress factor, and chi designates the optical distortion coefficient. In conjunction with an evaluation of the required window thickness as a function of the diameter, our analysis leads to the conclusion that operating the ABL system at the projected power level (2 MW) and pulse duration (5 s) requires bulk windows-if made of fused SiO(2)-of at least 20 cm in diameter but no more than 7.5 mm in thickness. (C) 2010 Society of Photo-Optical Instrumentation Engineers. [DOI: 10.1117/1.3484946]

Addresses: CAK Aanalyt Intl, Lexington, MA 02421 USA.
Reprint Address: Klein, CA (reprint author), CAK Aanalyt Intl, 9 Churchill Lane, Lexington, MA 02421 USA.
E-mail Addresses: CaK411@verizon.net

continued

Times Cited: 5
Number of references: 28
Tags: High enery laser - applications

Is this the time for a high-energy laser weapon program? (USA) 2013

Author(s): Kiel, DH (Kiel, David H.)

Source: OPTICAL ENGINEERING Volume: 52 Issue: 2 Article Number: 021008 DOI: 10.1117/1.OE.52.2.021008 Published: FEB 2013

ABSTRACT: The U.S. Department of Defense (DoD) has made large investments weaponizing laser technology for air defense. Despite billions of dollars spent, there has not been a successful transition of a high-energy laser (HEL) weapon from the lab to the field. Is the dream of a low-cost-per-shot, deep-magazine, speed-of-light HEL weapon an impossible dream or a set of technologies that are ready to emerge on the modern battlefield? Because of the rapid revolution taking place in modern warfare that is making conventional defensive weapons very expensive relative to the offensive weapons systems, the pull for less expensive air defense may necessitate a HEL weapon system. Also, due to the recent technological developments in solid-state lasers (SSL), especially fiber lasers, used throughout manufacturing for cutting and welding, a HEL weapon finally may be able to meet all the requirements of ease of use, sustainability, and reliability. Due to changes in warfare and SSL technology advances, the era of HEL weapons isn't over; it may be just starting if DoD takes an evolutionary approach to fielding a HEL weapon. The U.S. Navy, with its large ships and their available electric power, should lead the way. (c) 2012 Society of Photo-Optical Instrumentation Engineers (SPIE). [DOI: 10.1117/1.OE.52.2.021008]

Addresses: [Kiel, David H.] USN, Arlington, VA USA.
Reprint Address: Kiel, DH (reprint author), 1834 Burke St SE, Washington, DC 20003 USA.
E-mail Addresses: dkiel@innolog.com

Times Cited: 2
Number of references: 10
Tags: High enery laser - applications

Low absorption magnesium aluminate spinel windows for high energy laser applications (USA) 2014

Author(s): Villalobos, G (Villalobos, Guillermo); Bayya, S (Bayya, Shyam); Kim, W (Kim, Woohong); Baker, C (Baker, Colin); Sanghera, J (Sanghera, Jas); Hunt, M (Hunt, Michael); Sadowski, B (Sadowski, Bryan); Miklos, F (Miklos, Fritz); Aggarwal, I (Aggarwal, Ishwar)

Source: JOURNAL OF MATERIALS RESEARCH Volume: 29 Issue: 19 Special Issue: SI Pages: 2266-2271 DOI: 10.1557/jmr.2014.184 Published: OCT 14 2014

ABSTRACT: High energy laser (HEL) systems are currently being evaluated for various land, sea, and air based platforms. Some of these systems operate in or have to withstand harsh environment of sand storm, hurricane, and rain. The exit aperture on a HEL system operating in harsh environment can become the single point of failure. Current HEL systems operating in 1-2 mu m wavelength use fused silica windows which are at risk of damage in the theater. Rugged window materials such as sapphire, ALON, and spinel are currently being evaluated as a potential replacement. One of the major parameters in window selection apart from its ruggedness is its absorption loss coefficient at laser wavelength. This paper reports on 3 different methods to reduce absorption loss in spinel ceramic from 100,000 ppm/cm down to 75 ppm/cm. The results are compared with ALON and sapphire.

Addresses: [Villalobos, Guillermo; Bayya, Shyam; Kim, Woohong; Baker, Colin; Sanghera, Jas] Naval Res Lab, Washington, DC 20375 USA.
[Hunt, Michael] Univ Res Fdn, Greenbelt, MD 20770 USA.
[Sadowski, Bryan; Miklos, Fritz; Aggarwal, Ishwar] Sotera Def Solut Inc, Annapolis Jct, MD 20701 USA.
Reprint Address: Villalobos, G (reprint author), Naval Res Lab, Code 5620, Washington, DC 20375 USA.
E-mail Addresses: guillermo.villalobos@nrl.navy.mil

Times Cited: 1
Number of references: 23
Tags: High enery laser - applications

Near-IR absorption in high-purity photothermorefractive glass and holographic optical elements: measurement and application for high-energy lasers (USA) 2011

Author(s): Lumeau, J (Lumeau, Julien); Glebova, L (Glebova, Larissa); Glebov, LB (Glebov, Leonid B.)

Source: APPLIED OPTICS Volume: 50 Issue: 30 Pages: 5905-5911 DOI: 10.1364/AO.50.005905 Published: OCT 20 2011

ABSTRACT: Volume Bragg gratings (VBGs) in photothermorefractive (PTR) glass are widely used for laser beam control including high-power laser systems. Among them, spectral beam combining based on VBGs is one of the most promising. Achieving 100 + kW

continued

of combined laser beams requires the development of PTR glass and VBGs with an extremely low absorption coefficient and therefore methods of its measurement. This paper describes the calorimetric method that was developed for measuring a low absorption coefficient in PTR glass and VBGs. It is based on transmission monitoring of the intrinsic Fabry-Perot interferometer produced by the plane-parallel surfaces of the measured optical elements when heated by high-power laser radiation. An absorption coefficient at 1085 nm as low as 5 x 10(-5) cm(-1) is demonstrated in pristine PTR glass while an absorption coefficient as low as 1 x 10(-4) cm(-1) is measured in high-efficiency reflecting Bragg gratings with highest purity. The actual level of absorption in PTR glass allows laser beam control at the 10 kW level, while the 100 kW level would require active cooling and/or decreasing the absorption in PTR Bragg gratings to a value similar to that in virgin PTR glass. (C) 2011 Optical Society of America

Addresses: [Lumeau, Julien; Glebova, Larissa; Glebov, Leonid B.] Univ Cent Florida, CREOL, Coll Opt & Photon, Orlando, FL 32816 USA.
Reprint Address: Lumeau, J (reprint author), Univ Cent Florida, CREOL, Coll Opt & Photon, 4000 Cent Florida Blvd, Orlando, FL 32816 USA.
E-mail Addresses: jlumeau@creol.ucf.edu

Times Cited: 8

Number of references: 20

Tags: High energy laser - applications

A new Thomson Spectrometer for high energy laser-driven beams diagnostic (Italy) 2014

Author(s): Cirrone, GAP (Cirrone, G. A. P.); Tramontan, A (Tramontan, A.); Candiano, G (Candiano, G.); Carpinelli, M (Carpinelli, M.); Cavallaro, S (Cavallaro, S.); Cutroneo, M (Cutroneo, M.); Cuttone, G (Cuttone, G.); De Martinis, C (De Martinis, C.); Giove, D (Giove, D.); Krasa, J (Krasa, J.); Korn, G (Korn, G.); Maggiore, M (Maggiore, M.); Margarone, D (Margarone, D.); Pisciotta, P (Pisciotta, P.); Prokupek, J (Prokupek, J.); Romano, F (Romano, F.); Schillaci, F (Schillaci, F.); Scuderi, V (Scuderi, V.); Torrisi, L (Torrisi, L.); Velyhan, A (Velyhan, A.)

Source: JOURNAL OF INSTRUMENTATION Volume: 9 Article Number: T08001 DOI: 10.1088/1748-0221/9/08/T08001 Published: AUG 2014

ABSTRACT: Thomson Spectrometers (TPs) are widely used for beam diagnostic as they provide simultaneous information on charge over mass ratio, energy and momentum of detected ions. A new TP design has been realized at INFN-LNS within the LILIA (Laser Induced Light Ion Acceleration) and ELIMED (MEDical application at ELI-Beamlines) projects. This paper reports on the construction details of the TP and on its experimental tests performed at PALS laboratory in Prague, with the ASTERIX IV laser system. Reported data are obtained with polyethylene and polyvinyl alcohol solid targets, they have been compared with data obtained from other detectors. Consistency among results confirms the correct functioning of the new TP. The main features, characterizing the design, are a wide acceptance of the deflection sector and a tunability of the, partially overlapping, magnetic and electric fields that allow to resolve ions with energy up to about 40 MeV for protons.

Addresses: [Cirrone, G. A. P.; Tramontan, A.; Candiano, G.; Cavallaro, S.; Cutroneo, M.; Cuttone, G.; Pisciotta, P.; Romano, F.; Schillaci, F.; Scuderi, V.; Torrisi, L.] INFN LNS, I-95125 Catania, Italy.
[Cirrone, G. A. P.; Krasa, J.; Korn, G.; Maggiore, M.; Margarone, D.; Prokupek, J.; Schillaci, F.; Scuderi, V.; Velyhan, A.] Inst Phys ASCR, ELI Beamlines Project, CZ-19093 Prague, Czech Republic.
[Tramontan, A.] Univ Catania, I-95125 Catania, Italy.
[Carpinelli, M.] Univ Sassari, I-07100 Sassari, Italy.
[Carpinelli, M.] Complesso Univ Monserrato, Ist Nazl Fis Nucl, Sez Cagliari, I-09042 Cagliari, Italy.
[Cutroneo, M.; Torrisi, L.] Univ Messina, Dipartimento Fis, I-98166 Messina, Italy.
[De Martinis, C.; Giove, D.] Ist Nazl Fis Nucl, Milan sect, I-20133 Milan, Italy.
[Maggiore, M.] INFN LNL, I-35020 Legnaro, Italy.
[Prokupek, J.] Czech Tech Univ, FNSPE, Prague 98656, Czech Republic.
Reprint Address: Cirrone, GAP (reprint author), INFN LNS, Via S Sofia 62, I-95125 Catania, Italy.
E-mail Addresses: cirrone@lns.infn.it

Times Cited: 1

Number of references: 42

Tags: High energy laser - applications

Study on the influence of the response characteristics of a temperature sensor on the measurement accuracy of a water-absorption-based high-energy laser energy meter (China) 2013

Author(s): Wei, JF (Wei, Ji Feng); Sun, LQ (Sun, Li Qun); Zhang, K (Zhang, Kai)

Source: MEASUREMENT SCIENCE & TECHNOLOGY Volume: 24 Issue: 5 Article Number: 055103 DOI: 10.1088/0957-0233/24/5/055103 Published: MAY 2013

ABSTRACT: When using water as a cooling or absorption medium for an energy meter, a temperature sensor is limited by response characteristics and cannot reflect the real-time temperature changes in the water flow. In order to improve the accuracy of

continued

measurement, we should ensure that the corresponding value of the temperature integral will be substantially independent of the effects of the sensor response time. According to the analysis of the interaction process between temperature sensor and water flow temperature field, we have established a hot physical model of the whole measurement process, and decomposed it into a superposition of a slowly varying process and a transient process, then simplified the model. Finally, a quantitative relationship between the sensor response characteristics and measurement accuracy of the high energy laser energy meter is derived. With the mandatory heat exchange method, the frequency characteristics of the temperature field meet the requirements of the frequency characteristics of a temperature sensor; as a result, the impact on measurement accuracy is eliminated. The experimental results show that this method has good effects, and it can help to improve the measurement accuracy of a high-energy laser energy meter.

Addresses: [Wei, Ji Feng; Sun, Li Qun] Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.
[Wei, Ji Feng; Zhang, Kai] China Acad Engn Phys, Inst Appl Elect, Mianyang 621900, Peoples R China.
[Wei, Ji Feng] China Acad Engn Phys, Grad Sch, Beijing 100088, Peoples R China.
Reprint Address: Wei, JF (reprint author), Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.
E-mail Addresses: wjfcom2000@163.com

Times Cited: 5
Number of references: 11
Tags: High energy laser - applications

Volume absorption laser energy meter for high energy laser by water absorption (China) 2013

Author(s): Wei, JF (Wei, Ji Feng); Sun, LQ (Sun, Li Qun); Zhang, K (Zhang, Kai)
Source: APPLIED PHYSICS B-LASERS AND OPTICS Volume: 110 Issue: 4 Pages: 573-578 DOI: 10.1007/s00340-012-5294-0 Published: MAR 2013

ABSTRACT: Since the energy density of high energy laser can be extremely high and destructive, it is difficult to directly measure the laser energy with custom methods. A volume absorption method directly using water as absorption substance is introduced. In the energy meter, water is pumped into an absorption cavity sealed by a quartz window, and energy increment of water by laser is calculated. The new energy meter has excellent power and energy linearity and is almost not affected by power, energy and flow, its relative deviation to norm middle-power energy meter is 1.9 %, which infers that the new energy meter can measure higher laser energy and maintain higher precision as well.

Addresses: [Wei, Ji Feng; Sun, Li Qun] Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.
[Wei, Ji Feng; Zhang, Kai] China Acad Engn Phys, Inst Appl Elect, Mianyang 621900, Peoples R China.
Reprint Address: Wei, JF (reprint author), Tsinghua Univ, State Key Lab Precis Measurement Technol & Instru, Beijing 100084, Peoples R China.
E-mail Addresses: wjfcom2000@163.com; sunlq@mail.tsinghua.edu.cn; zhangkai217@sohu.com

Times Cited: 9
Number of references: 12
Tags: High energy laser - applications

High Energy Laser - Generation

Compact repetitively Q-switched Yb:YCa4O(BO3)(3) laser with an acousto-optic modulator (China) 2015

Author(s): Chen, XW (Chen, Xiaowen); Xu, HH (Xu, Honghao); Han, WJ (Han, Wenjuan); Yi, HY (Yi, Hongying); Yu, HH (Yu, Haohai); Zhang, HJ (Zhang, Huaijin); Liu, JH (Liu, Junhai)

Source: OPTICS AND LASER TECHNOLOGY Volume: 70 Pages: 128-130 DOI: 10.1016/j.optlastec.2015.02.002 Published: JUL 2015

ABSTRACT: Repetitively Q-switched operation was achieved with a Yb:YCa4O(BO3)(3) laser in a wide repetition rate range from 20 down to 0.1 kHz. An output power of 6.81 W at 20 kHz was generated with pulse duration of 42 ns; while operated at a low repetition rate of 0.1 kHz, the laser produced 0.53 W of output power with pulse width of 21 ns, the resulting pulse energy and peak power amounted respectively to 5.3 mJ and 252.4 kW. (C) 2015 Elsevier Ltd. All rights reserved.

Addresses: [Chen, Xiaowen; Xu, Honghao; Han, Wenjuan; Yi, Hongying; Liu, Junhai] Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
[Chen, Xiaowen; Xu, Honghao; Han, Wenjuan; Liu, Junhai] Qingdao Univ, Shandong Univ, Key Lab Photon Mat & Technol, Qingdao 266071, Peoples R China.

continued

[Yu, Haohai; Zhang, Huaijin] Shandong Univ, State Key Lab Crystal Mat, Jinan 250100, Peoples R China.
Reprint Address: Liu, JH (reprint author), Qingdao Univ, Coll Phys, 308 Ning Xia Rd, Qingdao 266071, Peoples R China.
E-mail Addresses: junhai_liu@hotmail.com
Times Cited: 1
Number of references: 10

Tags: High enery laser - generation

Fiber Front End With Multiple Phase Modulations and High-Bandwidth Pulse Shaping for High-Energy Laser-Beam Smoothing (USA) 2013

Author(s): Dorrer, C (Dorrer, Christophe); Roides, R (Roides, Richard); Cuffney, R (Cuffney, Robert); Okishev, AV (Okishev, Andrey V.); Bittle, WA (Bittle, Wade A.); Balonek, G (Balonek, Gregory); Consentino, A (Consentino, Albert); Hill, E (Hill, Elizabeth); Zuegel, JD (Zuegel, Jonathan D.)

Source: IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS Volume: 19 Issue: 6 Article Number: 3500112 DOI: 10.1109/JSTQE.2013.2260729 Published: NOV-DEC 2013

ABSTRACT: The design and performance of a fiber front end delivering temporally shaped, phase-modulated optical pulses to a large-scale, high-energy laser system to demonstrate beam-smoothing concepts are presented. High-bandwidth LiNbO3 (lithium niobate) Mach-Zehnder modulators and arbitrary waveform generators temporally shape the power of the optical pulses. High-bandwidth, three-section LiNbO3 phase modulators precisely modulate the optical phase of the pulses at up to three microwave frequencies. Various calibration procedures and fail-safe systems are described. Sources of frequency-modulation-to-amplitude-modulation conversion, which can lead to unsafe operation of the high-energy laser system, are identified and compensated by amplitude and dispersion compensators.

Addresses: [Dorrer, Christophe; Roides, Richard; Cuffney, Robert; Okishev, Andrey V.; Bittle, Wade A.; Balonek, Gregory; Consentino, Albert; Hill, Elizabeth; Zuegel, Jonathan D.] Univ Rochester, Laser Energet Lab, Rochester, NY 14623 USA.
Reprint Address: Dorrer, C (reprint author), Univ Rochester, Laser Energet Lab, 250 E River Rd, Rochester, NY 14623 USA.
E-mail Addresses: cdorrer@lle.rochester.edu; rroi@lle.rochester.edu; rcuf@lle.rochester.edu; aoki@lle.rochester.edu; wbit@lle.rochester.edu; gbal@lle.rochester.edu; acon@lle.rochester.edu; ehil@lle.rochester.edu; zuegel@lle.rochester.edu
Times Cited: 1
Number of references: 21

Tags: High enery laser - generation

Generation of 2.6-mJ 400-kW pulses from a compact Yb:Gd3Ga5O12 laser repetitively Q-switched by an acousto-optic modulator (China) 2013

Author(s): Liu, JH (Liu, Junhai); Chen, XW (Chen, Xiaowen); Han, WJ (Han, Wenjuan); Dai, QB (Dai, Qibiao); Wu, K (Wu, Kui); Zhang, HJ (Zhang, Huaijin)

Source: OPTICS EXPRESS Volume: 21 Issue: 22 Pages: 26605-26611 DOI: 10.1364/OE.21.026605 Published: NOV 4 2013

ABSTRACT: An efficient, acousto-optically Q-switched, and compact Yb:Gd3Ga5O12 laser oscillating around 1026 nm is demonstrated, producing an output power of 5.15 W at a pulse repetition rate of 2 kHz, with optical-to-optical and slope efficiencies being 35.8% and 52%, respectively. The generated laser pulses are 6.4 ns in duration (FWHM), with pulse energy and peak power amounting, respectively, to 2.58 mJ and 403 kW. (C) 2013 Optical Society of America

Addresses: [Liu, Junhai; Chen, Xiaowen; Han, Wenjuan; Dai, Qibiao] Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
[Wu, Kui; Zhang, Huaijin] Shandong Univ, State Key Lab Crystal Mat, Jinan 250100, Peoples R China.
[Liu, Junhai; Chen, Xiaowen; Han, Wenjuan; Dai, Qibiao] Qingdao Univ, Key Lab Photon Mat & Technol Univ Shandong, Qingdao 266071, Peoples R China.
Reprint Address: Liu, JH (reprint author), Qingdao Univ, Coll Phys, Ning Xia Rd 308, Qingdao 266071, Peoples R China.
E-mail Addresses: junhai_liu@hotmail.com
Times Cited: 0
Number of references: 20

Tags: High enery laser - generation

Investigation of the arbitrary waveform semiconductor laser as seed light source for high energy laser (China) 2012

Author(s): Wang, HY (Wang, Hongyun); Da, ZS (Da, Zhengshang); Liu, BY (Liu, Baiyu); Liu, H (Liu, Hui)

Source: MICROWAVE AND OPTICAL TECHNOLOGY LETTERS Volume: 54 Issue: 3 Pages: 751-755 DOI: 10.1002/mop.26652 Published: MAR 2012

ABSTRACT: A pulse semiconductor laser modulated by arbitrary shaping electrical waveform is produced and the generated optical pulse can be taken as the seed resource for high-power laser facilities.Based on ultrawide band microwave device and

continued

microstrip line transmission delay application, an all-solid-state circuit for generating arbitrary modulation pulse to modulate the semiconductor laser is fabricated. For improving the semiconductor laser power, the output laser pulse is sent into erbium-doped fiber master oscillator power amplifier architecture for amplification. In the experiment, the output laser pulse can be arbitrarily adjusted at 1547.9 nm center wavelength, less than 10 ns duration, lower than 100 kHz repetition rate, and 330 ps time domain adjustment. (C) 2012 Wiley Periodicals, Inc. Microwave Opt Technol Lett 54:751-755, 2012; View this article online at wileyonlinelibrary.com. DOI 10.1002/mop.26652

Addresses: [Wang, Hongyun; Da, Zhengshang; Liu, Baiyu; Liu, Hui] Chinese Acad Sci, Xian Inst Opt & Precis Mech, Xian 710119, Peoples R China.
[Wang, Hongyun; Liu, Hui] Chinese Acad Sci, Grad Sch, Beijing 100049, Peoples R China.
Reprint Address: Liu, H (reprint author), Chinese Acad Sci, Xian Inst Opt & Precis Mech, Xian 710119, Peoples R China.
E-mail Addresses: liuhui3713@gmail.com

Times Cited: 0

Number of references: 17

Tags: High energy laser - generation

Multistage fiber preamplifier employing spectral compression for generation of high-energy laser pulses (Russia) 2016

Author(s): Korobko, DA (Korobko, D. A.); Okhotnikov, OG (Okhotnikov, O. G.); Zolotovskii, IO (Zolotovskii, I. O.)

Source: JOURNAL OF THE OPTICAL SOCIETY OF AMERICA B-OPTICAL PHYSICS Volume: 33 Issue: 2 Pages: 239-245 DOI: 10.1364/JOSAB.33.000239 Published: FEB 1 2016

ABSTRACT: We report the main features of spectral compression (SC) of parabolic pulses in nonlinear optical fibers. It is shown that variational analysis correctly describes evolution of pulse parameters during SC. The model of a cascade amplifier system that employs SC is developed to achieve superior spectral densities. The proposed configuration is promising as an optical pulse preamplifier for operation in high-energy pulse laser systems. (C) 2016 Optical Society of America

Addresses: [Korobko, D. A.; Okhotnikov, O. G.; Zolotovskii, I. O.] Ulyanovsk State Univ, 42 L Tolstoy Str, Ulyanovsk 432017, Russia.
[Okhotnikov, O. G.] Tampere Univ Technol, Optoelect Res Ctr, Korkeakoulunkatu 3, FIN-33101 Tampere, Finland.
Reprint Address: Korobko, DA (reprint author), Ulyanovsk State Univ, 42 L Tolstoy Str, Ulyanovsk 432017, Russia.
E-mail Addresses: korobkotam@rambler.ru

Times Cited: 0

Number of references: 24

Tags: High enery laser - generation

Photoionized plasmas induced in neon with extreme ultraviolet and soft X-ray pulses produced using low and high energy laser systems (Poland) 2015

Author(s): Bartnik, A (Bartnik, A.); Wachulak, P (Wachulak, P.); Fok, T (Fok, T.); Wergrzynski, L (Wergrzynski, L.); Fiedorowicz, H (Fiedorowicz, H.); Pisarczyk, T (Pisarczyk, T.); Chodukowski, T (Chodukowski, T.); Kalinowska, Z (Kalinowska, Z.); Dudzak, R (Dudzak, R.); Dostal, J (Dostal, J.); Krousky, E (Krousky, E.); Skala, J (Skala, J.); Ullschmied, J (Ullschmied, J.); Hrebicek, J (Hrebicek, J.); Medrik, T (Medrik, T.)

Source: PHYSICS OF PLASMAS Volume: 22 Issue: 4 Article Number: 043302 DOI: 10.1063/1.4919024 Published: APR 2015

ABSTRACT: A comparative study of photoionized plasmas created by two soft X-ray and extreme ultraviolet (SXR/EUV) laser plasma sources with different parameters is presented. The two sources are based on double-stream Xe/He gas-puff targets irradiated with high (500 J/0.3 ns) and low energy (10 J/1 ns) laser pulses. In both cases, the SXR/EUV beam irradiated the gas stream, injected into a vacuum chamber synchronously with the radiation pulse. Irradiation of gases resulted in formation of photoionized plasmas emitting radiation in the SXR/EUV range. The measured Ne plasma radiation spectra are dominated by emission lines corresponding to radiative transitions in singly charged ions. A significant difference concerns origin of the lines: K-shell or L-shell emissions occur in case of the high and low energy irradiating system, respectively. In high energy system, the electron density measurements were also performed by laser interferometry, employing a femtosecond laser system. A maximum electron density for Ne plasma reached the value of 2.10(18) cm(-3). For the low energy system, a detection limit was too high for the interferometric measurements, thus only an upper estimation for electron density could be made. (C) 2015 AIP Publishing LLC.

Addresses: [Bartnik, A.; Wachulak, P.; Fok, T.; Wergrzynski, L.; Fiedorowicz, H.] Mil Univ Technol, Inst Optoelect, PL-00908 Warsaw, Poland.
[Pisarczyk, T.; Chodukowski, T.; Kalinowska, Z.] Inst Plasma Phys & Laser Microfus, PL-00908 Warsaw, Poland.
[Dudzak, R.; Dostal, J.; Krousky, E.; Skala, J.; Ullschmied, J.; Hrebicek, J.; Medrik, T.] Inst Plasma Phys ASCR, Prague, Czech Republic.

continued

[Dudzak, R.; Dostal, J.; Krousky, E.; Skala, J.; Ullschmied, J.; Hrebicek, J.; Medrik, T.] Inst Phys ASCR, Prague, Czech Republic.
Reprint Address: Bartnik, A (reprint author), Mil Univ Technol, Inst Optoelect, Kaliskiego 2, PL-00908 Warsaw, Poland.
Times Cited: 1
Number of references: 32
Tags: High enery laser - generation

Single-shot fluctuations in waveguided high-harmonic generation (The Netherlands) 2015

Author(s): Goh, SJ (Goh, S. J.); Tao, Y (Tao, Y.); van der Slot, PJM (van der Slot, P. J. M.); Bastiaens, HJM (Bastiaens, H. J. M.); Herek, J (Herek, J.); Biedron, SG (Biedron, S. G.); Danailov, MB (Danailov, M. B.); Milton, SV (Milton, S. V.); Boller, KJ (Boller, K. -J.)

Source: OPTICS EXPRESS Volume: 23 Issue: 19 Pages: 24888-24902 DOI: 10.1364/OE.23.024888 Published: SEP 21 2015

ABSTRACT: For exploring the application potential of coherent soft x-ray (SXR) and extreme ultraviolet radiation (XUV) provided by high-harmonic generation, it is important to characterize the central output parameters. Of specific importance are pulse-to-pulse (shot-to-shot) fluctuations of the high-harmonic output energy, fluctuations of the direction of the emission (pointing instabilities), and fluctuations of the beam divergence and shape that reduce the spatial coherence. We present the first single-shot measurements of waveguided high-harmonic generation in a waveguided (capillary-based) geometry. Using a capillary waveguide filled with Argon gas as the nonlinear medium, we provide the first characterization of shot-to-shot fluctuations of the pulse energy, of the divergence and of the beam pointing. We record the strength of these fluctuations vs. two basic input parameters, which are the drive laser pulse energy and the gas pressure in the capillary waveguide. In correlation measurements between single-shot drive laser beam profiles and single-shot high-harmonic beam profiles we prove the absence of drive laser beam-pointing-induced fluctuations in the high-harmonic output. We attribute the main source of high-harmonic fluctuations to ionization-induced nonlinear mode mixing during propagation of the drive laser pulse inside the capillary waveguide. (C) 2015 Optical Society of America

Addresses: [Goh, S. J.; Tao, Y.; van der Slot, P. J. M.; Bastiaens, H. J. M.; Boller, K. -J.] Univ Twente, Laser Phys & Nonlinear Opt, NL-7500 AE Enschede, Netherlands.
[Herek, J.] Univ Twente, Mesa Inst Nanotechnol, Opt Sci, NL-7500 AE Enschede, Netherlands.
[Biedron, S. G.; Milton, S. V.] Colorado State Univ, Dept Elect & Comp Engn, Ft Collins, CO 80523 USA.
[Danailov, M. B.] Sincrotrone Trieste SCpA, FERMI Elettra, Trieste, Italy.
Reprint Address: Goh, SJ (reprint author), Univ Twente, Laser Phys & Nonlinear Opt, POB 217, NL-7500 AE Enschede, Netherlands.
E-mail Addresses: s.j.goh@utwente.nl
Times Cited: 1
Number of references: 46
Tags: High enery laser - generation

Spatio-temporal modeling and optimization of a deformable-grating compressor for short high-energy laser pulses (USA) 2015

Author(s): Qiao, J (Qiao, J.); Papa, J (Papa, J.); Liu, X (Liu, X.)

Source: OPTICS EXPRESS Volume: 23 Issue: 20 Pages: 25923-25934 DOI: 10.1364/OE.23.025923 Published: OCT 5 2015

ABSTRACT: Monolithic large-scale diffraction gratings are desired to improve the performance of high-energy laser systems and scale them to higher energy, but the surface deformation of these diffraction gratings induce spatio-temporal coupling that is detrimental to the focusability and compressibility of the output pulse. A new deformable-grating-based pulse compressor architecture with optimized actuator positions has been designed to correct the spatial and temporal aberrations induced by grating wavefront errors. An integrated optical model has been built to analyze the effect of grating wavefront errors on the spatio-temporal performance of a compressor based on four deformable gratings. A 1.5-meter deformable grating has been optimized using an integrated finite-element-analysis and genetic-optimization model, leading to spatio-temporal performance similar to the baseline design with ideal gratings.

Addresses: [Qiao, J.] Rochester Inst Technol, Chester F Carlson Ctr Imaging Sci, Rochester, NY 14623 USA.
[Papa, J.; Liu, X.] Univ Rochester, Inst Opt, Rochester, NY 14627 USA.
Reprint Address: Qiao, J (reprint author), Rochester Inst Technol, Chester F Carlson Ctr Imaging Sci, 54 Lomb Mem Dr, Rochester, NY 14623 USA.
E-mail Addresses: qiao@cis.rit.edu
Times Cited: 0
Number of references: 18
Tags: High enery laser - generation

continued

Spectroscopic study of the discoloration of transparent MgAl2O4 spinel fabricated by spark-plasma-sintering (SPS) processing (Japan) 2015

Author(s): Morita, K (Morita, Koji); Kim, BN (Kim, Byung-Nam); Yoshida, H (Yoshida, Hidehiro); Hiraga, K (Hiraga, Keijiro); Sakka, Y (Sakka, Yoshio)

Source: ACTA MATERIALIA Volume: 84 Pages: 9-19 DOI: 10.1016/j.actamat.2014.10.030 Published: FEB 1 2015

ABSTRACT: Discoloration of spark-plasma-sintered spinel was investigated by spectroscopic techniques and transmission electron microscopy. The discoloration is explained by the combination of carbon contaminations and lattice defects (color centers), which are introduced in the spinel matrix depending on the spark-plasma-sintering conditions. For low heating rates of <= 10 degrees C min(-1), the trace carbonate CO3 pre-existing in the starting powder remained as glassy carbon within the matrix, irrespective of the sintering temperature. For a high heating rate of >= 50 degrees C min(-1), additional carbon contamination occurred by evaporating the carbon phases from the carbon papers and graphite dies during the heating process, and tended to be enhanced by the increasing heating rate. The present data indicate that the color center (F+-center) may be generated by the formation of oxygen vacancies, which are mainly introduced by dislocation motion depending on the sintering conditions. Since the rate of sintering, namely the deformation rate, increased with the heating rate, the concentration of the dislocation-related color centers increased with the heating rate, but decreased with the sintering temperature due to the bleaching of the oxygen vacancies. For the present spinel, the discoloration due to the carbon contamination and the formation of F+-centers deteriorates the light transmission, depending on the sintering conditions. (C) 2014 Acta Materialia Inc. Published by Elsevier Ltd. All rights reserved.

Addresses: [Morita, Koji; Kim, Byung-Nam; Yoshida, Hidehiro; Hiraga, Keijiro; Sakka, Yoshio] Natl Inst Mat Sci, Nanoceram Ctr, Tsukuba, Ibaraki 3050047, Japan.
[Hiraga, Keijiro] Kitami Inst Technol, Kitami, Hokkaido 0908507, Japan.
Reprint Address: Morita, K (reprint author), Natl Inst Mat Sci, Nanoceram Ctr, 1-2-1 Sengen, Tsukuba, Ibaraki 3050047, Japan.
E-mail Addresses: MORITA.Koji@nims.go.jp

Times Cited: 3
Number of references: 78
Tags: High enery laser - generation

High Energy Laser - Materials

Ceramic windows and gain media for high-energy lasers (USA) 2013

Author(s): Kim, W (Kim, Woohong); Villalobos, G (Villalobos, Guillermo); Baker, C (Baker, Colin); Frantz, J (Frantz, Jesse); Shaw, B (Shaw, Brandon); Bayya, S (Bayya, Shyam); Sadowski, B (Sadowski, Bryan); Hunt, M (Hunt, Michael); Aggarwal, I (Aggarwal, Ishwar); Sanghera, J (Sanghera, Jasbinder)

Source: OPTICAL ENGINEERING Volume: 52 Issue: 2 Article Number: 021003 DOI: 10.1117/1.OE.52.2.021003 Published: FEB 2013

ABSTRACT: Recent progress in high-quality transparent ceramic window materials (MgAl2O4 spinel and beta-SiC) and high-power solid-state laser materials (Yb3+ : Y2O3, Yb3+ : Lu2O3, and Ho3+ : Lu2O3) is reported. Spinel ceramic demonstrates a record low-absorption loss of 6 ppm/cm at 1.06 mu m. The capability of fabricating various shapes and sizes of spinel ceramics is also demonstrated. We also report optical transparency from a beta-SiC ceramic fabricated by field assisted sintering technology (FAST). We report lasing in hot-pressed Yb3+ : Y2O3 and Yb3+ : Lu2O3 ceramic made from coprecipitated powder. The highest ever reported output power and efficiency from 10% doped Yb3+ : Lu2O3 ceramic is also presented. Lasing oscillation from hot pressed composite of five-layered Yb3+ : Y2O3 ceramic is also demonstrated for the first time. (c) 2012 Society of Photo-Optical Instrumentation Engineers (SPIE). [DOI: 10.1117/1.OE.52.2.021003]

Addresses: [Kim, Woohong; Villalobos, Guillermo; Baker, Colin; Frantz, Jesse; Shaw, Brandon; Bayya, Shyam; Sanghera, Jasbinder] USN, Res Lab, Washington, DC 20375 USA.
[Sadowski, Bryan; Aggarwal, Ishwar] Sotera Def Solut, Crofton, MD 21114 USA.
[Hunt, Michael] Univ Res Fdn, Greenbelt, MD 20770 USA.
Reprint Address: Kim, W (reprint author), USN, Res Lab, Washington, DC 20375 USA.
E-mail Addresses: rick.kim@nrl.navy.mil

Times Cited: 3
Number of references: 15
Tags: High enery laser - materials

Characterization of material ablation driven by laser generated intense extreme ultraviolet light (Japan) 2015

Author(s): Tanaka, N (Tanaka, Nozomi); Masuda, M (Masuda, Masaya); Deguchi, R (Deguchi, Ryo); Murakami, M (Murakami, Masakatsu); Sunahara, A (Sunahara, Atsushi); Fujioka, S (Fujioka, Shinsuke); Yogo, A (Yogo, Akifumi); Nishimura, H (Nishimura, Hiroaki)

Source: APPLIED PHYSICS LETTERS Volume: 107 Issue: 11 Article Number: 114101 DOI: 10.1063/1.4930958 Published: SEP 14 2015

ABSTRACT: We present a comparative study on the hydrodynamic behaviour of plasmas generated by material ablation by the irradiation of nanosecond extreme ultraviolet (EUV or XUV) or infrared laser pulses on solid samples. It was clarified that the difference in the photon energy deposition and following material heating mechanism between these two lights result in the difference in the plasma parameters and plasma expansion characteristics. Silicon plate was ablated by either focused intense EUV pulse (lambda = 9-25 nm, 10 ns) or laser pulse (lambda = 1064 nm, 10 ns), both with an intensity of similar to 10(9) W/cm(2). Both the angular distributions and energy spectra of the expanding ions revealed that the photoionized plasma generated by the EUV light differs significantly from that produced by the laser. The laser-generated plasma undergoes spherical expansion, whereas the EUV-generated plasma undergoes planar expansion in a comparatively narrow angular range. It is presumed that the EUV radiation is transmitted through the expanding plasma and directly photoionizes the samples in the solid phase, consequently forming a high-density and high-pressure plasma. Due to a steep pressure gradient along the direction of the target normal, the EUV plasma expands straightforward resulting in the narrower angular distribution observed. (c) 2015 AIP Publishing LLC.

Addresses: [Tanaka, Nozomi; Masuda, Masaya; Deguchi, Ryo; Murakami, Masakatsu; Fujioka, Shinsuke; Yogo, Akifumi; Nishimura, Hiroaki] Osaka Univ, Inst Laser Engn, Suita, Osaka 5650871, Japan.
[Sunahara, Atsushi] Inst Laser Technol, Suita, Osaka 5650871, Japan.
Reprint Address: Tanaka, N (reprint author), Osaka Univ, Inst Laser Engn, 2-6 Yamadaoka, Suita, Osaka 5650871, Japan.
E-mail Addresses: tanaka-n@ile.osaka-u.ac.jp

Times Cited: 0
Number of references: 18

Tags: High enery laser - materials

Extremely Nonlinear Optics Using Shaped Pulses Spectrally Broadened in an Argon- or Sulfur Hexafluoride-Filled Hollow-Core Fiber (Germany) 2016

Author(s): Hoffmann, A (Hoffmann, Andreas); Zurch, M (Zuerch, Michael); Spielmann, C (Spielmann, Christian)

Source: APPLIED SCIENCES-BASEL Volume: 5 Issue: 4 Pages: 1310-1322 DOI: 10.3390/app5041310 Published: DEC 2015

ABSTRACT: In this contribution we present a comparison of the performance of spectrally broadened ultrashort pulses using a hollow-core fiber either filled with argon or sulfur hexafluoride (SF6) for demanding pulse-shaping experiments. The benefits of both gases for pulse-shaping are studied in the highly nonlinear process of high-harmonic generation. In this setup, temporally shaping the driving laser pulse leads to spectrally shaping of the output extreme ultraviolet (XUV) spectrum, where total yield and spectral selectivity in the XUV are the targets of the optimization approach. The effect of using sulfur hexafluoride for pulse-shaping the XUV yield can be doubled compared to pulse compression and pulse-shaping using argon and the spectral range for selective optimization of a single harmonic can be extended. The obtained results are of interest for extending the range of ultrafast science applications drawing on tailored XUV fields.

Addresses: [Hoffmann, Andreas; Zuerch, Michael; Spielmann, Christian] Univ Jena, Abbe Ctr Photon, Inst Opt & Quantum Elect, D-07743 Jena, Germany.
[Spielmann, Christian] Helmholtz Inst Jena, D-07743 Jena, Germany.
Reprint Address: Hoffmann, A (reprint author), Univ Jena, Abbe Ctr Photon, Inst Opt & Quantum Elect, Max Wien Pl 1, D-07743 Jena, Germany.
E-mail Addresses: andreas.hoffmann.3@uni-jena.de; michael.zuerch@uni-jena.de; christian.spielmann@uni-jena.de

Times Cited: 0
Number of references: 32

Tags: High enery laser - materials

continued

High-Energy Laser Systems and Components (USA) 2013

Author(s): Albertine, JR (Albertine, John R.)

Source: OPTICAL ENGINEERING Volume: 52 Issue: 2 Article Number: 021001 DOI: 10.1117/1.OE.52.2.021001 Published: FEB 2013

ABSTRACT: While most fictional depictions of laser weapons (and some news stories) are without sound basis, these devices do offer the potential for a whole new class of weapons and capabilities that complement (but do not replace) existing kinetic energy weapons and electronic warfare.

Addresses: [Albertine, John R.] Johns Hopkins Appl Phys Lab, Space Div, Laurel, MD 20723 USA.
[Albertine, John R.] Navys High Energy Laser Program Off, Arlington, VA USA.
[Albertine, John R.] US Dept Def, Arlington, VA USA.
[Albertine, John R.] High Energy Laser Joint Technol Off, Arlington, VA USA.
[Albertine, John R.] DEPS, Albuquerque, NM USA.
Reprint Address: Albertine, JR (reprint author), 109 Kingswood Rd, Annapolis, MD 21401 USA.
E-mail Addresses: albertij@erols.com

Times Cited: 0
Number of references: 0

Tags: High enery laser - materials

High-power CW and passively Q-switched laser operation of Yb:GdCa4O(BO3)(3) crystal (China) 2016

Author(s): Chen, XW (Chen, Xiaowen); Wang, LS (Wang, Lisha); Liu, JH (Liu, Junhai); Guo, YF (Guo, Yunfeng); Han, WJ (Han, Wenjuan); Xu, HH (Xu, Honghao); Yu, HH (Yu, Haohai); Zhang, HJ (Zhang, Huaijin)

Source: OPTICS AND LASER TECHNOLOGY Volume: 79 Pages: 74-78 DOI: 10.1016/j.optlastec.2015.11.022 Published: MAY 2016

ABSTRACT: We demonstrate efficient high-power CW and passively Q-switched operations of Yb:GdCa4O(BO3)(3) lasers. An output power of 18.2 W is generated at 1031.5 nm in CW mode, with optical-to-optical and slope efficiencies being respectively 55% and 70%, with respect to incident pump power. In passively Q-switched operation with a CO4+:YAG crystal as saturable absorber, a maximum average output power of 15.6 W is produced at a pulse repetition rate of 91 kHz, with an optical-to-optical efficiency of 44%. Low-repetition-rate Q-switched action is also realized, generating an average output power of 4.2 W at 5.7 kHz, the resulting pulse energy and duration are 737 mu J and 3.6 ns, leading to a peak power amounting to 205 kW. (C) 2015 Elsevier Ltd. All rights reserved.

Addresses: [Chen, Xiaowen; Wang, Lisha; Liu, Junhai; Guo, Yunfeng; Han, Wenjuan; Xu, Honghao] Qingdao Univ, Coll Phys, 308 Ning Xia Rd, Qingdao 266071, Peoples R China.
[Chen, Xiaowen; Wang, Lisha; Liu, Junhai; Guo, Yunfeng; Han, Wenjuan; Xu, Honghao] Qingdao Univ, Key Lab Photon Mat & Technol Univ Shandong, 308 Ning Xia Rd, Qingdao 266071, Peoples R China.
[Yu, Haohai; Zhang, Huaijin] Shandong Univ, State Key Lab Crystal Mat, Jinan 250100, Peoples R China.
Reprint Address: Liu, JH (reprint author), Qingdao Univ, Coll Phys, 308 Ning Xia Rd, Qingdao 266071, Peoples R China.
E-mail Addresses: junhai_liu@hotmail.com

Times Cited: 0
Number of references: 10

Tags: High enery laser - materials

An Insight into the Various Defects-Induced Emission in MgAl2O4 and Their Tunability with Phase Behavior: Combined Experimental and Theoretical Approach (India) 2016

Author(s): Pathak, N (Pathak, Nimai); Ghosh, PS (Ghosh, Partha Sarathi); Gupta, SK (Gupta, Santosh Kumar); Mukherjee, S (Mukherjee, Saurabh); Kadam, RM (Kadam, Ramakant Mahadeo); Arya, A (Arya, Ashok)

Source: JOURNAL OF PHYSICAL CHEMISTRY C Volume: 120 Issue: 7 Pages: 4016-4031 DOI: 10.1021/acs.jpcc.5b11822 Published: FEB 25 2016

ABSTRACT: The present work describes various defects-induced tunable emission behavior of MgAl2O4 compounds obtained after annealing at different temperatures through a sol gel combustion route. Multiple defect centers, such as F, F-2, F, and F2+ and different shallow and deep defects were found to be present inside the band gap, as confirmed by the lifetime and time-resolved emission spectroscopy (TRES) studies. The tunable emission characteristic at different annealing temperatures could be linked with the phase behavior of the spinel. Excitation wavelength variation suggested that a photoconversion process of F to F+ centers was involved with lambda(ex) = 250 nm, followed by a trapping de-trapping mechanism of the released electrons within different trap states. An exchange mechanism of electrons in between conduction band and shallow states was also observed at

continued

room temperature, which was absent at low temperature, as indicated by the emission profile. These observations render it to be a potential optical based thermal sensor material. DFT-based calculations were carried out for both pure and various oxygen-vacancy-introduced spinel phases in order to characterize the different defect states inside the band gap. Finally, on the basis of theoretical and experimental results, a model has been proposed to explain the mechanisms related to emission tunability.

Addresses: [Pathak, Nimai; Gupta, Santosh Kumar; Mukherjee, Saurabh; Kadam, Ramakant Mahadeo] Bhabha Atom Res Ctr, Div Radiochem, Bombay 400085, Maharashtra, India.
[Ghosh, Partha Sarathi; Arya, Ashok] Bhabha Atom Res Ctr, Div Mat Sci, Bombay 400085, Maharashtra, India.
Reprint Address: Pathak, N (reprint author), Bhabha Atom Res Ctr, Div Radiochem, Bombay 400085, Maharashtra, India.
E-mail Addresses: nmpathak4@gmail.com

Times Cited: 0
Number of references: 56
Tags: High enery laser - materials

The potential of Yb:YCa4O(BO3)(3) crystal in generating high-energy laser pulses (China) 2013

Author(s): Liu, JH (Liu, Junhai); Dai, QB (Dai, Qibiao); Wan, Y (Wan, Yong); Han, WJ (Han, Wenjuan); Tian, XP (Tian, Xueping)

Source: OPTICS EXPRESS Volume: 21 Issue: 8 Pages: 9365-9376 DOI: 10.1364/OE.21.009365 Published: APR 22 2013

ABSTRACT: The passive Q-switching laser performance of Yb:YCa4O(BO3)(3) is studied with crystals cut along the principal optical axes. Using a Cr4+:YAG saturable absorber with initial transmission of 93.7% and an output coupler of transmission of 40%, efficient Q-switched laser operation is achieved with a X-cut crystal, generating an output power of 2.14 W at a pulse repetition rate of 4.5 kHz. The resulting laser pulse is 9.3 ns in duration, with the energy being as high as 476 mu J and the peak power amounting to 51.2 kW. The results demonstrated in this work reveal the great potential of this crystal in developing high-energy compact pulsed lasers. (C) 2013 Optical Society of America

Addresses: [Liu, Junhai; Dai, Qibiao; Wan, Yong; Han, Wenjuan; Tian, Xueping] Qingdao Univ, Coll Phys, Qingdao 266071, Peoples R China.
[Liu, Junhai; Dai, Qibiao; Han, Wenjuan; Tian, Xueping] Qingdao Univ, Key Lab Photon Mat & Technol Univ Shandong, Qingdao 266071, Peoples R China.
Reprint Address: Liu, JH (reprint author), Qingdao Univ, Coll Phys, Ning Xia Rd 308, Qingdao 266071, Peoples R China.
E-mail Addresses: junhai_liu@hotmail.com

Times Cited: 6
Number of references: 36
Tags: High energy laser - material ■

ABOUT THIS PUBLICATION

The **S&T In-Depth Bulletin** is a compilation of selected recent technical articles on emerging fields in science and technology which may have long or short term implication for national security. Articles are selected from peer-reviewed journals and focus on providing a more detailed insight to the R&E community. Each quarter we will feature a topic and provide abstracts from the most timely and relevant review articles. Providing a comprehensive bibliography is beyond the scope of this publication but full articles may be requested via the Pentagon library or via your local Command's library. Personnel assigned to the Pentagon may request articles from John Mills at john.mills@whs.mil.

We welcome your feedback to improve the publication and make it more relevant to your work. To subscribe (or unsubscribe), visit https://tin-ly.sainc.com/ASDRE. To provide feedback or ask questions, contact us at asdre-st-bulletin-reply@sainc.com.

This publication is authored and distributed by:

The Office of Technical Intelligence
OSD AT&L/OASD(R&E)

Ms. Hema Viswanath
OTI Corporate Librarian

continued