43rd ANNUAL LASER DAMAGE SYMPOSIUM
Proceedings

LASER-INDUCED DAMAGE IN OPTICAL MATERIALS: 2011

18–21 September 2011
Boulder, Colorado

Editors
Gregory J. Exarhos, Vitaly E. Gruzdev, Joseph A. Menapace, Detlev Ristau, M. J. Soileau

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The International Program Committee of the Laser Damage Symposium XLIII: Annual Symposium on Optical Materials for High Power Lasers

The internationality of the LDS has always been extensively supported by an International Program Committee, representing research activities in different countries. Presently, the International Program Committee consists of representatives from the UK, France, China, Russia, Japan, Germany, and the United States. Besides providing contributions to the conference programme, the International Program Committee is active in promoting the conference and in attracting researchers from around the world. The engagement of the International Program Committee, which initiated participation from more than 30 countries during the last several years, is acknowledged here as a major contribution to the success of the conference.

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Symposium Welcome

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Welcome to Boulder and the 43rd Annual Symposium on Optical Materials for High-Power Lasers! The symposium co-chairs, Greg Exarhos, Vitaly Gruzdev, Detlev Ristau, M. J. Soileau, and I are excited to see the fantastic turnout at this year's conference and, like all participants, are anxious to hear about the great science that is being conducted in the area of laser damage and optical materials. For the past forty-three years the NIST facility in Boulder, Colorado, has been the conference epicenter inspiring spirited discussions between scientists, scholars, and engineers, from industrial companies, universities, and research institutes from around the world. The number of oral and poster contributions scheduled for this year's event clearly points to the continued interest in the field of laser damage and related topics from our scientific community. The International Program Committee continues in promoting the conference worldwide, this year attracting contributions from scientists and engineers from 13 different countries. Laser Damage 2011 sets the stage for sharing results and progress in research efforts from these countries and will include 50 oral presentations and 29 posters. Contributions from investigators around the world continue to advance our knowledge of laser-induced damage on optical materials and thin films; of novel processes to measure, characterize, and mitigate contamination and damage; of advanced methods to produce laser-damage resistant optics and coatings, and in unraveling the details of the mechanisms responsible for damage initiation and growth. The conference also hosts two mini-symposia where experimental results and fabrication protocols are presented in several key research subjects involving deep ultraviolet optical materials and meta-optics and photonic band gap materials. This year's *Proceedings of SPIE* will publish some interesting work and continues to be a true indicator of the strength and importance of the laser damage field. As such, the proceedings serve as one of the major resources compiled for laser damage research and development. Most important, the symposium staff recognizes and sends thanks to the authors whose extraordinary efforts to persevere through the difficulties encountered during their investigations and to prepare the manuscripts and posters to share with and inspire others. These efforts are deeply appreciated and validate our mission in the scientific community.

The co-chairs appreciatively recognize the tireless efforts of the SPIE conference staff, and Carly Limtiaco, Lawrence Livermore National Laboratory Symposium Assistant, whose hard work in planning and execution made the event possible. The organizers also value the efforts of Kent Rochford, NIST Technical Coordinator, who directed facility activities and audio/video capabilities at the symposium site. Financial support for Laser Damage 2011 has been graciously provided by the meeting co-sponsors: Lawrence Livermore National Laboratory, Laser Zentrum Hannover e.V., Pacific Northwest National Laboratory, Spica Technologies, Inc., the Office of Naval Research, and the Laboratory for Laser Energetics, University of Rochester. We also thank the NIST; CREOL & FPCE, College of Optics and Photonics, University of Central Florida; and the University of Missouri-Columbia for providing the much needed managerial support during planning and event operations. We express sincere gratitude and a "hats off" to Blue Ridge Optics, Alpine Laser, and RMI Laser and for providing refreshment services during the event and to Arrow Thin Films, AT Films, and Precision Photonics Corp. for hosting the open houses and evening receptions. We also especially thank Lars Jensen and the staff at Laser Zentrum Hannover e.V., who donated their time and facilities to perform the damage tests for the Excimer Mirror Laser Damage competition and Chris Stolz for pulling the competition together. This outstanding effort is appreciated by the community and the organizers.

The co-chairs hope the symposium and the Boulder community provide a first-class setting filled with great opportunities to relax with old friends, make new friends, and perhaps establish new research opportunities. On behalf of my co-chairs and the International Program Committee, we wish you a productive and enjoyable stay in Boulder and look forward to seeing you next year.

Summary of Meeting

SPIE Laser Damage
43rd Annual Symposium
on Optical Materials for High Power Lasers
18–21 September 2011

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1. Abstract

These proceedings contain the papers presented as oral and poster presentations at the 43rd Annual Symposium on Optical Materials for High Power Lasers. The conference was held at the National Institute of Standards and Technology facility in Boulder Colorado, 18–21 September 2011. The symposium was divided into the traditional sessions devoted to the following major topics: thin films; surfaces, mirrors and contamination; fundamental mechanisms; materials and measurements. Two mini-symposia were held this year: one on deep-UV optics, and the other on meta-optics/photonic band-gap materials. The starting event of the symposium was a round-table discussion on measurements of laser-damage threshold held on Sunday evening. The conference was opened by Dr. Joseph A. Menapace with a symposium welcome. Dr. Gregory J. Exarhos of Pacific Northwest National Laboratory (USA), Dr. Vitaly Gruzdev of the University of Missouri, Columbia (USA), Dr. Joseph A. Menapace of the Lawrence Livermore National Laboratory (USA), Dr. Detlev Ristau of the Laser Zentrum Hannover e.V. (Germany), and Dr. M. J. Soileau, of the University of Central Florida (USA) co-chaired the symposium. The founding organizers are Dr. Arthur H. Guenther and Dr. Alexander J. Glass.

79 papers were accepted for presentation at this meeting, and 71 of them were presented, including oral and poster presentations plus two mini-symposia. No parallel sessions were held, allowing the opportunity to discuss common research interests with all the presenters. With 149 participants attending, the meeting offered an opportunity to make many new acquaintances. Although held annually in the US, this is a truly international conference with 42 percent of the attendees and 61.5 percent of the presentations coming from abroad. As usual, the National Institute of Standards and Technology in Boulder, Colorado, offered a setting conducive to interchanges between individuals working in closely related and complementary fields. We look forward to future opportunities to come together again in this setting.

The 44th Annual Symposium of this series will be held in Boulder, Colorado, 24–26 September 2012. A continuous effort will be made to ensure a close liaison between the high-peak-power and high-average-power laser communities, as well as to include damage issues related to various research efforts and commercial laser applications. A mini-symposium related to the subject of laser-plasma interactions is anticipated. Invited talks are also anticipated to open the four major topical areas and the mini-symposium.

The principal topics to be considered as contributed papers in 2012 do not differ drastically from those enumerated above. We expect to hear more about the impacts of contamination on the laser resistance of optical components and the impacts of defects since both of these topics continue to generate significant interest. High-energy laser windows, crystals, and transparent ceramics continue to place limitations on laser systems and so remain an active area of research and spirited debate. Refinement of the mitigation strategy consisting of damage initiation followed by arresting damage growth through post-processing techniques, while not creating downstream damage, is also expected to be a continued focus as a large number of laser-resistant UV optics are manufactured for large-aperture fusion lasers. Short pulse laser optics and damage phenomena remain an active area of research. Recently increased activity in the field of ultra-short-pulse (femtosecond) laser-material interactions is expected to be one of growing topics of the future symposium. We also expect to hear more about new measurement techniques to improve our understanding of the different damage mechanisms or to improve the manufacturing of optical materials and thin films for optical components of greater laser damage resistance. Fundamental aspects of

laser-induced damage including multiphoton and avalanche ionization, scaling of damage threshold with laser and material parameters continue to attract much attention

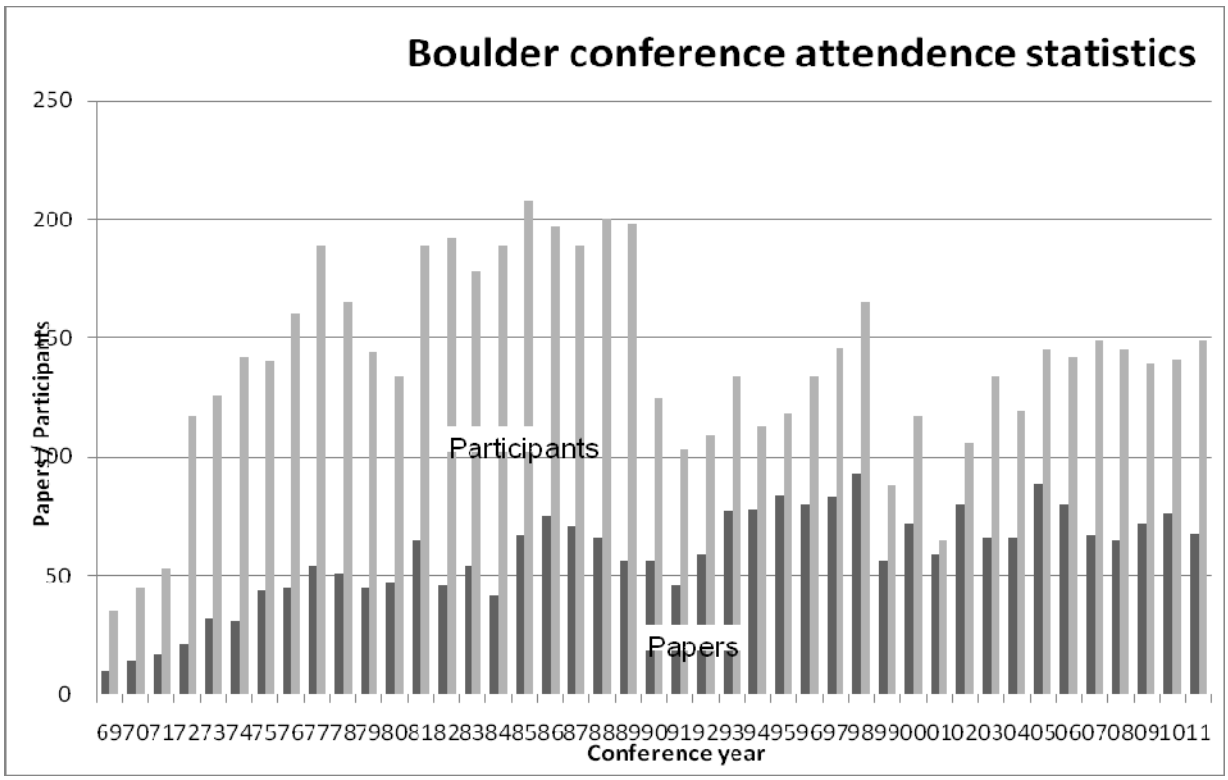
As was initially established in 1992, several distinguished invited speakers will make presentations of a tutorial or review nature, in addition, other contributors will cover late-breaking developments of interest to the attendees.

The purpose of this series of symposia is to exchange information about optical materials for high-power/high-energy lasers. The editors welcome comments and criticism from all interested readers relevant to this purpose.

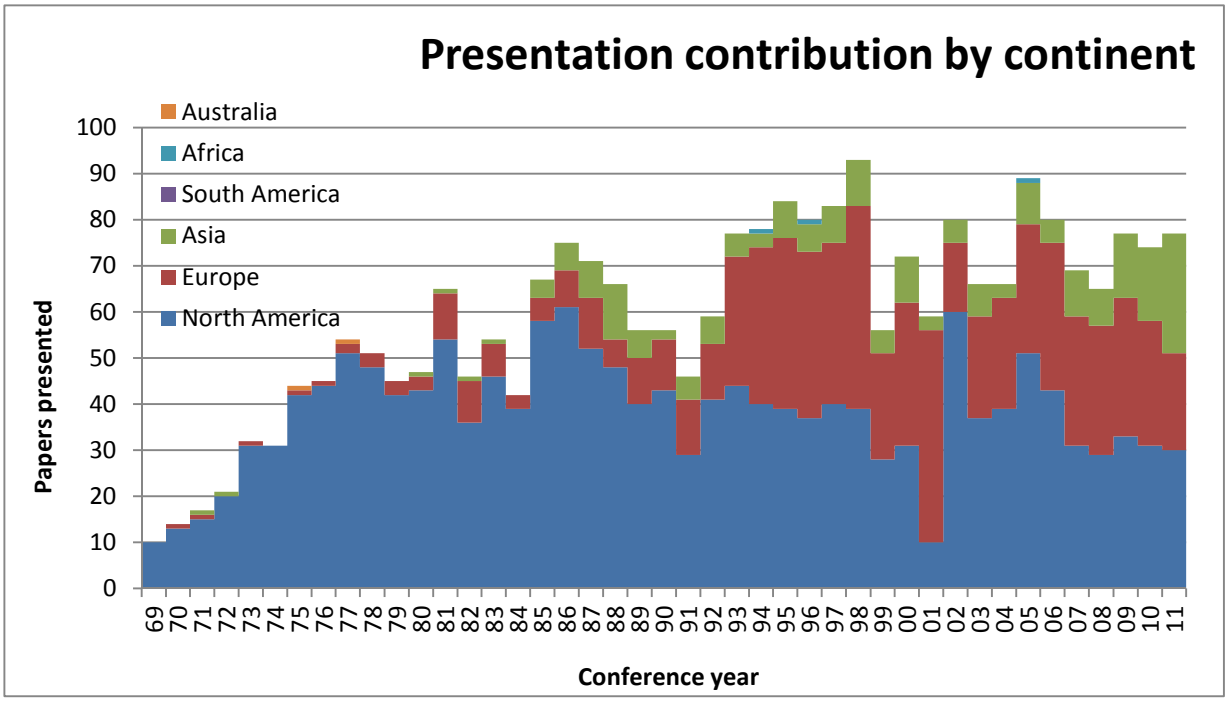
Key words: laser damage, laser interaction, optical components, optical fabrication, optical materials and properties, thin film coatings, contamination.

2. Introduction

The SPIE Laser Damage: 43rd Annual Symposium on Optical Materials for High Power Lasers (previously known as the Boulder Damage Symposium because of its Boulder, Colorado venue) was held 18–21 September 2011. This symposium continues to be the principal US and International forum for the exchange of information relative to the interaction of intense laser light with optical media and components. This year it was attended by 149 representatives of academia, industry, national research laboratories, and centers from 10 countries. Among 79 paper submittals, 71 presentations were delivered including 48 oral and 23 poster presentations. Although held annually in the US, this is a truly International conference with 42 percent of the attendees and 61.5 percent of the presentations coming from abroad this year. Historically, the meeting has been divided into four broad categories: thin films; fundamental mechanisms; materials and measurements; and surfaces, mirrors, and contamination. Starting from 1992, a mini-symposium is held to highlight hot research topics and areas of active research and special interest in the research fields related to high-power/high-energy lasers, laser-induced damage, optical materials, laser-material interactions. Starting from 2009, a Round-Table discussion is held on Sunday evening as a pre-symposium event. This year it featured the fundamental aspects of laser-induced damage under the topic "Definition and Measurement of Laser-Induced Damage in Transparent Materials by Single Short Laser Pulse". The discussion was moderated by Dr. V. E. Gruzdev and Dr. J. Arenberg and involved more than 45 participants of the conference.



Registered participants vs number of presented papers since 1969 till 2011 inclusive



Distribution of contributed papers by continents from 1969 till 2011 inclusive.

3. Symposium Cochairs

The Laser Damage Symposium (formerly the Boulder Damage Symposium) was founded by Dr. A. H. Guenther and Dr. Alexander Glass. Over the last 42 years many prominent leaders within the high-power laser community have contributed significantly as cochairs to this conference. A historical timeline of their contributions is listed below:

1969	A. H. Guenther, and A. J. Glass (C. M. Stickley)
1979	add H. E. Bennett and B. E. Newnam
1981	add D. Milam; A. J. glass departs
1987	add M. J. Soileau
1988	D. Milam departs
1989	add L. L. Chase
1994	add M. R. Kozlowski; L. L. Chase departs
1997	add G. J. Exarhos and K. L. Lewis; H. E. Bennett and B. E. Newnam depart
2001	add C. J. Stolz
2002	add N. Kaiser; M. R. Kozlowski departs
2004	N. Kaiser departs
2005	add D. Ristau
2007	A. H. Guenther deceased
2008	K. L. Lewis departs
2009	add V. Gruzdev
2010	add J. A. Menapace; C. J. Stolz departs

4. Thin Films

Because of the tremendous range of applications of optical multilayer coatings for modifying the optical performance of elements (e.g., reflectivity, wavelength sensitivities, polarization, or simply protection), this category continues to receive significant attention. Besides damage thresholds or sensitivity, topics include advanced thin deposition technologies (ion-beam sputtering and e-beam evaporation), film structure, film design, film response to environmental attack and aging, and numerous reports on important film properties such as adhesion, thermal conductivity, absorption, stability. Special attention is paid to coatings at 1064 nm, 532 nm, 355 nm, and deep-UV coatings. This year the problem of thin-film damage by UV and deep-UV pulses was doubly highlighted by the mini-symposium and the damage test competition described below. This demonstrates the strong increase of interest to this area due to mass involvement of excimer lasers into industrial production processes.

This year the fourth thin-film damage competition was organized by Dr. Christopher Stolz of Lawrence Livermore National Laboratory (USA). Three years ago, it started to sample the industrial, government, and academic sectors producing high laser resistant optical coatings. This year, excimer-laser high-reflection (mirrors with minimum reflectance 93% at 193 nm) coatings from several companies and institutes from the USA, Europe, China, and Japan were tested with 15 ns pulses at the use wavelength at the laser-damage test facility of Spica Technologies Inc. (USA). A multitude of deposition processes, coating materials, and manufacturing techniques submitted to this competition provided some interesting results that will likely lead to some interesting future research.

Dense thin film processes offer the benefit of environmental stability so much of the research in the field of thin films is proceeding in this direction. Laser interaction studies are uncovering areas where dense films offer advantages over traditional e-beam coatings. Also, as shown in the thin film damage competition, there are a number of companies that are manufacturing dense coatings from a variety of deposition techniques with very high laser resistance.

Coating defects continue to be an area of active interest in both process optimization to minimize defect formation as well as mitigation techniques such as laser conditioning. This year, we continued to see interest in short-pulse, ultrashort pulse, and DUV coatings.

5. Fundamental Mechanisms

This area deals with the interaction of light with matter – where real system experience is presented. Topics include laser-induced ionization, nonlinear behavior and effects, self-focusing, thermal modeling, and experimental data reduction protocols (e.g. effects of pulse width, repetition rate or duty cycle, spot size, wavelength, temperature, ionizing radiation, and other environmental effects), as well as all types of experimental or material variable scaling relationships that not only afford insight into the fundamentals of the interaction process, but allow extrapolations for engineering and cost-benefit evaluations. In many areas, these insights are based on real-world, systems-level tests, as opposed to a frequently pristine laboratory environment.

A significant amount of experimental and simulation work is now being done in the femtosecond regime as exemplified by the significant number of submitted papers on ultrafast phenomena. This year's presentations demonstrate stable growth of scientific interest and research activity in that field. A significant number of presentations also focus on the fundamental influence of defects on laser-induced damage threshold, linear and non-linear absorption, and material response to high-power laser action. This year, a novel definition of damage threshold associated with highly abrupt growth of electron density was presented by the invited speaker based on their results on simulation of laser-induced ionization of transparent materials. This novel result removes the need to involve controversial criteria for critical electron density to define the damage threshold.

6. Surfaces and Mirrors

Presentations of this category are devoted to surface preparation (including MRF technology for large-aperture optics, plasma pre-treatment, aqueous HF-based etching), subsurface damage characterization, roughness and scattering, environmental degradation and aging, as well as substrate material properties, including cooling techniques, and, of course, damage measurement and the cleaning of surfaces. The crux of the contamination problem is fundamentally that damage experiments done in controlled clean laboratory settings do not necessarily yield the same results as laser operations in less pristine operating environments. There is a significant amount of work needed in understanding what contamination is acceptable, what contamination is threatening to optic survivability, and how fluence-limiting or lifetime-limiting contamination can be eliminated or mitigated from operating laser systems.

A fair amount of papers deal with laser-damage mitigation demonstrating pronounced success in that field. Decontamination and refining of optical surfaces and the impact of contamination on laser resistance still stay the topics of active research and discussion. This year's invited talk also featured a highly interesting problem of laser-induced contamination on optics operating in space at laser-equipped satellites.

7. Materials and Measurements

Among the four main sections of the conference, this one continuously stays the largest over several last years. This section deals with measurement of laser damage to the bulk of transparent optical media whether amorphous, polymeric, polycrystalline, or crystalline; reports of material properties of importance for their optical function and/or the damage process, e.g., linear and nonlinear absorption coefficients, thermal conductivity, stress-optic coefficients, moduli, scattering, and various defects. Also included are new techniques for measuring these quantities, which present a continuing challenge as materials are improved in quality and diversity. Also, the strong novel trend is toward applications of optical ceramics for production of optics for high-power lasers. Characterization of optical quality and parameters of those materials were reported in the invited talk for this topic.

There is always interest in improved measurement systems or new instruments particularly in the area of non-destructive characterization and defect detection instrumentation. Laser damage measurements are difficult and work continues on developing tests that address large area versus small area and the difficulties of obtaining high resolution data. Significant efforts are reported on investigation of damage precursors, damage initiators, their identification and elimination. Impressing reports are delivered on automated programmable systems for defect identification and blocking for mitigating laser-induced damage. Among the novel techniques for material characterization, application of third-harmonic microscopy was discussed as a new approach to the traditional problems of detection and identification of damage initiators. Continuous efforts have been reported on measurement of absorption for deep-UV optics.

8. Mini-Symposium on deep-UV optics

This year the meeting hosted two mini-symposia. The first one focused on the problem of laser damage in optics operating for deep-UV. With 5 oral presentations, it made a highly interesting session on Wednesday morning. The interest in the deep-UV optics continues to grow due to stable development of laser applications for micro-lithography by excimer lasers operating at 193 nm.

The other mini-symposium was devoted to meta-optics and photonic band gap materials focusing on the issues related to laser damage. Two invited talks for this mini-symposium were excellent excursions and brilliant introductions into that novel field.

A brief summary of the past mini-symposium topics staring from 1992 and the organizing chairs is listed below.

Year	*Chair*	*Topic*
1992	Brian Newnam	Damage Issues for Lithographic Optics
1993	Karl Guenther	Quest for the Invincible Laser Coating – Critical Review of Pulse Laser-Induced Damage to Optical Coatings: Causes and Cures
1994	Claude Klein	Diamond for Optics Applications in Adverse Environment
1995	Floyd Hovis	Contamination and the Laser Damage Process
1996	Robert Setchell	Laser-Induced Damage in Optical fibers
1997	David Welch	Damage and Lifetime Issues for Laser diodes
1998	Norbert Kaiser	Optics for Deep UV
1999	David Sliney	Laser Damage Processes in the Eye and Other Biological Tissue
2000	Mark Kozlowski Hideo Hosono	Defects in Glass
2001	Mark Kozlowski	Optical Materials for Telecommunications
2002	Detlev Ristau	Optics characterization – joint with 7th International Workshop of Laser Beam and Optics characterization
2003	William Latham	Understanding Optical Damage with Ultra-short Laser Pulses
2004	Keith Lewis	Damage Issues in Fiber Laser systems
2005	Leon Glebov	Petawatt Lasers
2006	Alan Stewart	Optics in a Hostile Environment
2007	Stan Peplinski	Lifetime Issues for CW and Quasi-CW Lasers
2008	Christopher Stolz Herve Bercegol	Fused Silica
2009	Wolfgang Rudolph	Femtosecond Laser-Induced Damage
2010	Klaus Sokolowski-Tinten	Fundamentals of Laser Ablation
2011	Holger Blashke, Carmen Menoni	Deep-UV Optics
2011	Michelle Shin	Meta-Optics/Photonic Band Gap Materials

9. Invited Talks

As usual, the 43rd Laser Damage Symposium is highlighted by several invited presentations:

1. "Using engineered defects to study laser-induced damage in optical thin films with nanosecond pulses," Xibin Cheng, Zhengxiang Shen, Hongfei Jiao, Jinlong Zhang, Bin Ma, Tao Ding, Zhanshan Wang, Tongji Univ. (China) [819002]

2. "Characterization of optical losses in transparent YAG ceramics," Roman Gaume, Stanford Univ. (USA) [No manuscript available]

3. "Laser-induced contamination on space optics," Wolfgang Riede, Helmut Schroder, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany), Denny Wernham, Adrian P. Tighe, Federico Pettazzi, Jorge Alves, European Research and Technology Ctr. (The Netherlands) [81901E]

4. "Electron dynamics in transparent materials under high-intensity laser irradiation," Barbel Rethfeld, Technische Univ. Kaiserslautern (Germany) [81901W]

5. "3D meta-optics for high-power laser applications," Eric G. Johnson, The Univ. of North Carolina at Charlotte (USA) [No manuscript available]

6. "Thermal conduction in optical coatings and interfaces: a key to high-power meta-optics," Joseph J. Talghader, Univ. of Minnesota (USA) [No manuscript available]

10. Conference Awards

Beginning with the meeting in 2000, the organizers instituted a best paper award in the oral and poster categories. The awards appropriately take the form of laser-induced art in an optical glass plaque. (see, e.g., paper by I. N. Trotski, Proc. SPIE 4679, 392-399 (2001)).

There were several outstanding posters and oral papers, however, the following papers were selected:

Best oral paper:
"Electron dynamics in transparent materials under high-intensity laser irradiation *(Invited Paper)*," Barbel Rethfeld Technische Univ. Kaiserslautern (Germany) [81901W]

Best poster paper:
"The impact ionization coefficient in dielectric materials revisited," Christian Karras, Duy N. Nguyen, Luke A. Emmert, Wolfgang Rudolph, The Univ. of New Mexico (United States). [819028]

11. In Conclusion

The location in Boulder, Colorado, during autumn, at the venue of the National Institute of Standards and Technology and its outstanding facilities and support staff, were appreciated by all. The 149 attendees were easily accommodated with ample opportunity to mingle and socialize.

This year, the sunny and warm weather in Boulder encouraged taking a group picture of all symposium participants by the staircase of the National Institute of Atmospheric Research (Boulder, CO) (Fig. 1) where the traditional Wine and Cheese Reception was held on Tuesday, September 20.

The organizers of the Laser Damage Symposium look for opportunities to join with other related groups for joint meetings in the future. For example, in 2002, we had a joint meeting with the 7th International Workshop on Laser Beam and Optics Characterization (LBOC), again with no parallel sessions. Planning of another joint meeting with LBOC is under consideration for 2012. Also, this year the Pacific Rim Laser Damage (PLD) symposium was held from 6–9 November, in Shanghai, China, with the topics and the scope completely similar to the topics and scopes of this meeting. We are looking forward to developing a fruitful collaboration with the PLD meeting in order to join our efforts and better serve the laser-damage community worldwide.

We must also note the tireless assistance of SPIE who handle the administrative functions of the symposium. Their presence, experience, resources, and professionalism were clearly made manifest with on-line reservations, payment by credit cards, badges, preparation of the abstract book and pocket programs, preparation, and printing of this volume of conference proceedings, and on-line document service, to which we may add the social functions – thanks to them, "A good time was had by all."

Fig. 1. Participants of SPIE Laser Damage Symposium by the staircase of the National Institute of Atmospheric Research (Boulder, CO). 20 September 2011.

12. Acknowledgments

A number of volunteers help tirelessly with some of the administrative duties necessary to put on a conference of this magnitude. SPIE took care of all the administrative planning and on-site tasks including setup, registration, and general questions. Carle Limtiaco from Lawrence Livermore National Lab. helped with the registration pick up and was at the front desk through the entire meeting. SPIE took care of program preparation, invitation letters for international participants, and provided much on-line support for the conference. SPIE was also responsible for preparation of this volume of the conference proceedings and the online publication of the manuscripts. Artika Arpana from Lawrence Livermore National Laboratory assisted with the thin-film competition.

This year, we acknowledge support from local Colorado companies: ATFilms, Arrow Thin Films, CVI Melles Griot, Alpine Research Optics, and Precision Photonics Corp. for supporting social events at this meeting. They are separately acknowledged in this volume of conference proceedings.

Of course, we are all indebted to Kent Rochford, Division Chief of the Optoelectronics Division, who was the prime contact at NIST, for his continued support and encouragement, and Wendy Ortega, also of NIST, who together made it possible to hold a seamless meeting. On behalf of all the organizers and attendees, we thank them for their tireless efforts.

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Summary of Roundtable Discussion

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A newly established tradition of SPIE Laser Damage is a Roundtable discussion held as a pre-symposium event on Sunday evening during registration. In 2009, the Roundtable discussion was held for the first time with the purpose of intellectual warming up for symposium participants and preparing them for active discussions just before the main event of the meeting. Later, the objectives of this event became broader and included educational aspects for students participating in the symposium. Also, the discussion has become a very good platform for exchange of opinions and determining global trends and challenges in the broad field of laser-induced damage.

This year's discussion was the third event in this line. Topics of all the Roundtable discussions are listed below:

2009 Experimental Identification of Fundamental LID Mechanisms: Techniques, Challenges, and New Approaches
2010 Multiphoton vs. Avalanche Ionization in LID of Transparent Materials
2011 Definition and Measurement of Laser-Induced Damage in Transparent Materials by Single Short Laser Pulse

This year the discussion was moderated by Vitaly Gruzdev (University of Missouri, USA) and Jonathan Arenberg (Northrop Grumman Aerospace Systems, USA). It focused on definition and measurement of laser-induced damage (LID) of transparent materials by single short (nanosecond and shorter) laser pulses, i.e., the issues lying at the very foundation of the symposium. The discussion started with two presentations by the moderators with slightly differing views of how to define laser-induced damage of the transparent materials and how to measure its threshold. The main points for consideration included statistical vs. deterministic nature of LID, statistical variations of LID threshold and their origins, characteristic laser-induced phenomena and effects utilized to detect LID, and approaches to measure LID threshold. Forty-five registered meeting participants attended the discussion from the beginning and seven more joined the group later during the Roundtable discussion.

As previously, the organizers collected feedback from discussion participants in the form of response to 5 questions:

1) How interesting was the Roundtable discussion for you?
2) Was the Roundtable discussion useful and informative for you?
3) Would you participate in Roundtable discussion next year?
4) Were the 2 Opposing Views of value to the discussion? Do you have suggestions for improvements?
5) Do you have new topics to suggest for the next Round Table Discussion?

Summary of the feedback was presented to the International Program Committee during its meeting on Monday evening. This year, responses from 32 participants were obtained (against 16 replies obtained for that event in 2010). They said that the event was successful in general, and most participants considered it interesting and useful (Figs. 1-2). Moreover, most attendees were going to attend a Roundtable discussion in 2012 (Fig. 3).

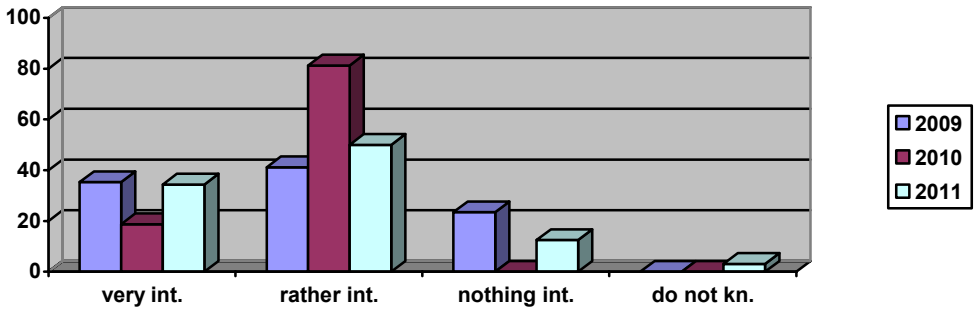

Fig. 1. Distribution of answers to the question "How interesting was the Roundtable discussion for you?" with answer option "very interesting", "rather interesting", "nothing interesting", and "do not know".

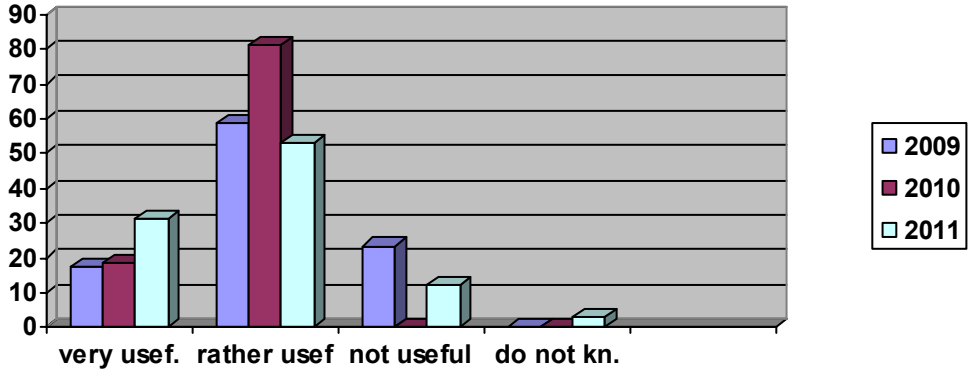

Fig. 2. Distribution of answers to the question "Was the Roundtable discussion useful and informative for you?" with answer option "very useful", "rather useful", "not useful", and "do not know".

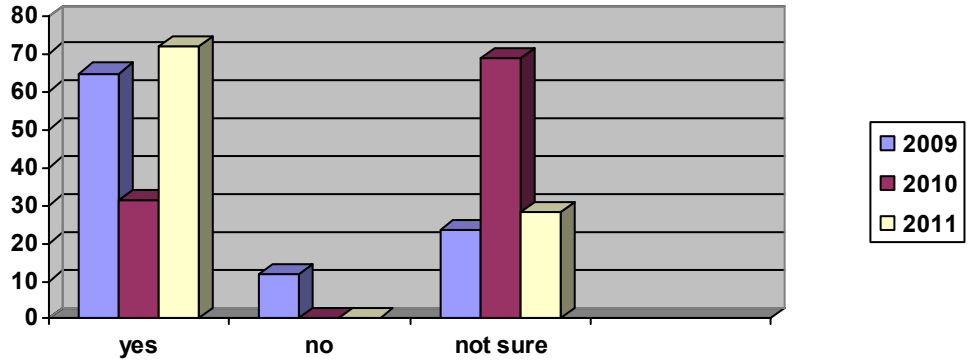

Fig. 3. Distribution of answers to the question "Would you participate in Roundtable discussion next year?" with answer option "yes", "no", and "not sure".

Among critical responses, the most frequent were that the two moderators actually presented significantly correlated and not completely opposing viewpoints. The critical responses were under special consideration by the organizers in order to improve the style and content of Roundtable discussion for 2012. Also, several topics for the discussion were suggested by the participants. Among them, the following three topics:

1) Surface vs. Bulk Laser Damage Mechanisms
2) Effects of Electric-Field Enhancement in Laser Damage
3) How to Make Measurements/Set Standards for Damage Threshold Measurement

collected the most votes and were shifted to a final voting during the meeting. From the list above, the topic "Surface vs. Bulk Laser Damage Mechanisms" was selected by most meeting attendees for the Roundtable discussion in 2012. Stavros Demos and Mike Feit, both from Lawrence Livermore National Lab., United States--kindly agreed to be moderators of the Roundtable discussion in 2012.