

Technical
Program



SPIE 
Boulder Damage

XXXIX Annual Symposium on
**Optical Materials for High
Power Lasers**

24–26 September 2007

National Institute of Standards and Technology
Lobby, Building 1, 325 Broadway
Boulder, Colorado USA



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Conference 6720

Monday-Wednesday 24-26 September 2007
Proceedings of SPIE Vol. 6720

SPIE Boulder Damage

XXXIX Annual Symposium on
Optical Materials for High Power Lasers

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SPIE

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Pacific Northwest National Laboratory

Laser Zentrum Hannover e.V. (Germany)

National Institute of Standards and Technology

**Electromagnetic Remote Sensing Defence Technology
Ctr. (United Kingdom)**

School of Optics: CREOL & FPCE, Univ. of Central Florida

Conference Cochairs:

Gregory J. Exarhos, Pacific Northwest National Lab.;

Arthur H. Guenther, The Univ. of New Mexico; **Keith L.**

Lewis, Electromagnetic Remote Sensing Defence

Technology Ctr. (United Kingdom); **Detlev Ristau**, Laser

Zentrum Hannover e.V. (Germany); **M. J. Soileau**, College of

Optics & Photonics/Univ. of Central Florida; **Christopher J.**

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National Lab.; **Jerry B. Franck**, U.S. Army Night Vision &

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Rochester; **Alan F. Stewart**, The Boeing Co.; **Kunio**

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Standards and Technology

IMPORTANT!

You will need your registration badge to get into the NIST parking lot. Visitors are required to show photo identification upon arrival and must wear a visitor's badge at all times while on the NIST campus.

Sunday 23 September

Registration Material Pick-up and Mixer Sun. 18.00 to 21.00

The Boulder Marriott (Last Year's Hotel)
2660 Canyon Blvd., Boulder

Monday 24 September

Registration Material Pick-up Mon. 07.30 to 08.30

The Courtyard by Marriott Boulder is the Conference Hotel
for 2007 - 4710 Pearl E Circle, Boulder

Poster Placement at NIST . . . Mon. 07.30 to 08.30

Poster authors for the Monday Poster Session are
to set up their posters at this time.

Opening Remarks Mon. 08.30 to 09.00

Chair: **Christopher J. Stolz**,
Lawrence Livermore National Lab.

Tribute to Arthur Guenther Mon. 09.00 to 10.00

09.00: **M. J. Soileau**, College of Optics and Photonics/Univ. of
Central Florida

09.30: **Alexander J. Glass**, KineMed, Inc.

Monday Poster Overview 10.00 to 10.30

*All Fundamental Mechanisms and Surfaces, Mirrors, and Contamina-
tion poster authors are asked to give a 2-minute/2-viewgraph
overview of their posters in the order they appear in the program.*

Poster Session and Refreshment Break Mon. 10.30 to 11.30

SESSION 1 Mon. 11.30 to 12.30

Fundamental Mechanisms I

Chair: **Vitaly E. Gruzdev**, Univ. of Missouri/Columbia

11.30: **Nanospallation induced by a femtosecond pulse** (*Invited
Paper*), S. I. Anisimov, N. I. Lobachevsky State Univ. of Nizhni
Novgorod (Russia); M. B. Agranat, S. I. Ashitkov, Institute for High
Temperatures (Russia); V. V. Zhakhovskii, Osaka Univ. (Japan);
N. A. Inogamov, L.D. Landau Institute for Theoretical Physics
(Russia); K. Nishihara, Osaka Univ. (Japan) [6720-01]

12.10: **Progress in the understanding of fracture related laser
damage of fused silica**, H. Bercegol, P. Grua, J. Morreeuw,
Commissariat à l'Energie Atomique (France) [6720-02]

Lunch Break 12.30 to 14.00

SESSION 2 Mon. 14.00 to 15.40

Fundamental Mechanisms II

Chair: M. J. Soileau,

College of Optics & Photonics/Univ. of Central Florida

14.00: **Photo-ionization of superlattices on dielectric surface by IR radiation**, V. E. Gruzdev, Univ. of Missouri/Columbia . . [6720-03]

14.20: **Does complex absorption behavior leading to conditioning and damage in KDP/DKDP reflect the electronic structure of initiators?**, M. D. Feit, P. P. DeMange, R. A. Negres, A. M. Rubenchik, S. G. Demos, Lawrence Livermore National Lab. [6720-04]

14.40: **A model of laser-induced damage of KDP based on the coupling of statistics and heat transfer**, G. Duchateau, A. D. Dyan, Commissariat à l'Energie Atomique (France) [6720-05]

15.00: **The effect of lattice temperature on surface damage in fused-silica optics**, J. D. Bude, G. M. Guss, M. J. Matthews, Lawrence Livermore National Lab. [6720-06]

15.20: **The role of virtual candidate spaces in the development of new optical materials**, K. F. Ferris, B. M. Webb-Robertson, Pacific Northwest National Lab.; D. Jones, Proximate Technogeis, LLC [6720-73]

Poster Session and Refreshment Break . . 15.40 to 16.40

SESSION 3 Mon. 16.40 to 17.40

Surfaces, Mirrors, and Contamination I

Chair: James E. Andrew, AWE plc (United Kingdom)

16.40: **James Webb Space Telescope: a large deployable cryogenic telescope in space** (*Invited Paper*), P. A. Lightsey, Ball Aerospace & Technologies Corp. [6720-22]

17.20: **Effects of wavelengths combination on initiation and growth of laser-induced surface damage in SiO₂**, L. Lemaignère, Commissariat à l'Energie Atomique (France); S. Reyné, Univ. d'Orléans (France); M. Loiseau, J. Poncetta, H. Bercegol, Commissariat à l'Energie Atomique (France) [6720-23]

Alpine Optics Open House and Reception at Alpine Research Optics

Mon. 18.30 to 19.30

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Laser-Induced Damage in Optical Materials: 2007

Co-Chairs: Gregory J. Exarhos, Pacific Northwest National Lab.; **Arthur H. Guenther**, The Univ. of New Mexico; **Keith L. Lewis**, Electromagnetic Remote Sensing Defence Technology Ctr. (United Kingdom); **Detlev Ristau**, Laser Zentrum Hannover e.V. (Germany); **M. J. Soileau**, College of Optics & Photonics/Univ. of Central Florida; **Christopher J. Stolz**, Lawrence Livermore National Lab.

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Posters-Monday

Room 1 Mon.10.30 to 11.30 and 15.40 to 16.40

Fundamental Mechanisms & Surface, Mirrors, and Contamination

Revealing the salient properties of KDP/DKDP bulk damage precursors, S. G. Demos, R. A. Negres, P. P. DeMange, M. D. Feit, Lawrence Livermore National Lab. [6720-08]

The exponential fitting of laser damage threshold and analyses of testing errors, D. Li, J. Shao, Y. Zhao, K. Yi, H. Qi, Shanghai Institute of Optics and Fine Mechanics (China) [6720-09]

Experimental and theoretical studies of subpicosecond laser damage in $Ti_xSi_{1-x}O_2$ composite films, D. N. Nguyen, I. Cravetchi, W. G. Rudolph, The Univ. of New Mexico; M. Jupe, M. Lappschies, K. Starke, D. Ristau, Laser Zentrum Hannover e.V. (Germany) [6720-10]

Preliminary results on mitigation of KDP surface damage using the ball-dimpling method, F. P. Guillet, B. Bertussi, L. Lamaignere, X. Leborgne, B. Minot, Commissariat à l'Energie Atomique (France) [6720-11]

Effect of laser pulse duration on damage to metal mirrors for laser IFE, J. E. Pulsifer, M. S. Tillack, Univ. of California/San Diego [6720-12]

Downstream intensification and optical damage caused by CO_2 mitigation of fused silica, M. J. Matthews, I. L. Bass, G. M. Guss, C. C. Widmayer, M. A. Johnson, Lawrence Livermore National Lab. [6720-13]

Posters-Monday

Room 2 10.30 to 11.30 and 15.40 to 16.40

Fundamental Mechanisms & Surface, Mirrors, and Contamination

Thermal mechanism of laser-induced damages in KDP crystals, S. Audrey, L. Sebastien, G. Francois, M. Benoit, D. Damiani, Commissariat à l'Energie Atomique (France); F. Gervais, Ctr. National de la Recherche Scientifique [6720-14]

Revisiting mechanisms of molecular contamination-induced laser optic damage, J. S. Canham, Swales Aerospace . . [6720-15]

Study of mechanical defects on silica samples under laser irradiation at 355 nm, S. Palmier, M. A. Josse, H. Bercegol, R. Courchinoux, L. Lamaignère, J. Rullier, B. Bertussi, Commissariat à l'Energie Atomique (France) [6720-16]

Optimizing a cleaning process for multilayer dielectric (MLD) diffraction gratings, B. Ashe, C. Giacofei, G. Myhre, A. W. Schmid, Univ. of Rochester; D. Smith, Plymouth Grating Lab Inc. . . [6720-17]

Studies on thin films as short pulse laser debris shields, J. Schwarz, P. K. Rambo, M. Geissel, D. Headley, M. Ramsey, B. T. Do, A. V. Smith, B. W. Atherton, Sandia National Labs. [6720-18]

Damage thresholds and morphology of the front- and back-irradiated SiO_2 thin films containing gold nanoparticles as artificial absorbing defects, S. Papernov, A. W. Schmid, J. B. Oliver, A. L. Rigatti, Univ. of Rochester [6720-19]

Effect of instrumental response time in exponential-decay-based cavity ring-down techniques for high reflectivity, Y. Gong, B. Li, Institute of Optics and Electronics (China) [6720-20]

Photothermal detuning technique for absorption measurement of optical thin films, H. Hao, B. Li, M. Liu, Institute of Optics and Electronics (China) [6720-21]

Tuesday 25 September

Poster Placement at NIST . . . Tues. 07.30 to 08.30

Poster authors for the Tuesday Poster Session are to set up their posters at this time.

SESSION 4 Tues. 08.40 to 10.20

Surfaces, Mirrors, and Contamination II

Chair: Gregory J. Exarhos, Pacific Northwest National Lab.

08.40: **Extended lifetime of fluoride optics**, J. Wang, H. Schreiber, Corning Tropol Corp. [6720-24]

09.00: **Growth of laser damage in fused silica: diameter to depth ratio**, M. A. Norton, J. J. Adams, W. Carr, E. E. Donohue, M. D. Feit, R. P. Hackel, W. G. Hollingsworth, J. A. Jarboe, M. J. Matthews, A. M. Rubenchik, M. L. Spaeth, Lawrence Livermore National Lab. [6720-25]

09.20: **Fluorescence monitoring of organic and inorganic deposits**, W. Riede, H. Schröder, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); D. Wernham, Y. Lien, S. Becker, European Space Research and Technology Ctr. (Netherlands) [6720-26]

09.40: **Operational experience of contamination and damage of the larger aperture optics in the HELEN laser facility vacuum system at 1053 and 527 nanometres**, J. E. Andrew, M. Girling, N. C. Honiatt, D. Scott, P. Wallace, AWE plc (United Kingdom) [6720-27]

10.00: **Damage characteristics at optical fiber connection for high-power light transmission**, S. Matsuda, T. Shibuya, M. Wakaki, Tokai Univ. (Japan) [6720-28]

Tuesday Poster Overview . . . Tues. 10.00 to 10.30

All Thin Film and Materials and Measurements poster authors are asked to give 2-minute/2-viewgraph overviews of their posters in the order they appear in the program.

Poster Session and Refreshment Break . . 10.30 to 11.30

SESSION 5 Tues. 11.30 to 12.30

Thin Films I

Chair: Leonid B. Glebov,

College of Optics & Photonics/Univ. of Central Florida

11.30: **Search for subtle laser damage of IBS films from long-duration exposure to 1064 nm, Q-switched laser radiation (Invited Paper)**, A. D. Streater, D. C. Ness, Research Electro-Optics, Inc. [6720-29]

12.10: **Laser damage of silica and hafnia thin films made by different deposition technologies**, L. Gallais, J. Capoulade, A. Ciapponi, F. R. Wagner, J. Natoli, M. Commandré, M. Cathelinaud, C. Koc, M. Lequime, C. Amra, Institut Fresnel (France) . . . [6720-30]

Lunch Break 12.30 to 14.00

SESSION 6 Tues. 14.00 to 15.00

Thin Films II

Chair: Brian E. Newnam, Los Alamos National Lab. (ret.)

14.00: **Performance enhancement of ion-beam sputtered oxide coatings for 193 nm**, H. Blaschke, M. Lappschies, D. Ristau, Laser Zentrum Hannover e.V. (Germany) [6720-31]

14.20: **Mixed oxide coatings for advanced fs-laser applications**, M. Jupé, L. Jensen, K. Starke, D. Ristau, Laser Zentrum Hannover e.V. (Germany); A. Melninkaitis, V. Sirutkaitis, Vilnius Univ. (Lithuania) [6720-32]

14.40: **Effect of electric-field distribution on the laser damage probability curves of multilayer coatings**, H. T. Krol, CILAS Marseille (France); C. Amra, Institut Fresnel (France); C. M. Grèzes-Besset, CILAS Marseille (France); M. Commandré, Institut Fresnel (France) [6720-33]

Poster Session and Refreshment Break . . 15.00 to 16.00

SESSION 7 Tues. 16.00 to 17.40

Materials and Measurements I

Chair: Hervé Bercegol, CEA Cesta (France)

16.00: **Final optics damage inspection for the National Ignition Facility (Invited Paper)**, S. G. Azevedo, A. D. Conder, J. J. Chang, W. H. Williams, M. L. Spaeth, J. A. Liebman, P. K. Whitman, M. C. Nostrand, L. M. Kegelmeyer, S. M. Glenn, Lawrence Livermore National Lab. [6720-49]

16.40: **Measurement of initial absorption of fused silica at 193 nm using laser induced deflection technique (LID)**, D. Schönfeld, U. Klett, Sr., Heraeus Quarzglas GmbH and Co. (Germany); C. Mühlig, Institut für Photonische Technologien e.V. (Germany); S. Thomas, Heraeus Quarzglas GmbH and Co. (Germany) [6720-50]

17.00: **The relationship between laser fluence profile and measured damage threshold**, J. W. Arenberg, Northrop Grumman Space Technology [6720-51]

17.20: **Effect of S and P polarization on single-layer homogeneous model**, U. Singh, A. Kapoor, Univ. of Delhi (India) [6720-52]

Wine and Cheese Reception at NCAR

Tues. 18.00 to 19.30

Posters-Tuesday

Room: 1 Tues. 10.30 to 11.30 and 15.00 to 16.00

Thin Films & Materials and Measurements

Laser-induced damage of multilayer high-reflectance coatings for 248 nm, H. Qi, Shanghai Institute of Optics and Fine Mechanics (China) and China Institute of Atomic Energy (China); K. Yi, H. Yu, Y. Cui, D. Li, Shanghai Institute of Optics and Fine Mechanics (China); Z. Gao, China Institute of Atomic Energy (China); J. Shao, Z. Fan, Shanghai Institute of Optics and Fine Mechanics (China) [6720-34]

Influence of process conditions on the optical properties of HfO₂/SiO₂ coatings for high-power lasers, K. Hsiao, J. B. Rodriguez, E. M. Krous, D. Patel, D. A. Alessi, E. Granados, Y. Wang, J. J. G. Rocca, C. S. Menoni, Colorado State Univ.; P. Langston, Naval Air Warfare Ctr.; A. A. Ogloza, Naval Air Warfare Ctr. (Afghanistan) [6720-35]

- Influence of electric-field distribution on laser-induced damage threshold and morphology of high-reflectance optical coatings**, R. Buzelis, G. Abromavicius, R. Drazdys, Fizikos Institutas (Lithuania); A. Melninkaitis, V. Sirutkaitis, Vilnius Univ. (Lithuania) [6720-36]
- Short pulse laser damage measurements of pulse compression gratings for petawatt laser**, G. Raze, J. Néauport, G. Dupuy, E. Lavastre, G. Mennerat, Commissariat à l'Energie Atomique (France) [6720-38]
- Fabrication of ceramic YAG composite with Nd gradient structure**, T. Kamimura, Y. Kawaguchi, Osaka Institute of Technology (Japan); T. Okamoto, Okamoto Optics Works, Inc. (Japan); Y. Lin Aung, A. Ikesue, World Lab Co., Ltd. (Japan) [6720-39]
- 248-nm high-fluence irradiation of CaF₂ crystals**, A. Burkert, Institut für Photonische Technologien e.V. (Germany); D. Keutel, U. Natura, SCHOTT Lithotec AG (Germany) [6720-40]
- Comparison of ns and sub-ns laser conditioning of KDP and DKDP crystals for high-power lasers**, C. Maunier, B. Bertussi, D. Damiani, T. Donval, G. Duchateau, A. D. Dyan, L. Lamaignère, X. Leborgne, M. Loiseau, G. Gaborit, H. Mathis, G. Raze, Commissariat à l'Energie Atomique (France) [6720-42]

Posters–Tuesday

Room: 2 Tues. 10.30 to 11.30 and 15.00 to 16.00

Thin Films & Materials and Measurements

- Comparison of Gaussian and top-hat beam profiles in LIDT testing**, L. Jensen, M. Jupé, K. Starke, D. Ristau, Laser Zentrum Hannover e.V. (Germany); W. Riede, P. Allenspacher, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) [6720-43]
- Laser damage metrology in biaxial nonlinear crystals using focused test beams**, A. Hildenbrand, F. R. Wagner, H. Akhouayri, J. Natoli, M. Commandré, Institut Fresnel (France) [6720-44]
- Comparative studies of laser-induced damage threshold measurements in highly reflecting mirrors**, A. Melninkaitis, D. Mikays, R. Grigonis, Vilnius Univ. (Lithuania); M. Jupé, D. Ristau, Laser Zentrum Hannover e.V. (Germany); V. Sirutkaitis, Vilnius Univ. (Lithuania) [6720-45]
- Optical damage threshold of silicon for ultrafast infrared pulses**, B. Cowan, Tech-X Corp. [6720-46]
- Measurements of damage and nonlinear thresholds for large-core multimode optical fibers**, S. Motokoshi, T. Higashizawa, Osaka Univ. (Japan); M. Yoshida, Kinki Univ. (Japan); H. Yoshida, T. Jitsuno, Osaka Univ. (Japan) [6720-47]
- Scaling in damage of optical materials by intensive laser radiation**, E. K. Maldutis, The General Jonas Zemaitis Military Academy of Lithuania (Lithuania) [6720-48]
- Analysis of output surface damage resulting from single 351-nm, 3-ns pulses on sub-nanosecond laser conditioned KD₂PO₄ crystals**, J. A. Jarboe, J. J. Adams, Lawrence Livermore National Lab. [6720-57]
- A novel photo-thermal setup for evaluation of absorptance losses and thermal wavefront deformations in DUV optics**, K. Mann, A. Bayer, T. Miege, V. Leinhos B. Schäfer, Laser-Lab. Göttingen e.V. (Germany) [6720-72]

Wednesday 26 September

SESSION 8 Wed. 08.30 to 10.10

Materials and Measurements II

Chair: Christopher J. Stolz,

Lawrence Livermore National Lab.

08.30: Comparison between S/1 and R/1 tests and Rho(Φ) results for unconditioned and subnanosecond laser conditioned KD₂PO₄ crystals, J. J. Adams, J. A. Jarboe, M. D. Feit, Lawrence Livermore National Lab. [6720-53]

08.50: Laser damage investigation in KTiOPO₄ (KTP) and RbTiOPO₄ (RTP) crystals: threshold anisotropy and the influence of SHG, F. R. Wagner, A. Hildenbrand, J. Natoli, M. Commandre, Institut Fresnel (France); F. Theodore, H. Albrecht, Cristal Laser S.A. (France) [6720-54]

09.10: Effect of random clustering on surface damage density estimates, M. J. Matthews, M. D. Feit, Lawrence Livermore National Lab. [6720-55]

09.30: Influence of laser beam size and wavelength in the determination of LIDT and associated laser damage precursor densities in KH₂PO₄, J. Natoli, J. Capoulade, Institut Fresnel (France); B. Bertussi, X. Leborgne, D. Damiani, H. Piombini, Commissariat à l'Énergie Atomique (France) [6720-56]

09.50: Study of defects in artificially grown calcium fluoride, M. Azumi, Nikon Corp. (Japan) [6720-71]

Refreshment Break 10.10 to 10.30

SESSION 9 Wed. 10.30 to 12.10

Materials and Measurements III

Chair: Jerry B. Franck,

U.S. Army Night Vision & Electronic Sensors Directorate

10.30: Coherent and incoherent damage of carbon nanotubes, K. E. Hurst, National Institute of Standards and Technology; G. Singh, Univ. of Colorado at Boulder; A. C. Dillon, National Renewable Energy Lab.; L. K. Roberson, National Institute of Standards and Technology; R. L. Mahajan, Virginia Polytechnic Institute and State Univ.; J. H. Lehman, National Institute of Standards and Technology [6720-58]

10.50: Raman spectroscopy of carbon nanotube coatings upon infrared laser damage, K. Ramadurai, Univ. of Colorado at Boulder; L. K. Roberson, C. L. Cromer, K. E. Hurst, National Institute of Standards and Technology; R. L. Mahajan, Virginia Polytechnic Institute and State Univ.; J. H. Lehman, National Institute of Standards and Technology [6720-59]

11.10: Pump and probe damage testing for investigation of transient material modifications associated with laser damage in optical materials, R. A. Negres, M. D. Feit, S. G. Demos, Lawrence Livermore National Lab. [6720-37]

11.30: Broadband wavelength tuneable laser calorimetric absorptance measurements, L. Jensen, I. Balasa, K. Starke, D. Ristau, Laser Zentrum Hannover e.V. (Germany) [6720-61]

11.50: Selective extinction of specular and scattered light in optical substrates and coatings, C. Amra, C. Deumié-Raviol, G. Georges, L. Arnaud, M. Zerrad, Institut Fresnel (France); C. M. Grèzes-Besset, CILAS Marseille (France); F. Chazallet, Shaktiware (France) [6720-65]

Lunch Break 12.10 to 14.00

SESSION 10 Wed. 14.00 to 15.40

Materials and Measurements IV

Chair: Gregory J. Exarhos, Pacific Northwest National Lab.

14.00: Adhesion of a halogenide plate to optical elements providing antireflection and thermal resistance properties for high-power laser, M. Murahara, Tokai Univ. (Japan); Y. Sato, T. Funatsu, Tokyo Institute of Technology (Japan); Y. Okamoto, Okamoto Optic Co. (Japan) [6720-63]

14.20: High-resolution 3D imaging of surface damage sites in fused silica with optical coherence tomography, G. M. Guss, I. L. Bass, R. P. Hackel, C. Mailhot, S. G. Demos, Lawrence Livermore National Lab. [6720-64]

14.40: Interferometric phase-surface analyzer with an adjustable reference wave, F. Segueineau, V. Beau, J. Rullier, Commissariat à l'Energie Atomique (France) [6720-66]

15.00: The effect of plasma scald from large aperture raster scanning of NIF transport mirrors on down-stream beam modulation, J. R. Schmidt, M. J. Runkel, C. J. Stolz, Lawrence Livermore National Lab. [6720-67]

15.20: High laser-damage threshold surface relief microstructures for antireflection and laser cavity mirror applications, D. S. Hobbs, B. D. MacLeod, TelAztec LLC [6720-68]

Refreshment Break 15.40 to 16.00

SESSION 11 Wed. 16.00 to 16.40

Mini Symposium: Lifetime Issues for CW and Quasi CW Lasers

Chair: Michelle D. Shinn, Thomas Jefferson National Accelerator Facility

16.00: Operation of the Jefferson Laboratory free-electron laser at high irradiances, M. D. Shinn, S. V. Benson, D. Douglas, P. Evtushenko, C. Gould, J. Gubeli III, D. Hardy, K. Jordan, G. R. Neil, D. W. Sexton, S. Zhang, Thomas Jefferson National Accelerator Facility . [6720-69]

16.20: Optical damage observed in the LHME II laser output coupler, J. J. Eric, Air Force Research Lab.; J. O. Bagford, F. R. Hull, D. B. Seibert II, General Dynamics Information Technology [6720-70]

Closing Remarks Wed. 16.40 to 16.45

Tuesday Coffee Break Sponsored by:



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SPIE Boulder Damage Conference Room Rate is \$119. (plus tax)

2006 Award Winners

2006 Best Oral Presentation

Optical characterization in laser damage studies (*Invited Paper*), Mireille Commandré, Jean-Yves Natoli, Laurent Gallais, Frank R. Wagner, Claude Amra, Institut Fresnel (France) [6403-62]

2006 Best Poster Presentation

Mitigation of growth of laser initiated surface damage in fused silica using a 4.6 mm wavelength laser, Gabe M. Guss, Lawrence Livermore National Lab. [6403-27]

Questions?

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SPIE would like to express its deepest appreciation to the co-chairs, program committee, and session chairs who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members.

This program is based on commitments received up to the time of publication and is subject to change without notice.

SPIE's Event Manager for this symposium is Bobbie Lively. For information about the technical program, email: meetinginfo@spie.org.

Left Cover Photo: **Courtesy of Oak Ridge National Laboratory**. John Budai of Solid State Division uses an X-ray diffractometer to analyze the structure of substrates and thin films for superconductors. He first demonstrated that rolled pieces of silver or other metals could provide sufficient texture to increase the superconductivity of an overlying film of yttrium-barium-copper-oxide, a high-temperature superconductor, and proposed that this approach would work for other metals. (ORNL Photo by Tom Cerniglio)