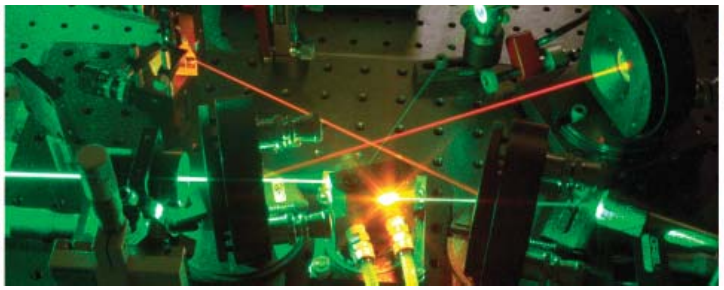
Technical Program

SPIE High-Power Laser Ablation

Conference: 20–24 April 2008

Sagebrush Inn
Taos, New Mexico, USA


SPIE
Connecting minds. Advancing light.

Technical Program

SPIE High-Power Laser Ablation

Conference: 20–24 April 2008

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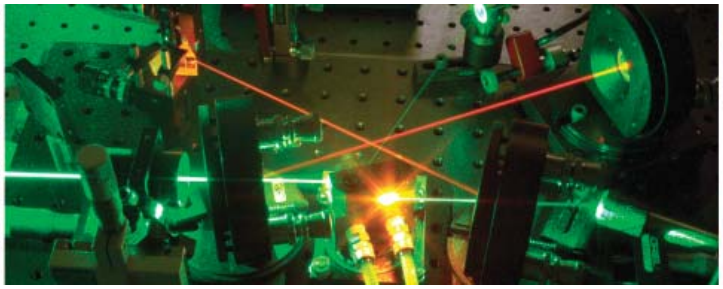


The conference is dedicated to the memory of Arthur Guenther.

Art Guenther
1931–2007

SPIE and the organizers gratefully acknowledge Photonic Associates, LLC for its sponsorship of this event.

Left cover image: **Courtesy of Georgia Tech, Photo: Gary Meek.** CardioMEMS engineer Michael Fonseca uses a laser to separate pressure sensors in the company's clean room facility in the ATDC Biosciences Center located at Georgia Tech's Environmental Science and Technology Building. *Middle cover image:* **Courtesy of Jefferson Lab.** Source lab laser test setup.

Conference Chair:
Claude R. Phipps, Photonic Associates, LLC

Program Committee:
Sergey Anisimov, Landau Institute for Theoretical Physics (Russia)
V. Apollonov, General Physics Institute (Russia)
Michel Autric, Univ. de la Méditerranée (France)
Dieter Bäuerle, Johannes Kepler Univ. Linz (Austria)
Willy Bohn, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)
Boris Chichkov, Laser Zentrum Hannover e.V. (Germany)
Gordon Hager, Air Force Research Lab.
Richard Haglund, Vanderbilt Univ.
Victor Hasson, Trex Enterprises Corp.
Andrey Ionin, P.N. Lebedev Physical Institute (Russia)
Michael Lander, General Dynamics Information Technology
Thomas Lippert, Paul Scherrer Institut (Switzerland)
Boris Luk'yanchuk, Data Storage Institute (Singapore)
Max Michaelis, Univ. of KwaZulu-Natal (South Africa)
Minoru Obara, Keio Univ. (Japan)
Dennis Paisley, Los Alamos National Lab.
James Reilly, Northeast Science and Technology
Klaus Sokolowski-Tinten, Univ. Duisburg-Essen (Germany)
Michael Tribelsky, Moscow Institute of Electrical Engineering and Technical Univ. (Russia)

Note: All events are located in the Chamisa Ballroom I except as noted below.

Sunday 20 April	Monday 21 April	Tuesday 22 April	Wednesday 23 April	Thursday 24 April
Early Registration, Conference Center Lobby, 6:00 to 8:00 pm	**Introductory Remarks,** 7:30 to 7:45 am	*Session 6:* **Short Pulse Laser Matter Interactions III,** 7:30 am	*Session 11:* **PLD, MAPLE and Processing of Advanced Materials,** 7:30 am	*Session 15:* **Physics of Laser Matter Interactions,** 7:30 am
Welcome Reception, Chamisa Ballroom II, 6:00 to 8:00 pm	**Dedication to Arthur Guenther,** 7:45 am	*Session 7:* **Nanoscale Physics and Structures,** 9:15 am	*Session 12:* **High Power Lasers Applications and Diagnostics,** 9:55 am	*Session 16:* **Laser Space Propulsion II,** 9:15 am
	Session 1: **Keynote I,** 7:55 am	*Session 8:* **Novel Applications in Physics and Electronics,** 12:50 pm	*Session 13:* **COIL, DOIL, EOIL and Other Unusual Sources,** 1:50 pm	*Session 17:* **DPALS I,** 10:25 am
	Session 2: **Short Pulse Laser Matter Interactions I,** 8:50 am	*Session 9:* **Laser Space Propulsion,** 2:45 pm	*Session 14:* **Optically Pumped Lasers,** 4:10 pm	*Session 18:* **DPALS II,** 1:40 pm
	Monday Luncheon, 11:35 to 12:45 pm	*Session 10:* **Laser Driven Flyers and Laser Cleaning,** 4:25 pm	**Conference Dinner and Awards Ceremony,** 7:00 to 10:00 pm	*Session 19:* **DPALS III,** 3:00 pm
	Session 3: **Materials Modification and Processing with Ultrashort Pulses,** 12:45 pm	**Posters,** 8:00 to 10:00 pm		**Final Remarks**, 4:05 to 4:15 pm
	Session 4: **Keynote II,** 3:10 to 3:55 pm			
	Session 5: **Short Pulse Laser Matter Interactions II,** 3:55 pm			
	Posters, 8:00 to 10:00 pm			

SPIE welcomes new Fellow

Edward I. Moses,
Lawrence Livermore National Lab.

Registration

Conference Center Lobby

Sunday . . . . . .6:00 to 8:00 pm
Monday . . . . . .7:00 am to 4:00 pm
Tuesday . . . . . .7:15 am to 4:00 pm
Wednesday . . . . . .7:15 am to 4:00 pm
Thursday . . . . . .7:15 am to 4:00 pm

Sunday Evening Welcome Reception and Registration

Conference Center Lobby and Chamisa Ballroom II

Sunday . . . . . .6:00 to 8:00 pm

A welcome reception for conference attendees will be held Sunday night from 6:00 to 8:00 pm in the Chamisa Ballroom II at the Sagebrush Inn and Convention Center. Attendees should first visit the registration desk in the conference lobby to pick up badges and reception tickets. This reception is included in your registration fee. Guests may accompany a registered attendee by purchasing a guest Welcome Reception and Conference Dinner ticket for $60.00 per person. Purchase ticket before reception at SPIE Registration Desk.

Monday Luncheon

Chamisa Ballroom II

Monday . . . . . 11:50 to 1:00 pm

A complimentary welcome luncheon for technical attendees only will be held Monday. Attendees should make their own luncheon arrangements on subsequent days.

Poster Sessions

Chamisa Ballroom II

Monday and Tuesday . . . . . .8:00 to 10:00 pm

Technical attendees are encouraged to view the high-quality papers presented in this interactive format. Authors will be present at their posters to discuss them with session attendees. Light snacks and beverages will be served. All participants are requested to wear their conference badges while attending these sessions.

Poster authors: You may set up your poster after 10:00 am on the day of your assigned poster session. Posters must be removed at the end of the session. Posters left on the boards after the session will be discarded.

Wednesday Conference Dinner and Best Paper Awards

Chamisa Ballroom II

Wednesday . . . . . 7:00 to 10:00 pm

This dinner is included in your registration fee. Guests may accompany a registered attendee for $60.00 per person. Guest tickets may be purchased before Tuesday noon at the SPIE Registration Desk.

Event of related interest

6th International Conference on

Photo-Excited Processes and Applications (ICPEPA6)

9-12 September 2008

http://www.icpepa6.com

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Conference 7005

Sunday-Thursday 20-24 April 2008 • Proceedings of SPIE Vol. 7005

High-Power Laser Ablation VII

Conference Chair: **Claude R. Phipps,** Photonic Associates, LLC

Program Committee: **Serguey I. Anisimov,** Landau Inst for Theoretical Physics (Russia); **V. V. Apollonov,** General Physics Institute (Russia); **Michel L. Autric,** Univ. de la Méditerranée (France); **Dieter Bäuerle,** Johannes Kepler Univ. Linz (Austria); **Willy L. Bohn,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Boris N. Chichkov,** Laser Zentrum Hannover e.V. (Germany); **Gordon D. Hager,** Air Force Research Lab.; **Richard F. Haglund, Jr.,** Vanderbilt Univ.; **Victor H. Hasson,** Trex Enterprises Corp.; **Andrey A. Ionin,** P.N. Lebedev Physical Institute (Russia); **Michael L. Lander,** General Dynamics Information Technology; **Thomas K. M. Lippert,** Paul Scherrer Institut (Switzerland); **Boris S. Luk'yanchuk,** Data Storage Institute (Singapore); **Max M. Michaelis,** Univ. of KwaZulu-Natal (South Africa); **Minoru Obara,** Keio Univ. (Japan); **Dennis L. Paisley,** Los Alamos National Lab.; **James P. Reilly,** Northeast Science and Technology; **Klaus Sokolowski-Tinten,** Univ. Duisburg-Essen (Germany); **Michael I. Tribelsky,** Moscow Institute of Electrical Engineering and Technical Univ. (Russia)

Monday 21 April

Chamisa Ballroom I . . . . . Mon. 7:30 am

Introductory Remarks

Claude R. Phipps, Photonic Associates, LLC

Chamisa Ballroom I . . . . . Mon. 7:45 am

Dedication to Arthur Guenther

William Pete Latham, Air Force Research Lab.

SESSION 1

Chamisa Ballroom I . . . . . Mon. 7:55 to 8:35 am

Keynote I

Session Chair: **Claude R. Phipps,** Photonic Associates, LLC

7:55 am: **High speed high precision ablation from ms to fs** *(Invited Paper)*, Reinhart Poprawe, Arnold Gillner, Fraunhofer-Institut für Lasertechnik Germany) . . . . . [7005-02]

Coffee Break . . . . . 8:35 to 8:50 am

SESSION 2

Chamisa Ballroom I . . . . . Mon. 8:50 to 11:35 am

Short Pulse Laser Matter Interactions I

Session Chair: **Klaus Sokolowski-Tinten,** Univ. Duisburg-Essen (Germany)

8:50 am: **Experimental and theoretical studies of carrier dependent lattice stability in semiconductors** *(Invited Paper)*, Kelly J. Gaffney, Stanford Linear Accelerator Ctr.; Patrick B. Hillyard, Stanford Univ.; Aaron M. Lindenberg, Stanford Linear Accelerator Ctr.; David A. Reis, Univ. of Michigan . . . [7005-03]

9:15 am: **Femtosecond x-ray diffuse scattering measurements of semiconductor ablation dynamics** *(Invited Paper)*, Aaron Lindenberg, Stanford Univ. and Stanford Linear Accelerator Ctr.; Simon Engemann, Kelly J. Gaffney, Stanford Linear Accelerator Ctr.; Klaus Sokolowski-Tinten, Univ. Duisburg-Essen (Germany); Jorgen Larsson, Lunds Univ. (Sweden); David Reis, Univ. of Michigan; Jerome B. Hastings, Stanford Linear Accelerator Ctr. . . . . [7005-04]

9:40 am: **Femtosecond coherent imaging with a free electron laser: x-ray snapshots of nanoscale transient phenomena** *(Invited Paper)*, Anton Barty, Lawrence Livermore National Lab. . . . . [7005-05]

10:05 am: **Ultrashort pulse lasers applied to propulsion/control in space- and atmospheric flight** *(Invited Paper)*, Kevin Kremeyer, Physics, Materials and Applied Mathematics Research, L.L.C. . . . . [7005-06]

10:30 am: **Ultrafast laser irradiation vs cluster ion impact: molecular-dynamics comparison of materials processes in highly energized solids** *(Invited Paper)*, Herbert M. Urbassek, Technische Univ. Kaiserslautern (Germany) . . . . . [7005-07]

10:55 am: **Implementation of kinetics of phase transitions into hydrocode for simulation of laser ablation**, Mikhail Povarnitsyn, Konstantin Khishchenko, Pavel Levashov, Joint Institute for High Temperatures (Russia) . . . . . [7005-08]

11:10 am: **Nonlinear ultrafast femtosecond X-waves** *(Invited Paper)*, Jerome V. Moloney, Miroslav Kolesik, College of Optical Sciences/The Univ. of Arizona. . . . . [7005-15]

Chamisa Ballroom II . . . . . 11:35 am to 12:45 pm

Welcome Luncheon

SESSION 3

Chamisa Ballroom I . . . . . Mon. 12:45 to 2:40 pm

Materials Modification and Processing with Ultrashort Pulses

Session Chair: **Minoru Obara,** Keio Univ. (Japan)

12:45 pm: **Fundamental issues of material removal by laser irradiation at sub-threshold fluences: insulating (wide bandgap) materials** *(Invited Paper)*, J. Thomas Dickinson, Washington State Univ. . . . . [7005-09]

1:10 pm: **Theoretical models of laser-induced ionization of transparent materials: challenges and recent improvements** *(Invited Paper)*, Vitaly E. Gruzdev, Univ. of Missouri/Columbia . . . . . [7005-10]

1:35 pm: **Charging and plasma effects under ultrashort pulsed laser ablation** *(Invited Paper)*, Nadezhda M. Bulgakova, Alexander V. Bulgakov, Institute of Thermophysics (Russia); Vladimir P. Zhukov, Institute of Computational Technologies (Russia); Wladimir I. Marine, Univ. de la Méditerranée (France); Anatoliy Y. Vorobyev, Chunlei Guo, Univ. of Rochester . . . . . [7005-11]

2:00 pm: **High speed scribing of FPD panels by use of high repetition** *(Invited Paper)*, Masanao Kamata, Sugio Wako, Tomohiro Imahoko, Norihiro Inoue, Tetsumi Sumiyoshi, Hitoshi Sekita, Cyber Laser Inc. (Japan). . . . . [7005-12]

2:25 pm: **Fabrication of microfluidic networks using a high power femtosecond fiber laser**, Lawrence Shah, IMRA America, Inc.; DongHyuck Kam, Jyotirmoy Mazumder, Univ. of Michigan . . . . . [7005-109]

Coffee Break . . . . . 2:40 to 3:10 pm

Chamisa Ballroom I . . . . . Mon. 3:10 to 3:55 pm

Keynote II

Session Chair: **Claude R. Phipps,** Photonic Associates, LLC

SPIE Fellow Presentation

3:10 pm: **Multi-MegaJoule NIF** *(Invited Paper),* Edward I. Moses, Lawrence Livermore National Lab. . . . . [7005-01]

SESSION 5

Chamisa Ballroom I . . . . . Mon. 3:55 to 5:35 pm

Short Pulse Laser Matter Interactions II

Session Chair: **William Pete Latham,** Air Force Research Lab.

3:55 pm: **On the mechanism of resonant infrared polymer ablation: the case of polystyrene** *(Invited Paper)*, Richard F. Haglund, Jr., Stephen L. Johnson, Vanderbilt Univ.; Daniel M. Bubb, Rutgers Univ.; Kannatessen Appavoo, Berea College . . . . . [7005-16]

4:20 pm: **Transient structures at laser-excited surfaces studied with fs-XUV-scattering**, Klaus Sokolowski-Tinten, Univ. Duisburg-Essen (Germany) . . . . . [7005-17]

4:35 pm: **Ultrafast laser ablation-based "green" synthesis of non-toxic nanoparticles in aqueous solutions**, Andrei V. Kabashin, Sebastien Besner, Michel Meunier, Ecole Polytechnique de Montréal (Canada); Francoise M. Winnik, Univ. de Montréal (Canada) . . . . . [7005-18]

4:50 pm: **Correlation between early-stage expansion and spectral emission of a nanosecond laser-induced plasma from an organic material**, Matthieu Baudelet, Myriam Boueri, Jin Yu, Univ. Claude Bernard Lyon 1 (France); Samuel S. Mao, Xianglei Mao, Rick E. Russo, Lawrence Berkeley National Lab.[7005-19]

5:05 pm: **Energy coupling and material removal from metallic surfaces irradiated by temporally-shaped and ultrashort laser pulses**, Jean-Philippe Colombier, Razvan Stoian, Eric Audouard, Univ. Jean Monnet Saint-Etienne (France); Patrick Combis, Commissariat a l'Energie Atomique (France); Arkadi Rosenfeld, Ingolf V. Hertel, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany) . . . . . [7005-90]

5:20 pm: **Formation of grooves in SiO_2 coated silicon using femtosecond Ytterbium DPSS laser,** Andrius Melninkaitis, Valdemaras Juzumas, Tadas Balciunas, Valdas Sirutkaitis, Vilnius Univ. (Lithuania); Julius Janušonis, Mokslininku Sajungos Institutas (Lithuania); Gintas Šlekys, Altechna Co. Ltd. (Lithuania) . . . . . [7005-21]

Chamisa Ballroom II . . . . . Mon. 8:00 to 10:00 pm

Posters-Monday

Attendees are encouraged to view the high-quality papers presented in this interactive format. Authors will be present at their posters to discuss them with session attendees. Light snacks and beverages will be served. All participants are requested to wear their conferences badges while attending these sessions.

Poster authors: You may set up your poster after 10:00 am on Monday. Posters must be removed at the end of each session. Posters left on the boards after the sessions will be discarded.

Pulsed laser cleaning of aluminium alloys: effects of surface modifications on adhesion, Michel L. Autric, Univ. de la Méditerranée-Aix Marseille II (France) . . . . . [7005-86]

Laser ablation of metals in an ambient gas: a numerical investigation, David Autrique, Annemie Bogaerts, Univ. Antwerpen (Belgium). . . . . [7005-87]

Organic material analysis by laser-induced breakdown spectroscopy, Francois Brygo, Univ. de la Méditerranée (France); Jörg Hermann, Univ. de la Méditerranée-Aix Marseille II (France). . . . . [7005-88]

A materialistic view of laser materials interactions, John S. Canham, ATK Corp. . . . . [7005-89]

Influence of pulsed laser annealing on the properties of Ge quantum dots in Si matrix, Elena I. Gatskevich, Gennadii D. Ivlev, B.I. Stepanov Institute of Physics (Belarus); Vladimir A. Volodin, Anatolii V. Dvurechenskii, M. D. Efremov, Alexander I. Nikiforov, Andrei Yakimov, Institute of Semiconductor Physics (Russia) . . . . . [7005-93]

Theoretical and experimental study of hydrodynamics of metal target irradiated by short laser pulse, Nail A. Inogamov, Sergey I. Anisimov, Yurii V. Petrov, Viktor A. Khokhlov, L.D. Landau Institute for Theoretical Physics (Russia); Vasilii V. Zhakhovskii, Osaka Univ. (Japan) and Institute for High Temperatures (Russia); Katsunobu Nishihara, Osaka Univ. (Japan); Mikhail B. Agranat, Sergey I. Ashitkov, Pavel S. Komarov, Institute for High Temperatures (Russia)[7005-97]

Mode-locked electron-beam-sustained-discharge CO laser, Andrey A. Ionin, Yurii M. Klimachev, Andrey A. Kotkov, Andrey Y. Kozlov, Leonid V. Seleznev, Dmitry V. Sinitsyn, P.N. Lebedev Physical Institute (Russia) . . . . . [7005-98]

Laser plasma-assisted processing to nanostructure surfaces, Andrei V. Kabashin, Ecole Polytechnique de Montréal (Canada); Wladimir I. Marine, Univ. de la Méditerranée-Aix Marseille II (France); Michel Meunier, Ecole Polytechnique de Montréal (Canada) . . . . . [7005-99]

Thin-film deposition of optically active nanoparticles by resonant infrared laser ablation, Richard F. Haglund, Jr., Stephen L. Johnson, Vanderbilt Univ.; Hee K. Park, AppliFlex LLC; Kannatessen Appavoo, Berea College . [7005-119]

Tuesday 22 April

SESSION 6

Chamisa Ballroom I . . . . . Tues. 7:30 to 9:00 am

Short Pulse Laser Matter Interactions III

Session Chair: **Thomas K. M. Lippert,** Paul Scherrer Institut (Switzerland)

7:30 am: **Ultrafast dynamic ellipsometry (UDE) and its application to the study of ablation dynamics** *(Invited Paper)*, Cynthia A. Bolme, Massachusetts Institute of Technology; David J. Funk, Shawn D. McGrane, David S. Moore, Los Alamos National Lab. . . . . [7005-22]

7:55 am: **Ultra-short laser interactions with metals and optical multi-layer materials: transport phenomena and damage threshold** *(Invited Paper)*, Tatiana E. Itina, Olivier P. Uteza, Nicolas Sanner, Marc L. Sentis, Univ. de la Méditerranée (France) . . . . . [7005-23]

8:20 am: **Ultrafast dynamics of electrons in laser-excited solids** *(Invited Paper)*, Bärbel Rethfeld, Technische Univ. Kaiserslautern (Germany) . [7005-24]

8:45 am: **Investigations of the ultrafast laser induced melt dynamics by means of transient quantitative phase microscopy (TQPm)**, Ilya Mingareev, Fraunhofer-Institut für Lasertechnik (Germany); Alexander Horn, RWTH Aachen (Germany) . . . . . [7005-25]

Coffee Break . . . . . 9:00 to 9:15 am

SESSION 7

Chamisa Ballroom I . . . . . Tues. 9:15 to 11:10 am

Nanoscale Physics and Structures

Session Chair: **Gediminas Raciukaitis,** Fizikos Institutas (Lithuania)

9:15 am: **Industrially-scaled pulsed laser deposition based coating techniques for the realization of hemocompatible surfaces for blood contact applications**, Juergen M. Lackner, JOANNEUM RESEARCH Forschungsgesellschaft mbH (Austria) . . . . . [7005-103]

9:30 am: **Self-organized nanostructure formation upon femtosecond laser ablation** *(Invited Paper)*, Juergen Reif, Olga Varlamova, Florenta A. Costache, Brandenburgische Technische Univ. Cottbus (Germany). . . . . [7005-27]

9:55 am: **Laser ablation on nanoscales** *(Invited Paper)*, Zengbo Wang, The Univ. of Manchester (United Kingdom); Boris S. Luk'yanchuk, Data Storage Institute (Singapore); Wei Guo, Lin Li, Zhu Liu, The Univ. of Manchester (United Kingdom) . . . . . [7005-28]

10:20 am: **Formation of nanoparticles by short and ultra-short laser pulses** *(Invited Paper)*, Karine Gouriet, Tatiana E. Itina, Sylvie Noël, Jörg Hermann, Marc L. Sentis, Univ. de la Méditerranée-Aix Marseille II (France); Leonid V. Zhigilei, Univ. of Virginia . . . . . [7005-94]

10:45 am: **Nanopulsed laser modification of Ge/Si heterostructures** *(Invited Paper)*, Elena I. Gatskevich, Gennadii D. Ivlev, B.I. Stepanov Institute of Physics (Belarus). . . . . [7005-30]

Lunch Break . . . . . 11:10 am to 12:50 pm

SESSION 8

Chamisa Ballroom I . . . . . Tues. 12:50 to 2:30 pm

Novel Applications in Physics and Electronics

Session Chair: **Michel L. Autric,** Univ. de la Méditerranée (France)

12:50 pm: **Development of high efficient solar pumper laser for renewable magunesium energy cycle** *(Invited Paper)*, Takashi Yabe, Shigeaki Uchida, Tokyo Institute of Technology (Japan) . . . . . [7005-31]

1:15 pm: **Pulsed laser deposition of ferromagnetic alloys for spintronics: an overview** *(Invited Paper)*, Cristiana E. A.Grigorescu, National Institute of Research & Development for Optoelectronics (Romania). . . . . [7005-32]

1:40 pm: **Laser-induced plasma from pure and doped water-ice at high fluence** *(Invited Paper)*, Jørgen Schou, Danmarks Tekniske Univ. (Denmark); Andreea Matei, National Institute for Lasers, Plasma and Radiation Physics (Romania); Kartarzyna Rodrigo, Danmarks Tekniske Univ. (Denmark); Maria Dinescu, National Institute for Lasers, Plasma and Radiation Physics (Romania) . . . . . [7005-33]

2:05 pm: **Combinatorial pulsed laser deposition of thin films** *(Invited Paper)*, Valentin Craciun, Doina Craciun, Ion N. Mihailescu, Gabriel Socol, Nicolaie Stefan, Emanuel Axinte, National Institute for Lasers, Plasma and Radiation Physics (Romania). . . . . [7005-34]

Coffee Break . . . . . 2:30 to 2:45 pm

SESSION 9

Chamisa Ballroom I . . . . . Tues. 2:45 to 4:25 pm

Laser Space Propulsion

Session Chair: **Willy L. Bohn,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

2:45 pm: **Wall-ablative, laser-driven in-tube accelerator** *(Invited Paper)*, Akihiro Sasoh, Shingo Suzuki, Atsushi Matsuda, Nagoya Univ. (Japan)[7005-35]

3:10 pm: **First demonstration of photonic laser thruster (PLT)** *(Invited Paper)*, Young K. Bae, Bae Institute . . . . . [7005-36]

3:35 pm: **Stationary force production: experimental and theoretical investigations** *(Invited Paper)*, Victor V. Apollonov, General Physics Institute (Russia) . . . . . [7005-37]

4:00 pm: **Materials for laser propulsion** *(Invited Paper),* Thomas K. M.Lippert, Lukas Urech, Alexander J. Wokaun, Paul Scherrer Institut (Switzerland); Claude R. Phipps, Photonic Associates, LLC . . . . . [7005-38]

SESSION 10

Chamisa Ballroom I . . . . . Tues. 4:25 to 5:30 pm

Laser Driven Flyers and Laser Cleaning

Session Chair: **Dennis L. Paisley,** Los Alamos National Lab.

4:25 pm: **Pulsed laser cleaning: comparing science and art and cultural heritage applications** *(Invited Paper)*, Deb M. Kane, Alanna J. Fernandes, Macquarie Univ. (Australia) . . . . . [7005-39]

4:50 pm: **Investigating physical and mechanical properties of condensed matter with laser-driven shock waves** *(Invited Paper)*, Sheng-Nian Luo, Dennis L. Paisley, Scott R. Greenfield, Los Alamos National Lab. . . . . [7005-40]

5:15 pm: **The laser-driven flyer system for space debris hypervelocity impact simulations,** Zizheng Gong, Beijing Institute of Spacecrafts Environment Engineering (China) . . . . . [7005-41]

Chamisa Ballroom II . . . . . Tues. 8:00 to 10:00 pm

Posters-Tuesday

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Laser Radiation plasma dynamics and momentum coupling *(Invited Paper)*, John L. Remo, Peter X. Hammerling, Quantum Resonance Inc. . . . . [7005-70]

Efficient TEA CO_2 laser-based ablation system, Francois J. Prinsloo, Stephan P. van Heerden, Neil C. du Preez, Scientific Development and Integration (South Africa); Lourens R. Botha, Council for Scientific and Industrial Research (South Africa) . . . . . [7005-104]

Accumulation effects in laser ablation of metals with high-repetition rate lasers, Gediminas Raciukaitis, Marijus Brikas, Paulius Gecys, Mindaugas Gedvilas, Fizikos Institutas (Lithuania) . . . . . [7005-105]

High energy density laser beam interactions simulating astrophysical and planetary processes, John L. Remo, Quantum Resonance Inc.; Richard G. Adams, Sandia National Labs. . . . . [7005-106]

Terawatt picosecond CO_2-laser on a basis of ring amplifier scheme, Yuri A. Rezunkov M.D., Research Institute for Complex Testing of Optoelectronic Devices and Systems (Russia) . . . . . [7005-107]

Surface morphology and crystalline structure of CdTe, ZnTe low-dimensional films, Victor K. Savchuk, Bohdan K. Kotlyarchuk, Pidstryhach Institute for Applied Problems of Mechanics and Mathematics (Ukraine); Maciej Oszwaldowski, Politechnika Poznanska (Poland) . . . . . [7005-108]

Reflection Fourier transform infrared spectroscopy of polymer targets for CO_2 laser ablation, John E. Sinko, The Univ. of Alabama in Huntsville; Clifford A. Schlecht, Washington Univ. in St. Louis. . . . . [7005-110]

Area scaling for laser propulsion, John E. Sinko, Nilesh B. Dhote, Jonathan Lassiter, Don A. Gregory, The Univ. of Alabama in Huntsville . . . . . [7005-111]

Investigation on momentum coupling coefficient for a parabolic shell, Rongqing Tan, Yijun Zheng, Changjun Ke, Kuohai Zhang, Donglei Wang, Chongyi Wan, Shiming Liu, The Institute of Electronics (China); Jin Wu, Institute of Electronics (China) . . . . . [7005-112]

Efficient gas lasers pumped by the generators with inductive energy storage, Victor F. Tarasenko, Institute of High Current Electronics (Russia); Alexei N. Panchenko, Institute of High Current Electronics; Alexei E. Tel'minov, Institute of High Current Electronics (Russia) . . . . . [7005-113]

VUV and UV excilamps, Victor F. Tarasenko, Mikhail I. Lomaev, Institute of High Current Electronics (Russia); Edvard A. Sosnin, Institute of High Current Electronics; Dmitry V. Shitz, Institute of High Current Electronics (Russia) . . . . . [7005-114]

Magnetic field for efficient exhaustion of CO_2 laser-produced Sn plasma in EUV light source, Yoshifumi Ueno, Georg Soumagne, Takashi Suganuma, Takayuki Yabu, Masato Moriya, Hiroshi Komori, Tamotsu Abe, Akira Endo, Akira Sumitani, Extreme Ultraviolet Lithography System Development Association (Japan). . . . . [7005-115]

Femtosecond laser surface structuring of biocompatible metals, Anatoliy Y. Vorobyev, Chunlei Guo, Univ. of Rochester . . . . . [7005-116]

Dynamics of femtosecond laser-induced periodic surface structures on metals, Jincheng Wang, Anatoliy Y. Vorobyev, Chunlei Guo, Univ. of Rochester . . . . . [7005-117]

Space polypropulsion, Barry J. Kellett, Douglas K. Griffin, Rutherford Appleton Lab. (United Kingdom); Robert N. Campbell, Univ. of KwaZulu-Natal (South Africa); Robert Bingham, Rutherford Appleton Lab. (United Kingdom); Andrew Forbes, Council for Scientific and Industrial Research (South Africa); Max M. Michaelis, Univ. of KwaZulu-Natal (South Africa) . . . . . [7005-118]

Nanolasers surface processing by tuning near-field focusing properties of particle lens, Wei Guo, Zengbo Wang, Lin Li, Zhu Liu, David J. Whitehead, The Univ. of Manchester (United Kingdom) . . . . . [7005-121]

Femtosecond laser milling of ultrathin films of $LiNbO_3$, Ophir Gaathon, Avishai Ofan, Jerry I. Dadap, Jr., Alexander Wirthmüller, Columbia Univ.; Lakshmanan Vanamurthy, Sasha Bakhru, Hassaram Bakhru, Univ. at Albany; Richard M. Osgood, Jr., Columbia Univ. . . . . [7005-122]

Wednesday 23 April

SESSION 11

Chamisa Ballroom I . . . . . Wed. 7:30 to 9:40 am

PLD, MAPLE and Processing of Advanced Materials

Session Chair: **Claude R. Phipps,** Photonic Associates, LLC

7:30 am: **Matrix-assisted pulsed laser evaporation (MAPLE): fundamental studies and emerging research** *(Invited Paper)*, James M. Fitz-Gerald, Aaron T. Sellinger, Elodie Leveugle, Leonid V. Zhigilei, Univ. of Virginia. . . . . [7005-42]

7:55 am: **Molecular dynamics simulation study of the ejection of polymer molecules and generation of molecular balloons in matrix-assisted pulsed laser evaporation** *(Invited Paper)*, Leonid V. Zhigilei, Elodie Leveugle, Aaron Sellinger, James M. Fitz-Gerald, Univ. of Virginia . . . . . [7005-43]

8:20 am: **Designing laser-induced refractive index changes in "thermal" glasses** *(Invited Paper)*, Razvan I. Stoian, Alexandre Mermillod-Blondin, Cyril Mauclair, Nicolas Huot, Eric Audouard, Univ. Jean Monnet Saint-Etienne (France); Igor M. Burakov, Nadezhda M. Bulgakova, Institute of Thermophysics (Russia); Yuri P. Meschcheryakov, Institute of Hydrodynamics (Russia); Arkady Rosenfeld, Ingolf V. Hertel, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany) . . . . . [7005-44]

8:45 am: **Thin film nano-processing mediated with surface plasmon coupling excited by femtosecond laser** *(Invited Paper)*, Yuto Tanaka, Minoru Obara, Keio Univ. (Japan) . . . . . [7005-45]

9:00 am: **Pulsed-laser deposition of ZnO and related compound thin films for optoelectronics**, Eric Millon, Univ. d'Orléans (France); Jacques Perriere, Univ. Paris 7-Denis Diderot (France); Chantal M. Boulmer-Leborgne, Univ. d'Orléans (France) . . . . . [7005-46]

9:15 am: **Low defect ZnO growth and catalyst-free growth of ZnO nanorods by pulsed laser deposition** *(Invited Paper)*, Tatsunori Sakano, Keio Univ. (Japan); Ryo Nishimura, Hiroki Fukuoka, Keio Univ (Japan); Yoshihiro Yada, Minoru Obara, Keio Univ. (Japan); Hiroyuki Kato, Michihiro Sano, Stanley Electric Co., Ltd. (Japan) . . . . . [7005-47]

Coffee Break . . . . . 9:40 to 9:55 am

SESSION 12

Chamisa Ballroom I . . . . . Wed. 9:55 to 11:50 am

High Power Lasers Applications and Diagnostics

Session Chair: **Michael L. Lander,** General Dynamics Information Technology

9:55 am: **Novel aspects in laser propulsion** *(Invited Paper)*, Willy L. Bohn, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . . [7005-48]

10:20 am: **Pulsed fiber laser sources for materials processing applications** *(Invited Paper)*, Fabio Di Teodoro, Northrop Grumman Space Technology . . . . . [7005-49]

10:45 am: **Lasers in space** *(Invited Paper)*, Max M. Michaelis, Univ. of KwaZulu-Natal (South Africa); Andrew Forbes, Council for Scientific and Industrial Research (South Africa); Robert Bingham, Rutherford Appleton Lab. (United Kingdom) . . . . . [7005-50]

11:10 am: **CO_2 laser with 65MW pulses and 100kW average power (concept and first steps of development)** *(Invited Paper)*, Dieter Schuöcker, Bernhard Holzinger, Technische Univ. Wien (Austria). . . . . [7005-51]

11:35 am: **Evaluation of materials for on-board laser diagnostics**, James R. Luke, David E. Thomas, The AEgis Technologies Group, Inc.; Jay Lewis, RTI International; Claude R. Phipps, Photonic Associates, LLC . . . . . [7005-52]

Lunch Break . . . . . 11:50 am to 1:50 pm

SESSION 13

Chamisa Ballroom I . . . . . Wed. 1:50 to 3:55 pm

COIL, DOIL, EOIL and Other Unusual Sources

Session Chair: **Carl William Larson,** Air Force Research Lab.

1:50 pm: **Development of a non-self-sustained electric discharge pumped oxygen-iodine laser** *(Invited Paper)*, Igor V. Adamovich, John Bruzzese, Adam Hicks, J. W. Rich, Walter R. Lempert, The Ohio State Univ.. . . . . [7005-53]

2:15 pm: **Latest developments toward the demonstration of a KW-class EOIL laser** *(Invited Paper)*, Alan E. Hill, Plasmatronics, Inc. . . . . [7005-54]

2:40 pm: **Influence of nitrogen oxides NO and NO_2 additives on singlet delta oxygen production in pulsed e-beam sustained discharge in oxygen** *(Invited Paper)*, Andrey A. Ionin, Yurii M. Klimachev, Andrey Y. Kozlov, Andrey A. Kotkov, P.N. Lebedev Physical Institute (Russia); Igor V. Kochetov, Anatoly P. Napartovich, Oleg A. Rulev, Troitsk Institute for Innovation and Fusion Research (Russia); Leonid V. Seleznev, Dmitry V. Sinitsyn, Nikolay P. Vagin, Nikolay N. Yuryshev, P.N. Lebedev Physical Institute (Russia) . . . . . [7005-55]

3:05 pm: **Optical sources based on a multichannel surface discharge and their application to pump photolytically driven femtosecond XeF(C-A) amplifier** *(Invited Paper)*, Vadim I. Tcheremiskine, Olivier P. Uteza, Marc L. Sentis, Univ. de la Méditerranée-Aix Marseille II (France); Leonid D. Mikheev, P.N. Lebedev Physical Institute (Russia). . . . . [7005-56]

3:30 pm: **Improved production of O_2(a1D) in transverse radio-frequency discharges** *(Invited Paper)*, Brian S. Woodard, Joseph W. Zimmerman, Joseph T. Verdeyen, David L. Carroll, Tyler H. Field, Gabriel F. Benavides, Andrew D. Palla, Wayne C. Solomon, CU Aerospace LLC. . . . . [7005-57]

Coffee Break . . . . . 3:55 to 4:10 pm

SESSION 14

Chamisa Ballroom I . . . . . Wed. 4:10 to 5:45 pm

Optically Pumped Lasers

Session Chair: **Andrey A. Ionin,** P.N. Lebedev Physical Institute (Russia)

4:10 pm: **Problem definition of experimental investigations on laser propulsion under space conditions** *(Invited Paper)*, Yuri A. Rezunkov M.D., Research Institute for Complex Testing of Optoelectronic Devices and Systems (Russia); Yuri M. Baturin, Yuri Gagarin Russian State Science Research Cosmonauts Training Ctr. (Russia) . . . . . [7005-58]

4:35 pm: **Formation of superpower volume discharges and their application for modification surface of metals** *(Invited Paper)*, Victor F. Tarasenko, Michael A. Shulepov, Institute of High Current Electronics (Russia). . . [7005-59]

5:00 pm: **Development of CO_2 laser drilling machine for microvias formation of the HDI printed circuit boards**, Ming-Fei Chen, Yu-Pin Chen, Wen-Tse Hsiao, National Changhua Univ. of Education (Taiwan) . . . . . [7005-61]

5:15 pm: **Optically pumped HBr gas laser operating in regions of high atmospheric transmission**, Vasudevan Nampoothiri, Amarin Ratanavis, Neil Campbell, Wolfgang Rudolph, The Univ. of New Mexico. . . . . [7005-62]

5:30 pm: **Efficient and compact short pulse MOPA system for Laser-Produced-Plasma Extreme-UV sources employing RF-discharge slab-waveguide CO_2 amplifiers,** Krzysztof M. Nowak, Takashi Suganuma, Akira Endo, Akira Sumitani, Extreme Ultraviolet Lithography System Development Association (Japan); Dmitri A. Goryachkin, Nikolay A. Romanov, Andrey Y. Rodionov, Vladimir E. Sherstobitov, Lev V. Kovalchuk, J.S.C. Laser Physics (Russia) . . . . . [7005-63]

Chamisa Ballroom II . . . . . Wed. 7:00 to 10:00 pm

Conference Dinner and Best Poster Awards

Thursday 24 April

SESSION 15

Chamisa Ballroom I . . . . . Thurs. 7:30 to 9:00 am

Physics of Laser Matter Interactions

Session Chair: **Max M. Michaelis,** Univ. of KwaZulu-Natal (South Africa)

7:30 am: **Spectroscopic characterization of an ultrashort laser driven Ar cluster target incorporating both Boltzmann and particle-in-cell models**, Manolo E. Sherrill, Joseph Abdallah, Jr., George Csanak, Evan S. Dodd, Los Alamos National Lab.; Yuji Fukuda, Japan Atomic Energy Research Institute (Japan); Anatoly Y. Skobelev, VNIIFTRI (Russia). . . . . [7005-64]

7:45 am: **Ultrafast modification of optical properties of metals, irradiated by powerful laser pulses**, Mikhail Veysman, Nikolay Andreev, Vladimir E. Fortov, Konstantin Khishchenko, Oleg Kostenko, Pavel Levashov, Mikhail Povarnicyn, Institute for High Energy Densities (Russia) . . . . . [7005-65]

8:00 am: **Colorizing metals with femtosecond laser pulses** *(Invited Paper)*, Anatoliy Y. Vorobyev, Chunlei Guo, Univ. of Rochester . . . . . [7005-66]

8:15 am: **Dielectric function and optical phonon oscillations in fs-laser excited bismuth**, Davide Boschetto, Thomas Garl, Antoine Rousse, Ecole Nationale Supérieure de Techniques Avancées (France); Eugene G. Gamaly, Andrei V. Rode, The Australian National Univ. (Australia) . . . . . [7005-67]

8:30 am: **Subpicosecond dielectric breakdown and incubation in TixSi1-xO2 composite films with adjustable band gap**, Luke Emmert, Duy Nguyen, Igor Cravetchi, Wolfgang Rudolph, The Univ. of New Mexico; Marco Jupe, Marc Lappschies, Kai Starke, Detlev Ristau, Laser Zentrum Hannover e.V. (Germany) . . . . . [7005-68]

8:45 am: **Equation of state of matter irradiated by short laser pulse and geometry of spallation cupola**, Nail A. Inogamov, L.D. Landau Institute for Theoretical Physics (Russia); Vasilii V. Zhakhovskii, Osaka Univ. (Japan) and Joint Institute of High Temperature (Russia); Katsunobu Nishihara, Osaka Univ. (Japan). . . . . [7005-69]

Coffee Break . . . . . 9:00 to 9:15 am

SESSION 16

Chamisa Ballroom I . . . . . Thurs. 9:15 to 10:25 am

Laser Space Propulsion II

Session Chair: **Akihiro Sasoh,** Nagoya Univ. (Japan)

9:15 am: **Laser-powered, multi-newton thrust space engine with variable specific impulse**, Claude R. Phipps, Photonic Associates, LLC; James R. Luke, The AEgis Technologies Group, Inc.; Wesley D. Helgeson, New Mexico Institute of Mining and Technology. . . . . [7005-71]

9:30 am: **Binary polymer propellants for laser-propelled constant momentum missions** *(Invited Paper)*, Andrew V. Pakhomov, The Univ. of Alabama in Huntsville; Kevin Mahaffy, Exquadrum, Inc. . . . . [7005-72]

9:55 am: **Critical fluence effects in laser propulsion** *(Invited Paper)*, John E. Sinko, Don A. Gregory, The Univ. of Alabama in Huntsville . . . . . [7005-73]

10:10 am: **Novel concept of laser-plasma microthruster design,** Andrei V. Fedenev, Fedor N. Ljubchenko, Central Research Institute of Engineering (Russia) . . . . . [7005-74]

SESSION 17

Chamisa Ballroom I . . . . . Thurs. 10:25 to 11:40 am

DPALS I

Session Chair: **Gordon D. Hager,** The Univ. of New Mexico

10:25 am: **Diode pumped alkali lasers: an overview** *(Invited Paper)*, William F. Krupke, WFK Lasers, LLC. . . . . [7005-75]

10:50 am: **Collisional quenching and radiation trapping kinetics for Rb(5p) in the presence of ethane** *(Invited Paper)*, David A. Hostutler, Air Force Research Lab.; Gordon D. Hager, The Univ. of New Mexico; Michael C. Heaven, Emory Univ. . . . . [7005-123]

11:15 am: **Resonance transition 795-nm Rubidium laser with He buffer gas** *(Invited Paper)*, Sheldon S.Wu, Lawrence Livermore National Lab. and Univ. of California/San Diego; Thomas F. Soules, Ralph H. Page, Scott C. Mitchell, Vernon K. Kanz, Raymond J. Beach, Lawrence Livermore National Lab.. . . . . [7005-77]

Lunch Break . . . . . 11:40 am to 1:40 pm

SESSION 18

Chamisa Ballroom I . . . . . Thurs. 1:40 to 2:45 pm

DPALS II

Session Chair: **Gordon D. Hager,** The Univ. of New Mexico

1:40 pm: **Alkali lasers development at Laser and Optics Research Center of the US Air Force Academy** *(Invited Paper)*, Boris V. Zhdanov, Randall J. Knize, U.S. Air Force Academy . . . . . [7005-78]

2:05 pm: **High power diode pumped alkali vapor lasers** *(Invited Paper)*, Jason S. Zweiback, General Atomics; William F. Krupke, WFK Lasers, LLC; Paul S. Banks, Aleksey M. Komashko, Chris Murphy, Justin Nash, John Smith, General Atomics . . . . . [7005-79]

2:30 pm: **Pressure broadening of the D1 and D2 lines in atomic cesium**, Greg A. Pitz, Glen P. Perram, Air Force Institute of Technology. . . . . [7005-80]

Coffee Break . . . . . 2:45 to 3:00 pm

SESSION 19

Chamisa Ballroom I . . . . . Thurs. 3:00 to 4:05 pm

DPALS III

Session Chair: **Gordon D. Hager,** The Univ. of New Mexico

3:00 pm: **Microplasmas as efficient generators of singlet delta oxygen**, Vincent Puech, Gerard Bauville, Bernard Lacour, Joao Santos Sousa, Univ. Paris-Sud II (France); Leanne C. Pitchford, Univ. Paul Sabatier (France)[7005-81]

3:15 pm: **A quasi-two level analytic model for end pumped alkali metal vapor lasers** *(Invited Paper)*, Gordon D. Hager, Air Force Institute of Technology; John K. McIver, The Univ. of New Mexico; David A. Hostutler, Air Force Research Lab.; Greg A. Pitz, Glen P. Perram, Air Force Institute of Technology . . . . . [7005-82]

3:40 pm: **Second harmonic operation of diode-pumped Rb vapor lasers** *(Invited Paper),* Alan B. Petersen, Randall Lane, Spectra-Physics . . . . [7005-83]

Final Remarks. . . . . Thurs. 4:05 pm

Claude R. Phipps, Photonic Associates, LLC

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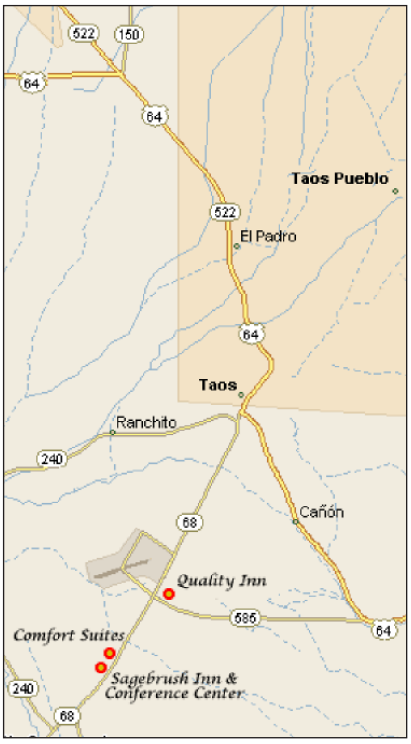

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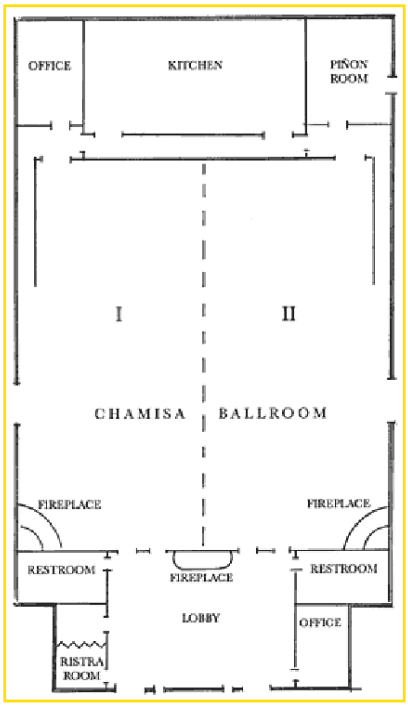

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