



22 - 27 January 2011  
The Moscone Center  
San Francisco, California United States

Conference 7920

## Laser Applications in Microelectronic and Optoelectronic Manufacturing (LAMOM) XVI

Conference Program Track: **Laser Micro-/Nanoengineering** ([View Daily Schedule of Program Track](#))

Available in print as *Proceedings of SPIE Volume: 7920*

Dates: **Monday-Thursday 24 - 27 January 2011**

### Conference Chairs

**Bo Gu**, IPG Photonics Corp.; **Guido Hennig**, Daetwyler Graphics AG (Switzerland); **Xianfan Xu**, Purdue Univ.; **Hiroyuki Niino**, National Institute of Advanced Industrial Science and Technology (Japan)

### Program Committee

**Craig B. Arnold**, Princeton Univ.; **Ian W. Boyd**, Monash Univ. (Australia); **Paul V. Braun**, Univ. of Illinois at Urbana-Champaign; **Douglas B. Chrisey**, Rensselaer Polytechnic Institute; **Santiago Costantino**, Univ. de Montréal (Canada); **J. Thomas Dickinson**, Washington State Univ.; **Jan J. Dubowski**, Univ. de Sherbrooke (Canada); **Richard F. Haglund, Jr.**, Vanderbilt Univ.; **Yoshio Hayasaki**, Utsunomiya Univ. (Japan); **Andrew S. Holmes**, Imperial College London (United Kingdom); **Jyotirmoy Mazumder**, Univ. of Michigan; **Eric D. Mazur**, Harvard Univ.; **Michel Meunier**, Ecole Polytechnique de Montréal (Canada); **Beat Neuenschwander**, Berner Fachhochschule (Switzerland); **Henry Peng**, GE China Technology Ctr. (China); **Alberto Piqué**, U.S. Naval Research Lab.; **Koji Sugioka**, RIKEN (Japan); **Vassilia Zorba**, Lawrence Berkeley National Lab.

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### Monday 24 January

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#### Opening Remarks

Date: **Monday 24 January**  
Time: **8:30 AM - 8:40 AM**

**Bo Gu**, IPG Photonics Corp. (USA)

#### Session 1: Fundamental Aspects of Laser Interaction

Date: **Monday 24 January**  
Time: **8:40 AM - 10:10 AM**

*Session Chairs:* **Bo Gu**, IPG Photonics Corp.; **Guido Hennig**, Daetwyler Graphics AG (Switzerland)

Fundamental studies of the role of photo-induced defect production on laser modification and etching of surfaces: single crystal ZnO (*Invited Paper*)

Paper 7920-1

Time: **8:40 AM - 9:10 AM**

Author(s): Enamul H. Khan, John Unverferth, Steve C. Langford, J. Thomas Dickinson, Washington State Univ. (United States)

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Absorption of femtosecond laser pulse in fused silica: experiments and modelling

Paper 7920-2

Time: **9:10 AM - 9:30 AM**

Author(s): Nadezda Varkentina, Olivier P. Uteza, Benoît Chimier, Nicolas Sanner, Lasers, Plasmas et Procédés Photoniques (France); Tatiana E. Itina, Lab. Hubert Curien (France); Marc L. Sentis, Lasers, Plasmas et Procédés Photoniques (France)

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Goos-Hänchen effect enhanced by surface plasmon resonance in Kretschmann-Raether configuration

Paper 7920-3

Time: **9:30 AM - 9:50 AM**

Author(s): Tao Duan, Xi'an Institute of Optics and Precision Mechanics (China)

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Effects of the source, surface, and sensor couplings and colorimetric of laser speckle pattern on the performance of optical imaging system

Paper 7920-4

Time: **9:50 AM - 10:10 AM**

Author(s): Mohamed Darwiesh, Ashraf F. El-Sherif, Military Technical College (Egypt); Hatem El-Ghandour, Ain Shams Univ. (Egypt); Hussein Aly, Military Technical College (Egypt)

No abstract available

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**Coffee Break 10:10 AM - 10:40 AM**  
.....

Session 2: Laser Microscale Materials Processing

Date: **Monday 24 January**  
Time: **10:40 AM - 12:30 PM**

Session Chairs: **J. Thomas Dickinson**, Washington State Univ.; **Yongfeng Lu**, Univ. of Nebraska-Lincoln

Glass welding technology using ultra short laser pulses (*Invited Paper*)

Paper 7920-5

Time: **10:40 AM - 11:10 AM**

Author(s): Stephan Roth, Kristian Cvecek, Isamu Miyamoto, Michael H. M. Schmidt, BLZ Bayerisches Laserzentrum GmbH (Germany)

No abstract available

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Reliable laser micro-welding of copper

Paper 7920-6

Time: **11:10 AM - 11:30 AM**

Author(s): Christoph Rüttimann, Ulrich Duerr, LASAG AG (Switzerland); Anas Moalem, Laser Zentrum Hannover e.V. (Germany)

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Advanced micro-machining applications for low nanosecond high brightness fiber lasers

Paper 7920-7

Time: **11:30 AM - 11:50 AM**

Author(s): Anthony P. Hoult, IPG Photonics Corp. (United States)

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Processing of metals with ps-laserpulses in the range between 10ps and 100ps

Paper 7920-8

Time: **11:50 AM - 12:10 PM**

Author(s): Beat Neuenschwander, Marc Schmid, Valerio Romano, Beat Jaeggi, Urs W. Hunziker, Berner Fachhochschule Technik und Informatik (Switzerland)

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Novel micromachining process using optical breakdown of a microdroplet

Paper 7920-9

Time: **12:10 PM - 12:30 PM**

Author(s): Daehwan Ahn, Deoksuk Jang, Dongsik Kim, Pohang Univ. of Science and Technology (Korea, Republic of)

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**Lunch Break 12:30 PM - 2:00 PM**  
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Session 3: Surface Microstructuring and Cleaning

Date: **Monday 24 January**  
Time: **2:00 PM - 3:30 PM**

Session Chairs: **Guido Hennig**, Daetwyler Graphics AG (Switzerland); **Bo Gu**, IPG Photonics Corp.

Generation of superfine structure smaller than 10 nm by interfering femtosecond laser processing (*Invited Paper*)

Paper 7920-10

Time: **2:00 PM - 2:30 PM**

Author(s): Yoshiki Nakata, Kazuma Momoo, Takuya Hiromoto, Noriaki Miyanaga, Osaka Univ. (Japan)

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Surface morphology of SiO<sub>2</sub> coated InP/InGaAs/InGaAsP microstructures following irradiation with the ArF and KrF excimer lasers

Paper 7920-11

Time: **2:30 PM - 2:50 PM**

Author(s): Neng Liu, Khalid Moumanis, Jan J. Dubowski, Univ. de Sherbrooke (Canada)

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Generating sub-micron features on rough surfaces using optical trap assisted nanopatterning

Paper 7920-12

Time: **2:50 PM - 3:10 PM**

Author(s): Yu-Cheng Tsai, Romain Fardel, Craig B. Arnold, Princeton Univ. (United States)

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Novel surface cleaning method using high-speed micro jet generated by laser-induced breakdown of a microdroplet

Paper 7920-13

Time: **3:10 PM - 3:30 PM**

Author(s): Deoksuk Jang, Daehwan Ahn, Dongsik Kim, Pohang Univ. of Science and Technology (Korea, Republic of)

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**Coffee Break** 3:30 PM - 4:00 PM

#### Session 4: Laser Modification of Materials

Date: **Monday 24 January**

Time: **4:00 PM - 5:30 PM**

*Session Chairs:* **Hiroyuki Niino**, National Institute of Advanced Industrial Science and Technology (Japan); **Yoshiki Nakata**, Osaka Univ. (Japan)

Controlled growth of carbon nanotubes: from locations to structures (*Invited Paper*)

Paper 7920-14

Time: **4:00 PM - 4:30 PM**

Author(s): Yongfeng Lu, Yunshen Zhou, Masoud Mahjouri Samani, Wei Xiong, M. Mitchell, Univ. of Nebraska-Lincoln (United States)

No abstract available

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High rep-rate UV laser precipitation of silicon nanocrystals

Paper 7920-15

Time: **4:30 PM - 4:50 PM**

Author(s): Waqas Mustafeez, Stanford Univ. (United States); Daeho Lee, Costas P. Grigoropoulos, Univ. of California, Berkeley (United States); Alberto Salleo, Stanford Univ. (United States)

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Femtosecond laser doping of TiO<sub>2</sub> for photocatalysis

Paper 7920-16

Time: **4:50 PM - 5:10 PM**

Author(s): Katherine C. Phillips, Meng-Ju Sher, Anne Co, Elizabeth C. Landis, Cynthia M. Friend, Eric D. Mazur, Harvard Univ. (United States)

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Sintering of solution-based nano-particles by a UV laser pulse train

Paper 7920-17

Time: **5:10 PM - 5:30 PM**

Author(s): Jie Zhang, Ming Li, Panasonic Corp. of North America (United States); Kiyoshi Morimoto, Panasonic Corp. (Japan)

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### Tuesday 25 January

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#### Session 5: Ultrashort Pulse Micromachining: Joint Session with Conference 7925

Date: **Tuesday 25 January**

Time: **8:00 AM - 10:20 AM**

*Session Chair:* **Craig B. Arnold**, Princeton Univ.

Fundamentals and industrial applications of ultrashort pulsed lasers at Bosch (*Invited Paper*)

Paper 7925-32

Time: **8:00 AM - 8:30 AM**

Author(s): Jens Koenig, Thorsten Bauer, Robert Bosch GmbH (Germany)

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Directly induced ablation of metal thin films by ultra short laser pulses

Paper 7925-33

Time: **8:30 AM - 8:50 AM**

Author(s): Gerhard Heise, Christian Hellwig, Jan Konrad, Sebastian Sarrach, Heinz P. Huber, Hochschule München für Angewandte Wissenschaften (Germany)

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Colorizing of the stainless steel surface by single-beam direct femtosecond laser writing

Paper 7925-34

Time: **8:50 AM - 9:10 AM**

Author(s): Md. S. Ahsan, KAIST (Korea, Republic of) and Khulna Univ. (Bangladesh); Yeong Gyu Kim, Man Seop Lee, KAIST (Korea, Republic of)

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Core techniques for precise and productive microdrilling in steel with ultrashort pulsed laser radiation (*Invited Paper*)

Paper 7925-35

Time: **9:10 AM - 9:40 AM**

Author(s): Martin Kraus, Andreas Michalowski, Johannes Fruechtenicht, Rudolf Weber, Thomas Graf, Univ. Stuttgart (Germany)

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Industrial production with ultra fast laser workstations

Paper 7920-18

Time: **9:40 AM - 10:00 AM**

Author(s): Eric Audouard, Univ. Jean Monnet Saint-Etienne (France); Hervé Soder, Impulsion SAS (France)

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An investigation of piezoelectric cutting by femtosecond laser

Paper 7920-19

Time: **10:00 AM - 10:20 AM**

Author(s): Yoan Di Maio, Eric Audouard, Jean-Philippe Colombier, Univ. Jean Monnet Saint-Etienne (France); Paul Cazottes, José Beitia, Sagem Defense Securite (France)

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**Coffee Break 10:20 AM - 10:50 AM**

## Session 6: Thin Film and Wafer Processing: Joint Session with Conference 7925

Date: **Tuesday 25 January**

Time: **10:50 AM - 12:20 PM**

Session Chair: **Jens Koenig**, Robert Bosch GmbH (Germany)

The effect of ambient conditions on thin wafers processed with fs-laser machining (*Invited Paper*)

Paper 7925-36

Time: **10:50 AM - 11:20 AM**

Author(s): Sae Chae Jeoung, Korea Research Institute of Standards and Science (Korea, Republic of)

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On the damage behaviour of Al<sub>2</sub>O<sub>3</sub> insulating layers in thin film systems for the fabrication of sputtered strain gauges

Paper 7925-37

Time: **11:20 AM - 11:40 AM**

Author(s): Oliver Suttman, Ulrich Klug, Rainer Kling, Laser Zentrum Hannover e.V. (Germany)

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Laser ablation of AgInSe<sub>2</sub>: a clean and effective approach for ternary semiconductors

Paper 7920-20

Time: **11:40 AM - 12:00 PM**

Author(s): Dinesh Pathak, Guru Nanak Dev Univ. (India)

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Investigation on solid state Nd<sup>3+</sup>:YAG line beam laser annealing and texturing of amorphous silicon thin films

Paper 7920-21

Time: **12:00 PM - 12:20 PM**

Author(s): Nilesh J. Vasa, Anand I. Palani, Makaram Singaperumal, Indian Institute of Technology Madras (India)

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**Lunch/Exhibition Break 12:20 PM - 2:00 PM**  
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## Session 7: Online Monitoring: Joint Session with Conference 7925

Date: **Tuesday 25 January**

Time: **2:00 PM - 3:00 PM**

Session Chair: **Andreas Michalowski**, Univ. Stuttgart (Germany)

In-situ coherent imaging to monitor and control laser micro machining processes (*Invited Paper*)

Paper 7925-38

Time: **2:00 PM - 2:30 PM**

Author(s): James M. Fraser, Paul J. Webster, Joe X. Yu, Benjamin Y. Leung, Logan G. Wright, Kevin D. Mortimer, Queen's Univ. (Canada)

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In-situ observation of the hole formation during deep drilling with ultrashort laser pulses (*Invited Paper*)

Paper 7925-39

Time: **2:30 PM - 3:00 PM**

Author(s): Sven Döring, Sören Richter, Friedrich-Schiller-Univ. Jena (Germany); Stefan Nolte, Andreas Tünnermann, Friedrich-Schiller-Univ. Jena (Germany) and Fraunhofer Institute Applied Optics and Precision Engineering (Germany)

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**Coffee Break 3:00 PM - 3:30 PM**  
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## Session 8: Femtosecond Laser Nanoprocessing: Joint Session with Conference 7925

Date: **Tuesday 25 January**  
Time: **3:30 PM - 5:40 PM**

Session Chair: **Beat Neuenschwander**, Berner Fachhochschule Technik und Informatik (Switzerland)

### Ultrafast microsphere near-field nanostructuring

Paper 7925-40

Time: **3:30 PM - 3:50 PM**

Author(s): Karl-Heinz Leitz, Ulf Quentin, Lehrstuhl für Photonische Technologien (Germany) and Erlangen Graduate School of Advanced Optical Technologie (Germany); Benjamin Hornung, Consultant (Germany); Andreas Otto, Ilya Alexeev, Michael Schmidt, Lehrstuhl für Photonische Technologien (Germany) and Erlangen Graduate School of Advanced Optical Technologie (Germany)

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### Laser-induced breakdown spectroscopy with tailored femtosecond pulses for 3-dimensional chemical imaging with high spatial resolution (*Invited Paper*)

Paper 7920-24

Time: **3:50 PM - 4:20 PM**

Author(s): Jutta Mildner, Cristian Sarpe-Tudoran, Lars Englert, Dirk Otto, Nadine Goette, Matthias Wollenhaupt, Waldemar Wessel, Angelika Brueckner-Foit, Thomas Baumert, Univ. Kassel (Germany)

No abstract available

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### Uniform near-field nanopatterning due to the field distribution control by oblique femtosecond laser irradiation to nanoparticles

Paper 7920-25

Time: **4:20 PM - 4:40 PM**

Author(s): Tomoya Miyaniishi, Mitsuhiro Terakawa, Minoru Obara, Keio Univ. (Japan)

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### Nanostructure formation on silicon surfaces by high repetition-rate sub-15fs near-infrared laser pulses

Paper 7920-26

Time: **4:40 PM - 5:00 PM**

Author(s): Martin H. Straub, Karsten König, Univ. des Saarlandes (Germany)

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### Towards all-in-glass micro-actuators fabricated with femtosecond lasers

Paper 7925-45

Time: **5:00 PM - 5:20 PM**

Author(s): Yves Bellouard, Technische Univ. Eindhoven (Netherlands); Ali A. Said, Mark A. Dugan, Philippe Bado, Translume, Inc. (United States)

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### Optimization methods of hologram for holographic femtosecond laser processing

Paper 7920-28

Time: **5:20 PM - 5:40 PM**

Author(s): Yoshio Hayasaki, Satoshi Hasegawa, Utsunomiya Univ. (Japan)

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## Posters-Tuesday

Date: **Tuesday 25 January**  
Time: **6:00 PM - 7:30 PM**

Conference attendees are invited to attend the LASE & MOEMS-MEMS poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions. Poster authors, view poster presentation guidelines and set-up instructions at <http://spie.org/x27476.xml>.

### Generation of complicated or duplicated structure by interfering femtosecond laser processing of metallic thin film

Paper 7920-41

Author(s): Takuya Hiromoto, Kazuma Momoo, Yoshiki Nakata, Noriaki Miyanaga, Osaka Univ. (Japan)

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### F<sub>2</sub> laser surface modification of UV transparent polymer for selective cell culture and its mechanism study

Paper 7920-42

Author(s): Yasutaka Hanada, Koji Sugioka, Katsumi Midorikawa, RIKEN (Japan)

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Multiphoton lithography and ITO structuring by high repetition-rate sub-15 femtosecond laser pulses

Paper 7920-43

Author(s): Maziar Afshar, Somaie Saremi, Henning Völlm, Dara Feili, Helmut Seidel, Martin H. Straub, Huijing Zhang, Karsten König, Univ. des Saarlandes (Germany)

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Non-destructive analysis on femtosecond laser doped silicon

Paper 7920-44

Author(s): Yu-Ting Lin, Harvard Univ. (United States); Matthew J. Smith, Silvoja Gradecak, Massachusetts Institute of Technology (United States); Eric D. Mazur, Harvard Univ. (United States)

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Manufacture of stacked-layers pattern by femto-second laser-induced forward transfer

Paper 7920-45

Author(s): Chung Hao Lu, Bo Han Chen, Chia Min Chang, Ming Lun Tseng, National Taiwan Univ. (Taiwan); Cheng Hung Chu, Hai-Pang Chiang, National Taiwan Ocean Univ. (Taiwan); Din Ping Tsai, National Taiwan Univ. (Taiwan)

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Evaluation of a refractive index profiles for a modification induced by focused femtosecond laser irradiation in the optical glasses

Paper 7920-46

Author(s): Tomohiro Hashimoto, Shuhei Tanaka, New Glass Forum (Japan)

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Laser cutting of carbon fiber reinforced plastics (CFRP) by UV pulsed laser ablation

Paper 7920-47

Author(s): Hiroyuki Niino, Ryozo Kurosaki, National Institute of Advanced Industrial Science and Technology (Japan)

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F<sub>2</sub> laser formation of SiO<sub>2</sub> protective layer onto polycarbonate for lightweight vehicle window

Paper 7920-48

Author(s): Shingo Sonobe, National Defense Academy (Japan); Yoshihiko Nojima, National Defense Academy (Japan) and Renias Co., Ltd. (Japan); Masayuki Okoshi, National Defense Academy (Japan); Hidetoshi Nojiri, Renias Co., Ltd. (Japan); Narumi Inoue, National Defense Academy (Japan)

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Patterning of aluminum thin films by 157nm F<sub>2</sub> laser

Paper 7920-49

Author(s): Kazufumi Iwai, Masayuki Okoshi, National Defense Academy (Japan); Hidetoshi Nojiri, Renias Co., Ltd. (Japan); Narumi Inoue, National Defense Academy (Japan)

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Microwelding of glass substrates by double pulse irradiation of femtosecond laser

Paper 7920-50

Author(s): Makoto Iida, RIKEN (Japan) and Tokyo Denki Univ. (Japan); Yasutaka Hanada, Koji Sugioka, RIKEN (Japan); Hiroshi Takai, Tokyo Denki Univ. (Japan); Katsumi Midorikawa, RIKEN (Japan)

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Laser micro welding of copper using a 532nm Nd:YAG laser

Paper 7920-51

Author(s): Geoff J. Shannon, Miyachi Unitek Corp. (United States)

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**Wednesday 26 January**

Session 9: Laser Processing of Transparent Materials

Date: **Wednesday 26 January**

Time: **8:00 AM - 9:50 AM**

Session Chairs: **Xianfan Xu**, Purdue Univ.; **Andreas Michalowski**, Univ. Stuttgart (Germany)

Designer pulses for optimal ablation (*Invited Paper*)

Paper 7920-29

Time: **8:00 AM - 8:30 AM**

Author(s): Razvan I. Stoian, Jean-Philippe Colombier, M. Guillermin, Florence Garrelie, Eric Audouard, Lab. Hubert Curien, CNRS, Univ. de Lyon, Univ. Jean Monnet Saint-Etienne (France)

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Micromachining display glass with picosecond lasers

Paper 7920-30

Time: **8:30 AM - 8:50 AM**

Author(s): Dirk Mueller, Hatim Haloui, Bernhard H. Klimt, LUMERA LASER GmbH (Germany)

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Novel applications of sub-surface laser machining

Paper 7920-31

Time: **8:50 AM - 9:10 AM**

Author(s): Benjamin R. Campbell, David M. Bernot, Lucas A. Forster, The Pennsylvania State Univ. Electro-Optics Ctr. (United States)

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CO<sub>2</sub> laser scribe of chemically strengthened glass with high surface compressive stress

Paper 7920-32

Time: **9:10 AM - 9:30 AM**

Author(s): Xinghua Li, Butchi R. Vaddi, Corning Inc. (United States)

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Laser machining and plasma analysis using a novel trepanning system

Paper 7920-33

Time: **9:30 AM - 9:50 AM**

Author(s): Gerd Illing, David Ashkenasi, Tristan Kaszemeikat, Norbert Müller, Laser- und Medizin-Technologie GmbH, Berlin (Germany); David Diego-Vallejo, Instituto Politécnico Nacional (Mexico); Hans-Joachim Eichler, Technische Univ. Berlin (Germany)

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**Coffee Break 9:50 AM - 10:20 AM**  
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## LASE Plenary Session

Date: **Wednesday 26 January**

Time: **10:20 AM - 12:30 PM**

10:20 am: **Welcome and Opening Remarks**, Friedhelm Dorsch, TRUMPF GmbH & Co. KG (Germany) and Alberto Piqué, U.S. Naval Research Lab. (USA)

10:25 am: **Announcement of the Best "Green Photonics" Paper Award in LASE**, Stephen J. Eglash, Precourt Institute for Energy, Stanford Univ. (USA)

10:30 am: **Of Light, Electrons, and Metamaterials**, Nader Engheta, Univ. of Pennsylvania (USA)

11:10 am: **Using Lasers in Particle-based Applications**, Andreas Ostendorf, Ruhr-Univ. Bochum (Germany)

11:50 am: **Advances in Lasers and Their Impact on Industrial Applications**, Paul E. Denney, Connecticut Ctr. for Advanced Technology, Inc. (USA)

See p.xx for details.

**Lunch/Exhibition Break 12:30 PM - 2:00 PM**

## Session 10: Processing with Novel Laser Systems and Optics

Date: **Wednesday 26 January**

Time: **2:00 PM - 4:00 PM**

*Session Chairs:* **Razvan I. Stoian**, Lab. Hubert Curien, CNRS, Univ. de Lyon, Univ. Jean Monnet Saint-Etienne (France); **Hiroyuki Niino**, National Institute of Advanced Industrial Science and Technology (Japan)

Laser surface structuring with long depth of focus (*Invited Paper*)

Paper 7920-34

Time: **2:00 PM - 2:30 PM**

Author(s): Andreas Michalowski, Christian Freitag, Rudolf Weber, Thomas Graf, Univ. Stuttgart (Germany)

No abstract available

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A study on 8 beam laser diode to adopt laser scanning unit

Paper 7920-35

Time: **2:30 PM - 2:50 PM**

Author(s): DaeGwon Song, QSI Co., Ltd. (Korea, Republic of)

No abstract available

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Advantages offered by high average power picosecond lasers

Paper 7920-36

Time: **2:50 PM - 3:10 PM**

Author(s): Colin J. Moorhouse, Coherent Scotland Ltd. (United Kingdom)

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Novel 1.2kW UV Laser system for micro fabrication and annealing

Paper 7920-37

Time: **3:10 PM - 3:30 PM**

Author(s): Ludolf Herbst, Rainer Paetzl, Kai Schmidt, Coherent GmbH (Germany)

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Three-dimensional structuring inside transparent materials by a phase modulated fs laser beam with a LCOS-SLM (*Invited Paper*)

Paper 7920-38

Time: **3:30 PM - 4:00 PM**

Author(s): Masaaki Sakakura, Kiyotaka Miura, Kyoto Univ. (Japan); Tsutomu Sawano, New Glass Forum (Japan); Yasuhiko Shimotsuma, Kyoto Univ. (Japan); Kazuyuki Hirao, New Glass Forum (Japan)

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**Thursday 27 January**

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**Session 11: Photovoltaics/Energy Devices: Joint Session with Conference 7921**

Date: **Thursday 27 January**

Time: **3:35 PM - 5:35 PM**

Session Chair: **Yongfeng Lu**, Univ. of Nebraska-Lincoln

Recent status and prospects of the EU-funded ALPINE project (*Invited Paper*)

Paper 7921-26

Time: **3:35 PM - 4:00 PM**

Author(s): Stefano Selleri, Univ. degli Studi di Parma (Italy)

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The change of electrical properties of CIGS thin-film solar cells after structuring with ultrashort laser pulses

Paper 7921-28

Time: **4:00 PM - 4:15 PM**

Author(s): Anja Wehrmann, H. Schulte-Huxe, Martin Ehrhardt, Klaus-Peter Zimmer, Leibniz-Institut für Oberflächenmodifizierung e.V. (Germany); Alexander Braun, Steffen Ragnow, Solarion AG (Germany)

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Laser processing of organic photovoltaic cells with a roll-to-roll manufacturing process (*Invited Paper*)

Paper 7921-29

Time: **4:15 PM - 4:40 PM**

Author(s): Tino Petsch, Jens Hänel, Bernd Keiper, Maurice Clair, Christian Scholz, 3D-Micromac AG (Germany)

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Multi-spot laser processing of crystalline solar cells

Paper 7921-30

Time: **4:40 PM - 4:55 PM**

Author(s): Oliver Haupt, Viktor Schütz, Uwe Stute, Laser Zentrum Hannover e.V. (Germany)

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Innovative laser based solar cell scribing (*Invited Paper*)

Paper 7920-39

Time: **4:55 PM - 5:20 PM**

Author(s): Bruno Frei, Stefan Schneeberger, Reiner Witte, Solneva SA (Switzerland)

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Femtosecond laser doped silicon for photovoltaic applications

Paper 7920-40

Time: **5:20 PM - 5:35 PM**

Author(s): Meng-Ju Sher, Mark T. Winkler, Yu-Ting Lin, Eric D. Mazur, Harvard Univ. (United States)

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