

## Community

## Conference Notes

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## UKP Workshop: Say Farewell to Cold Ablation

Aachen, Germany, April 26–27, 2017



A substantial topic at the 4th UKP Workshop was heat transfer in ultrafast ablation. Thomas Graf (right) said: ‘We haven’t fully understood yet, how much heat is left from ultrafast pulses in the material’. (Copyright Fraunhofer ILT, Aachen).

On April 26 and 27, the 4th UKP Workshop: Ultrafast Laser Technology united about 150 experts from the academic and industrial ultrafast laser community in Aachen, Germany. The bi-annual workshop reflects the trends in this exciting field from basic research up to fully automated systems for manufacturing.

While everyone agrees on the benefits of ultrafast (aka, ultra-short pulse) lasers, namely, an extremely precise ablation without debris, there is much debate at the moment on how the new generation of high-power systems with up to 100 W can be used to drive productivity.

### It is fast and precise but not cold!

Beside productivity, some findings from the academic research were particularly exciting this year: Beat Neuenschwander from Bern University of Applied Science (Switzerland) and Thomas Graf from Stuttgart University

(Germany) showed experimental and theoretical evidence that the concept of cold ablation does not hold for high-power ultrafast laser processing of metals.

In fact, heat is deposited and transferred to the adjacent material from high repetition rate ultrafast pulses. Neuenschwander showed a lot of interesting experimental findings beyond that. For example, he found a maximum ablation efficiency for several metallic materials depending on the laser fluence.

Both scientists agreed on the fact that thermal effects are critical for ultrafast laser ablation in industrial applications. To retain benefits such as a very limited melt zone or debris-free processing, the laser parameters have to be selected carefully. Proper laser parameters have been investigated for materials such as copper or steel, but a complete description of the underlying physics and material science is currently not available.

### How to get the horse power on the road?

So far, ultrafast lasers have occupied some niche markets. Productivity is now seen as the key to larger markets. Today, big sources are available; the main obstacle is seen in the process and system technology for using such power on larger areas.

Two ways for enhanced productivity have been presented: fast scanners with more than 1000 m/s (Scanlab) and multi-beam solutions where patterns with up to 600 beams are generated out of one beam (Fraunhofer ILT). Both approaches are promising, but still under evaluation.

Another important trend is the use of special fibers for the flexible distribution of ultrafast laser beams. PT Photonic Tools presented photonic crystal fibers with a damage threshold of up to 1 GW/cm<sup>2</sup>. Additional effects such as beam shortening or frequency conversion will be available from gas-filled fibers.

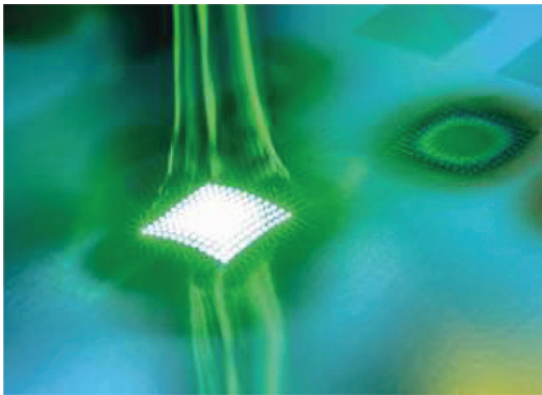
### Trends and applications

Two sessions were devoted to industrial applications. Fully automated systems for applications in semiconductor and glass processing were presented. One had two heads for more productivity (Manz AG), another one combined pico- and nanosecond lasers in one machine (GF

Machining Solutions). New applications are expected in texturing, structuring, and engraving on large surfaces for automotive, ICT, and packaging.

Still, a simple machine tool is missing as workshop organizer Arnold Gillner from Fraunhofer ILT pointed out in the end. It will be worth to watch for the next UKP workshop on April 10 and 11, 2019, as one major outcome of this year's workshop is that: The industrial application of ultrafast laser is just at the beginning.

(A modified version of this text has first been published with Laser Focus World).



Multi-beam solutions use diffractive optical elements (DOE) to generate a pattern of beamlets. Combined with zoom optics or even scanners they offer an attractive approach to increased productivity for ultrafast laser applications. (Copyright Fraunhofer ILT, Aachen).

## Preview: LASER world of Photonics 2017

Munich, June 26–29, 2017

LASER World of PHOTONICS, the international trade fair for the laser and photonics industry, has been held in Munich since 1973. Today, it is probably the biggest event related to the photonics industry and research in the world. Every 2 years, key players and decision-makers come to Munich to meet at 'the LASER', as it is called.

In 2015, the trade fair set a new record with 1227 exhibiting companies and 31,279 visitors. While they opened a new hall last time, the exhibition space will remain at 55,000 m<sup>2</sup> this year.

A number of related events accompany the trade show, most notably the World of Photonics Congress, held from June 25 to 29 in the Congress Center right beside the fairgrounds. There, several German, European, and American societies host almost a dozen conferences and workshops that will be introduced below. Independently, the

trade fair offers a comprehensive program of events on the fairgrounds, including several stages with full-day lecture and panel programs, several award ceremonies, and other events.

## Getting around the trade show

The fair occupies five halls at the Munich fairgrounds. After arriving through the west entrance, visitors may register for the fair or the congress and then enter the fairgrounds. The fair is separated into several exhibition sectors:

- Hall A2: Imaging, Sensors, Test and Measurement/Optical Measurement Systems
- Hall A2/A3: Lasers and Laser Systems for Production Engineering
- Hall B1: Optics/Manufacturing Technologies for Optics
- Hall B2/B3: Laser and Optoelectronics
- Hall B2: Biophotonics and Medical Engineering
- Hall B3: Optical Information and Communication
- ICM/Hall B0: World of Photonics Congress

What has changed? 'Lasers and optoelectronics' in B3 vanished; quite reasonably, it is all summed up under 'Optical Information and Communication' in Hall B3 this year.

Messe München is offering free wireless internet access (WiFi name: messeWifi) to all LASER World of PHOTONICS visitors at the trade-fair center. Bandwidth is up to 1.5 Mbit/s, and the download volume is limited to 50 MB per user per day.

## Five Special picks and tips for the exhibition

Primarily, the Laser World of Photonics in Munich is a trade show, but the organizers make considerable effort to make it a true community event. Beyond a simple walk through the halls, the visitor may find plenty of events to learn about recent trends or to meet interesting people. For those looking for new trends, they offer four stages in the halls with application panels and an almost continuous program. Those who go there to meet people may enjoy a number of parties such as the Bavarian evening (Monday 18:15), award ceremonies, and even a breakfast where a direct exchange is possible. The most difficult will be scheduling. Therefore, a few personal picks are shown here:

- Booth parties: Reserve your Tuesday afternoon for the booth parties. In recent years, TOPTICA Photonics AG (B2-103) built a reputation for the best booth party of the whole trade show. You cannot miss it.

- The Start-Up World in Hall B3 gives new, innovative companies from Germany and abroad an opportunity to present their products in front of the critical eye of industry professionals.
- The CEO Breakfast on Tuesday morning at 7:30. This invitation-only event is a good occasion for seeing and being seen and, of course, for making new contacts.
- ‘International Laser Marketplace’ organized by OPTTECH CONSULTING and LASER World of PHOTONICS will give an exclusive update on the world’s most important laser markets to CEOs and investors. It is a separate event with separate ticketing (475 €).
- The half-day symposium will revolve around latest trends in the laser markets, such as electromobility, Industry 4.0, and semiconductor manufacturing. Furthermore, the forum will focus on four key laser markets: China, India, Japan, and Turkey. It takes place on Wednesday, June 28, 12:45 to 17:00 at the Conference Room above the press center.
- Make Light MAKEATHON in Hall B3: A first-of-its-kind event that will bring together 80 smart minds, mainly students and young engineers. Different teams will develop innovative hard- and software in only 24 h, starting on June 27, 2017. Right afterward, a jury will award prizes for the best product.

More recommendations and some live impressions from LASER 2017 will be published on twitter at [https://twitter.com/photonics\\_news](https://twitter.com/photonics_news).

## Six conferences covering all of photonics

Through all the years, it has been a challenge to oversee the complex program of the World of Photonics congress. There are now six conferences including the new event on Digital Optical Technologies. Almost 3500 lectures and posters will be presented to probably more than 5600 participants. If that is not enough, there will be 16 application panels in the exhibition halls featuring nearly 100 practice-oriented presentations.

**CLEO®/Europe-EQEC 2017.** With 1705 presentations, the European Conference on Lasers and Electro-Optics and the European Quantum Electronics Conference (CLEO®/Europe-EQEC) is the largest, most comprehensive, and most prestigious gathering of optics and photonics researchers and engineers in Europe.

This conference invites for guided laboratory tours through selected Munich (Garching) Laser Laboratories.

Tours will take place on Friday morning, June 30, 2017 from 10:00 to 12:00.

Participants can sign up for the laboratory visits during the conference: sign up on lists will hang on the message board located in the corridor between Entrance West and ICM.

[www.cleoeurope.org/](http://www.cleoeurope.org/)

**Lasers in Manufacturing (LiM) 2017.** LiM is the place to go for laser material processing, including process engineering, system technology, and process optimization. LiM is organized by the German Scientific Laser Society (WLT). Beside a comprehensive program, they offer a LiM Get-together at Augustiner Bierkeller on Tuesday evening.

[www.wlt.de/lim/](http://www.wlt.de/lim/)

**EOS Topical Meetings.** The topical meetings organized by the European Optical Society (EOS) focus on the latest trends in the development, manufacture, and testing of optical components and optofluidics and deal with optomechanical and light engineering. In 2017, they include the following conferences:

- 5th Conference on Manufacturing of Optical Systems
- 4th Conference on Optofluidics
- 2nd Conference on Light Engineering
- 2nd Conference on Optomechanical Engineering (Merged into Manufacturing of Optical Systems conference)

[www.myeos.org/events/](http://www.myeos.org/events/)

**SPIE Optical Metrology.** Optical Metrology is organized by SPIE Europe. This year, they focus on 2017 Conference topics

- Optical Measurement Systems for Industrial Inspection
- Modeling Aspects in Optical Metrology
- O3A: Optics for Arts, Architecture, and Archaeology
- Videometrics, Range Imaging, and Applications
- Optical Methods for Inspection, Characterization, and Imaging of Biomaterials
- Automated Visual Inspection and Machine Vision

Highly recommended are two of their plenary presentations:

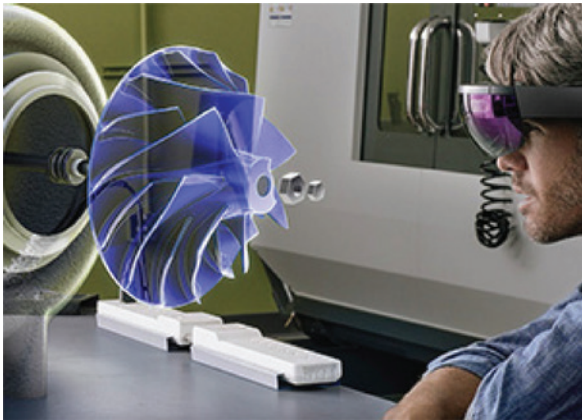
- Federico Capasso (Harvard University, USA) ‘Metasurface Diffractive Optics’
- Jörg Wrachtrup (University of Stuttgart, Germany) ‘Putting a Spin on Photons’

<http://spie.org/x6506.xml>

**New: SPIE Digital Optical Technologies:** Is a new conference focused on the components, systems design, and applications of emerging digital optical technologies in all social, academic, medical, and industrial areas.

The conference reflects trends in recent technologies such as 3D sensors, immersive multimedia, novel displays, light sources, and imaging systems. Digital optical technologies include optics designed by digital means, fabricated by digital means, with functionalities enhanced or altered by digital techniques (computational optics or dynamic optics).

<http://spie.org/conferences-and-exhibitions/digital-optical-technologies>



The new conference on Digital Optical Technologies offers an interactive personal demo session on Virtual Reality, Augmented Reality, and Mixed Reality (Image: SPIE).

**European Conferences on Biomedical Optics (ECBO).**

Sponsored by OSA and SPIE, the European Conferences on Biomedical Optics bring together scientists, engineers, and clinicians who work with optics and photonics to solve problems in medicine and biomedicine. This year's categories are:

- Clinical and Preclinical Optical Diagnostics
- Diffuse Optical Spectroscopy and Imaging
- Novel Biophotonics Techniques and Applications
- Advances in Microscopic Imaging
- Opto-Acoustic Methods and Applications
- Optical Coherence Imaging Techniques and Imaging in Scattering Media
- Medical Laser Applications and Laser-Tissue Interactions
- Head and Neck Optical Diagnostics and Intervention (held in conjunction with ECBO)

[www.osa.org/en-us/meetings/topical\\_meetings/european\\_conferences\\_on\\_biomedical\\_optics/](http://www.osa.org/en-us/meetings/topical_meetings/european_conferences_on_biomedical_optics/)

# Conference Calendar

## June

### 118. Annual Meeting DGaO

Dresden, Germany  
June 6–10, 2016  
[www.dgao.de/de/jahrestagung](http://www.dgao.de/de/jahrestagung)

### Laser Ignition Conference

Bucharest, Romania  
June 20–23, 2017  
[www.osa.org/Meetings/Topical\\_Meetings/Laser\\_Ignition\\_Conference](http://www.osa.org/Meetings/Topical_Meetings/Laser_Ignition_Conference)

### LASER World of Photonics

Munich, Germany  
June 26–29, 2017  
[www.laser.de](http://www.laser.de)

### European Conferences on Biomedical Optics (ECBO)\*

#### SPIE Optical Metrology\*

#### Lasers in Manufacturing (LiM 2017)\*

CLEO Europe\*  
Munich, Germany  
June 25–29, 2017  
[www.photonics-congress.com](http://www.photonics-congress.com)

### NEW: SPIE Digital Optical Technologies\*

Munich, Germany  
June 26–29, 2017  
<http://spie.org/conferences-and-exhibitions/digital-optical-technologies>

### EOS Optical Technologies\*

EOS Conference on Manufacturing of Optical Systems  
EOS Conference on Optofluidics  
EOS Conference on Light Engineering  
EOS Conference on Optomechanical Engineering  
Munich, Germany  
June 26–29, 2017  
[www.myeos.org/events/photonics-congress-2017](http://www.myeos.org/events/photonics-congress-2017)

\*AOT will be presented at the World of Photonics Congress, probably with a separate booth in the congress center. For more information, please contact us at: [contact@advanced-optics.org](mailto:contact@advanced-optics.org)

### OSA Imaging and Applied Optics Congress

3D Image Acquisition and Display: Technology, Perception, and Applications  
Applied Industrial Optics  
Computational Optical Sensing and Imaging  
Imaging Systems and Applications  
Mathematics in Imaging  
Propagation Through and Characterization of Atmospheric and Oceanic Phenomena  
San Francisco, CA, USA

June 26–29, 2017

[www.osa.org/Meetings/OSA\\_Meetings/Imaging\\_and\\_Applied\\_Optics\\_Congress](http://www.osa.org/Meetings/OSA_Meetings/Imaging_and_Applied_Optics_Congress)

## July

### OSA Optical Design and Fabrication Congress

International Optical Design Conference  
Optical Fabrication and Testing  
Freeform Optics  
Denver, CO, USA  
July 9–13, 2017  
[www.osa.org/en-us/meetings/osa\\_meetings/optical\\_design\\_and\\_fabrication/](http://www.osa.org/en-us/meetings/osa_meetings/optical_design_and_fabrication/)

### OSA Advanced Photonics Congress

Integrated Photonics Research, Silicon, and Nano-Photonics  
Novel Optical Materials and Applications  
Optical Sensors  
Photonic Networks and Devices  
Photonics in Switching  
Signal Processing in Photonics Communications  
New Orleans, Louisiana, USA  
July 24–27, 2017  
[www.osa.org/Meetings/OSA\\_Meetings/Advanced\\_Photonics](http://www.osa.org/Meetings/OSA_Meetings/Advanced_Photonics)

### 2017 CLEO Pacific Rim Conference

Singapore, Singapore  
July 31–August 4, 2017  
[www.osa.org/Meetings/Global\\_Calendar/Events/cleopr](http://www.osa.org/Meetings/Global_Calendar/Events/cleopr)

## August

### SPIE Optics + Photonics

San Diego, California, USA  
August 6–10, 2017  
<http://spie.org/x306.xml>

### International Conference on Group IV Photonics

Berlin, Germany  
August 23–25, 2017  
[www.photonicsociety.org/conferences/international-conference-on-group-iv-photonics](http://www.photonicsociety.org/conferences/international-conference-on-group-iv-photonics)

## September

### SPIE Security + Defense

Remote Sensing  
Warsaw, Poland  
September 11–14, 2017  
<http://spie.org/x124462.xml>  
<http://spie.org/x124461.xml>



**SPIE Photomask Technology + EUV Lithography**

Monterey, California, USA  
 September 11–14, 2017  
<http://spie.org/x6323.xml>

**FiO/LASER Science 101st OSA Annual Meeting**

Washington, DC, USA  
 September 17–21, 2017  
[www.frontiersinoptics.com/home/](http://www.frontiersinoptics.com/home/)

**5th EOS Topical Meeting on Blue Photonics**

Sopot, Poland  
 NEW: September 18–20, 2017  
[www.myeos.org/events/bluephotonics5](http://www.myeos.org/events/bluephotonics5)

**October****ASSL**

Nagoya, Japan  
 October 1–5, 2017  
[www.osa.org/en-us/meetings/global\\_calendar/events/advanced\\_solid\\_state\\_lasers/](http://www.osa.org/en-us/meetings/global_calendar/events/advanced_solid_state_lasers/)

**30th IEEE Photonics Conference**

Lake Buena Vista, Florida, USA  
 October 1–5, 2017  
[www.photonicsociety.org/conferences/ieee-photonics-conference](http://www.photonicsociety.org/conferences/ieee-photonics-conference)

**SPIE Optifab**

Rochester, New York, USA  
 October 16–19, 2017  
<http://spie.org/x6567.xml>

**FOC 2017 Frontier of Optical Coating**

Guangzhou, China  
 October 22–26, 2017  
<http://foc.tongji.edu.cn>

**32nd ASPE Annual Meeting**

Charlotte, North Carolina, USA  
 October 29–November 3, 2017  
<http://aspe.net/technical-meetings/32nd-annual-meeting/>

**November****OSA Light, Energy and the Environment Congress**

Optical Nanostructures and Advanced Materials for Photovoltaics (PV), Optics and Photonics for Energy & the Environment (E2), Optics for Solar Energy (SOLAR), Solid-State Lighting (SSL)  
 Boulder, Colorado, USA  
 November 6–9, 2017  
[www.osa.org/en-us/meetings/osa\\_meetings/osa\\_light\\_energy\\_and\\_the\\_environment\\_congress/](http://www.osa.org/en-us/meetings/osa_meetings/osa_light_energy_and_the_environment_congress/)

**The 22nd Microoptics Conference MOC2017**

Tokyo, Japan  
 November 19–22, 2017  
[www.moc17.com](http://www.moc17.com)

**2018****SPIE Photonics West**

San Francisco, California, USA  
 January 27–February 1, 2018  
 Exhibition: January 30–February 1, 2018  
<http://spie.org/pw>

**SPIE Advanced Lithography**

San Jose, CA, USA  
 February 18–22, 2018  
<http://spie.org/al>

**OFC**

San Diego, CA, USA  
 March 11–15, 2018  
[www.ofcconference.org](http://www.ofcconference.org)

**OSA Biophotonics Congress: Biomedical Optics**

Clinical and Translational Biophotonics Optics and the Brain Optical Tomography and Spectroscopy  
 Hollywood, Florida, USA  
 April 3–6, 2018  
[www.osa.org/en-us/meetings/osa\\_meetings/osa\\_biophotonics\\_congress\\_biomedical\\_optics/](http://www.osa.org/en-us/meetings/osa_meetings/osa_biophotonics_congress_biomedical_optics/)

**SPIE Defense + Commercial Sensing**

Orlando, Florida, USA  
 April 15–19, 2018  
<http://spie.org/dcs>

**SPIE Photonics Europe**

Strasbourg, France  
 April 23–26, 2018  
 Exhibition  
 April 24–25, 2018  
<http://spie.org/pe>

**AKL'18 International Laser Technology Congress**

Aachen, Germany  
 May 2–4, 2018  
[www.lasercongress.org](http://www.lasercongress.org)

**LASYS**

Stuttgart, Germany  
 June 5–7, 2018  
[www.lasys-messe.de](http://www.lasys-messe.de)

**SLT'18 – Stuttgart Laser Technology Forum**

Co-located with LASYS  
 Stuttgart, Germany  
 June 5–7, 2018  
[www.slt.uni-stuttgart.de](http://www.slt.uni-stuttgart.de)

**SPIE Astronomical Telescopes and Instrumentation**

Austin, Texas, USA  
 June 10–15, 2018  
<http://spie.org/astronomical-instrumentation.xml>

**IEEE RAPID Conference**

Research and Applications of Photonics In Defense Conference (RAPID)

Miramar Beach, Florida, USA

August 22–24, 2018

[www.photonicsociety.org/conferences/ieee-rapid](http://www.photonicsociety.org/conferences/ieee-rapid)

**SPIE Optics + Photonics**

San Diego, California, USA

August 19–23, 2018

Exhibition

August 21–23, 2018

<http://spie.org/op>

**SPIE Security + Defence**

Berlin, Germany

September 10–13, 2018

Exhibition

September 11–12, 2018

<http://spie.org/sd>

**FiO/LASER Science: 102nd OSA Annual Meeting**

Washington, DC, USA

September 16–26, 2018

[www.frontiersinoptics.com/home/](http://www.frontiersinoptics.com/home/)

**2019****SPIE Photonics West**

San Francisco, California, USA

February 2–7, 2019

Exhibition: February 5–7, 2019

<http://spie.org/pw>

**SPIE Advanced Lithography**

San Jose, California, USA

February 19–22, 2019

**5. UKP-Workshop**

Aachen, Germany

April 10–11, 2019

**SPIE Optifab**

Rochester, New York, USA

October 14–17, 2019