

## Optoelectronics trends at LASER World of PHOTONICS 2015

### **Trends Ultra short pulse laser goes on - From molecule blasting via photon counters to piezo positioning**

Ultra short pulse lasers have already broken through into automotive industry production processes. Microprocessing entails their laser pulses, lasting billionths of a second, blasting individual molecules out of metals without melting the adjacent material. Such picosecond lasers almost clinically excavate bead and burr-free furrows in steel, progressing with astonishing speed thanks to the high frequency, energy charged pulse. Not just picosecond lasers but femtolasers as well are gaining ground. Laser developers are even exploiting the attosecond range, in which light pulses are of less than one billionth of a second duration. In the staccato of the attosecond pulses it is possible to observe such things as how chemical compounds come into being.

### **Super-resolved fluorescence microscopy made possible by laser tools**

Lasers are also the key to so-called STED microscopy, the resolution of which is making inroads into the sub 50 nm range. To achieve that notwithstanding the use of beam sources with a typical wavelength of around 640 nm, the challenge is to outwit physics, as this gained the Nobel Prize for Chemistry 2014. To achieve this, the developers use switchable fluorescent dyes to severely limit the visual field – and then make numerous successive scans of this area. Software merges the individual scans into an overall image. It is only this trick that enables resolution beyond the diffraction limit. Laser and optoelectronic developers contribute the tool: picosecond laser diodes in various wavelength ranges including the control technology, plus photon counters, high-precision optics and the scanner's galvo and piezo drives.

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### **Energetically excitable materials important for laser technologies**

Positioning systems based on piezo ceramics, which suffer minimal deformation when an electric voltage is applied, and can therefore be used as nm-precision drives, are indispensable for high resolution imaging.

There is also a second group of energetically excitable materials that plays a critical role in laser technology: thermoelectric materials. They convert the abundant waste heat from high performance diodes into electricity. Immediately evacuating the heat by means of the semiconducting Peltier elements directly on the diodes is deemed to be key to the reliable long term use of energy-efficient high-power laser diodes in industrial processes.

### **Lasers are taking surgery and measurement technology into new dimensions**

The use of efficient semiconductor diodes is still less prevalent in material processing than it is in measurement technology and image processing in industrial quality control. Sometimes they project light patterns on car body parts, which camera systems then use to check complex geometries within milliseconds, detecting even variances in the micrometer range in the process. At other times they help wafer and microchip manufacturers with the high end tuning of their production equipment. Or doctors use them to position patients for diagnosis using imaging processes. With robot-assisted teeth implants or eye operations lasers ensure unprecedented precision.

For almost two years, leading eye clinics in Germany have been operating on cataract patients using femtosecond lasers. The femto pulses in the near infrared range and automated incision enable far more accurate, finer incisions than by human hand. Wounds heal dramatically quicker. Complications are avoided. This application involves the use of diode-pumped solid-state lasers or fiber lasers.

### **Beam sources: diversification of the technology mix forges ahead**

Whether gallium nitride (GaN)-based UV laser diodes required for the energy-efficient hardening of paints or for sterilizing drinking water and surfaces. Whether green laser

diodes (560 nm) pulsed in the picosecond range, which biochemical analysts and quality controllers in the semiconductor industry have long dreamed of Whether red high power diodes (670 nm) in the power range to 2 Watt peak, 18 Watt diodes in the spectral range around 980 nm for medical technology or aerospace users or yellow luminescent diodes in the spectral range between 1100 and 1200 nm - there are reports of increases in the technology mix almost weekly.

The manufacturers are bringing their low cost Fabry-Pérot diodes, their brilliant distributed feedback (DFB) diodes or Bragg reflection DBR diodes in the various power, wavelength and frequency classes to bear on user requirements.

The development of conventional laser technologies is making progress as well. New fiber lasers, delivering femtosecond pulses in a number of excitation wavelengths are considered to be a compact and cost-efficient alternative to titanium-sapphire lasers. The market for continuously tunable lasers, ensuring highly accurate analyses, especially in spectroscopy, is also becoming more broadly based. This is an area in which diode lasers have ensured a discernible boost to competition between processes. And in the detection and filtering, from the deep-UV to terahertz range and with photon counters as well, technological diversity and brilliance are progressing in tandem.

Fotos at: [http://www.world-of-photonics.com/trade-fair/for-the-press/newsroom/press-releases/press-release\\_50112.html](http://www.world-of-photonics.com/trade-fair/for-the-press/newsroom/press-releases/press-release_50112.html)

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#### **About LASER World of PHOTONICS**

The LASER World of PHOTONICS trade fairs and their congresses are the most important marketplaces and think tanks for the worldwide laser and photonics industry and its users. They combine research and applications and promote the utilization and further development of optical technologies.

Messe München International has held [LASER World of PHOTONICS](#) every two years since 1973. The fair was the first event to focus on the sector for optical technologies in the world.

At the same time the World of Photonics Congress - Europe's largest and the world's third biggest photonics congress - is held in cooperation with the world's leading organizations in this field.

A spin-off event, [LASER World of PHOTONICS CHINA](#), is the leading regional trade show for optical technologies in China. It takes place in Shanghai every year, in spring. The [LASER World of](#)

[PHOTONICS INDIA](#) takes place since 2012 every year and is a regional trade fair for optical technologies in India.

With a total of **1,860 exhibitors and more than 70,000 visitors** in Munich, China and India, Messe Muenchen International is the world's leading trade show organizer for lasers and photonics.

The websites at [Uwww.world-of-photonics.com](http://www.world-of-photonics.com) feature information on the photonics trade shows, industry information, product innovations, and application reports and are a virtual platform for optical technologies.

#### **About the conference program at the World of Photonics Congress**

The world's leading scientific organizations in the field of photonics will organize conferences under the umbrella of the World of Photonics Congress from June 21 until 25, 2015:

- "CLEO/Europe-EQEC", organized by the European Physical Society (EPS), sponsored by the EPS Quantum Electronics and Optics Division, OSA, IEEE/LEOS
- "Optofluidics", "Manufacturing of Optical Components" and "Advanced Optomechanical Engineering", organized by the European Optical Society (EOS)
- "LiM - Lasers in Manufacturing", organized by the Scientific Laser Society (WLT);
- "ECBO - European Conference on Biomedical Optics", organized by the Optical Society of America (OSA) and the International Society for Optics and Photonics (SPIE)
- Optical Metrology, organized by SPIE Europe

The conference program is rounded out by application panels featuring practical lectures about laser and photonics applications organized by Messe München.

#### **Messe München International**

Messe München International is one of the world's leading trade show companies. In Munich alone it organizes around 40 trade shows for capital and consumer goods, and key high tech industries. Each year more than 30,000 exhibitors and around two million visitors take part in the events held at the Messe München exhibition center, the ICM – International Congress Center München, and in the MOC Veranstaltungszentrum München. The leading international trade fairs of Messe München International are all independently audited. In addition, Messe München International organizes trade shows in China, India, Turkey and South Africa. With a combination of affiliates abroad – in Europe, Asia and in Africa – and over 60 foreign representatives actively serving over 100 countries, Messe München International has a worldwide business network. The Group also takes a pioneering role as regards sustainability: It is the first trade-fair company to be awarded energy-efficiency certification from the technical inspection authorities TÜV SÜD.

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