



# LIA TODAY

THE OFFICIAL NEWSLETTER OF THE LASER INSTITUTE OF AMERICA  
The international society dedicated to fostering lasers, laser applications and laser safety worldwide.

FOCUS: INDUSTRIAL LASERS | VOLUME 20 NO. 5 | SEPTEMBER / OCTOBER 2012

Photo Courtesy of Cincinnati Incorporated - CL-850 5000 Watt CO2 Laser Cutting System

## LME<sup>®</sup> 2012 LASERS FOR MANUFACTURING EVENT™

The Industry's Leading Arena  
for Laser Processing Needs

pg. 6



Laser Beam Welding  
with High Frequency  
- pg. 10



Wavelength Dependency  
in High Power Laser Cutting  
- pg. 12



ICALEO 2012 Presents the  
Latest in Laser Materials  
Processing Research  
- pg. 16



Laser Institute  
of America

*Laser Applications and Safety*

# LIA TODAY

THE OFFICIAL NEWSLETTER OF THE LASER INSTITUTE OF AMERICA

LIA TODAY is published bimonthly to educate and inform laser professionals in laser safety and new trends related to laser technology. LIA members receive a free subscription to LIA TODAY and the *Journal of Laser Applications*<sup>®</sup> in addition to discounts on all LIA products and services.

The editors of LIA TODAY welcome input from readers. Please submit news-related releases, articles of general interest and letters to the editor. Mail us at LIA TODAY, 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826, fax +1.407.380.5588, or send material by email to lia@lia.org.

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## ABOUT LIA

Laser Institute of America (LIA) is the professional society for laser applications and safety. Our mission is to foster lasers, laser applications and laser safety worldwide.

We believe in the importance of sharing new ideas about lasers. In fact, laser pioneers such as Dr. Arthur Schawlow and Dr. Theodore H. Maiman were among LIA's original founders who set the stage for our enduring mission to promote laser applications and their safe use through education, training and symposia. LIA was formed in 1968 by people who represented the heart of the profession—a group of academic scientists, developers and engineers who were truly passionate about taking an emerging new laser technology and turning it into a viable industry.

Whether you are new to the world of lasers or an experienced laser professional, LIA is for you. We offer a wide array of products, services, education and events to enhance your laser knowledge and expertise. As an individual or corporate member, you will qualify for significant discounts on LIA materials, training courses and the industry's most popular LIA conferences and workshops. We invite you to become part of the LIA experience – cultivating innovation, ingenuity and inspiration.

## IN THIS ISSUE

### FEATURES

LME 2012.....	6
Laser Beam Welding.....	10
High Power Laser Cutting.....	12
ICALEO 2012.....	16
LASER CHINA 2013.....	20

### DEPARTMENTS

Calendar of Events.....	2
Executive Director's Message.....	5
President's Message.....	5
Corporate Member Profile.....	24
ASC Z136 Update.....	26
BLS Update.....	27
Laser Insights.....	28
JLA Update.....	29
Members in Motion.....	30
Member Innovations.....	30
Welcome Corporate Members.....	31
LIA Announces.....	31

### ADVERTISERS

Aerotech, Inc.....	17
AdlOptica GmbH.....	14
ANSI Z136.8.....	26
Board of Laser Safety.....	27
Fraunhofer USA, CCLA.....	7
ILSC 2013.....	29
IPG Photonics.....	32
Kentek Corporation.....	3
Koolant Coolers, Inc.....	21
LAM 2013.....	4
LASER CHINA.....	22
LASER MUNICH.....	14
Laserline Inc.....	13
LaserStar Technologies.....	15
LASERVISION USA.....	25
Liburdi Automation, Inc.....	14
Mecco Marking & Traceability.....	21
Newport Corporation.....	21
PennWell (ILS/LFW).....	28
Photomachining, Inc.....	22
Photonics Media.....	25
Precitec, Inc.....	23
Rockwell Laser Industries.....	11
SCANLAB America, Inc.....	22
TRUMPF, Inc.....	9

### CALENDAR OF EVENTS

#### Laser Safety Officer Training

Dec. 4-6, 2012	Orlando, FL
Feb. 26-28, 2013	San Diego, CA
June 25-27, 2013	Indianapolis, IN

#### Laser Safety Officer with Hazard Analysis\*

Nov. 5-9, 2012	San Antonio, TX
Jan. 28-Feb. 1, 2013	Orlando, FL
Mar. 11-15, 2013	Phoenix, AZ
June 10-14, 2013	Niagara Falls, NY

\*Certified Laser Safety Officer exam offered after the course.

#### Medical Laser Safety Officer Training\*

Oct. 20-21, 2012	Chicago, IL
Feb. 9-10, 2013	San Antonio, TX
Mar. 2-3, 2013	San Diego, CA
Mar. 16-17, 2013	Orlando, FL

\*Certified Medical Laser Safety Officer exam offered after the course.

#### Laser Welding & Joining Workshop

Oct. 23-24, 2012	Schaumburg, IL
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#### Lasers for Manufacturing Event (LME<sup>®</sup>)

Oct. 23-24, 2012	Schaumburg, IL
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#### Laser Additive Manufacturing Workshop (LAM)

Feb. 12-13, 2013	Houston, TX
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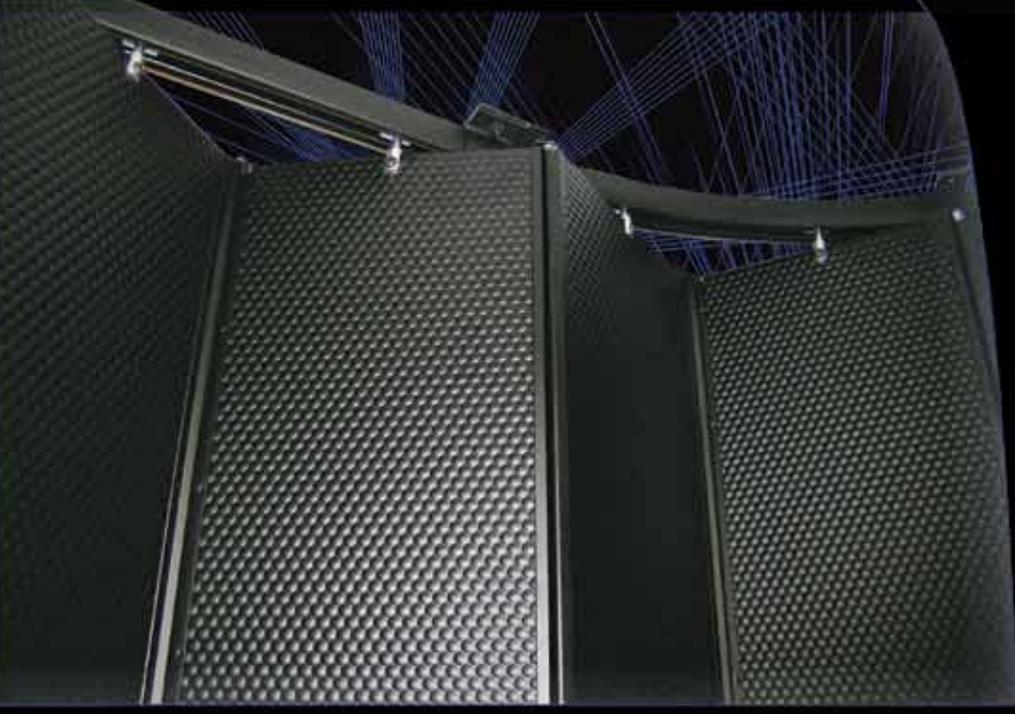
#### International Laser Safety Conference (ILSC<sup>®</sup>)

Mar. 18-21, 2013	Orlando, FL
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#### International Congress on Applications of Lasers & Electro-Optics (ICALEO<sup>®</sup>)

Oct. 6-10, 2013	Miami, FL
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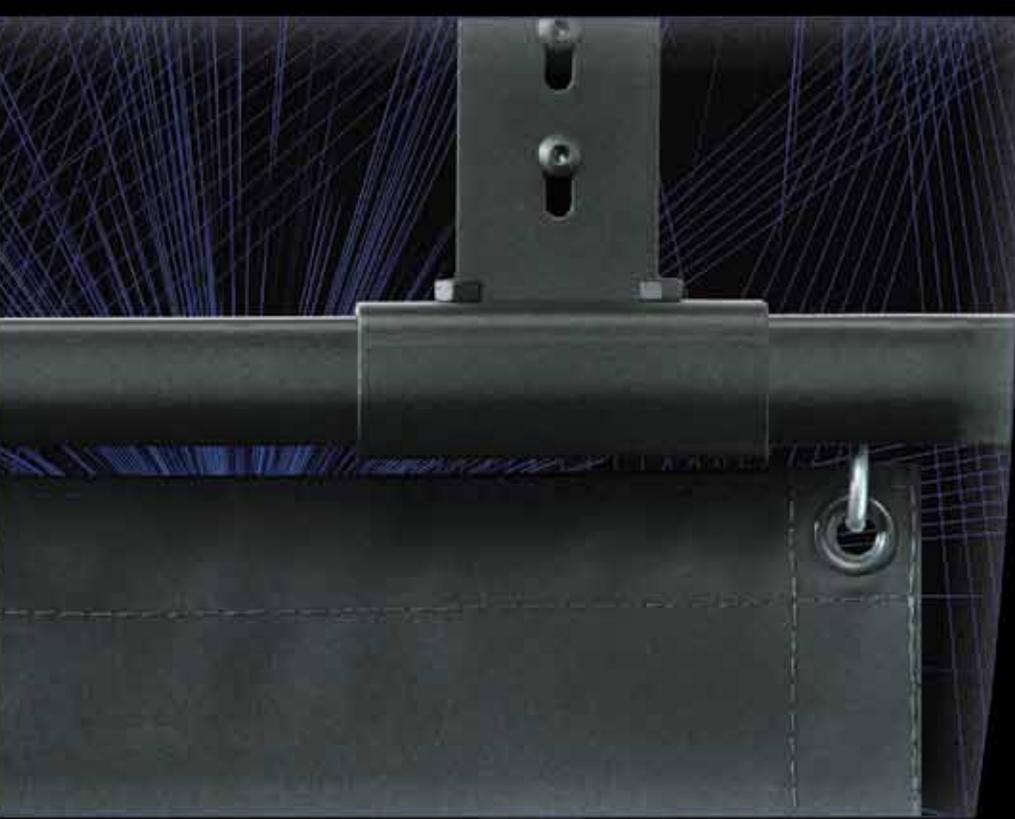
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The Next Era of U.S.  
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Photo courtesy of Fraunhofer ILT, Aachen, Germany / Volker Lannert



- Laser Additive Manufacturing (LAM)  
- A paradigm change in future manufacturing?
- Process and Supply Chains & CAX Framework
- Digital Manufacturing for Medical and Dentistry
- International Markets
- Powders
- Surface Tailoring
- Success Stories (Maintenance, Repair, Overhaul, Under Water Cladding, Economics and more...)



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## PRESIDENT'S MESSAGE



Dear LIA members, friends, colleagues and readers,

This issue of *LIA TODAY* is dedicated to the industrial side of the organization. One of the motivations for an increase of activity in this domain is the well-known decline of manufacturing in the U.S. Currently, only 13 percent of the US-GDP is covered by manufacturing; the corresponding number in China is – depending on the year –

around 35-40 percent! Consequently, the long standing U.S. trade deficit presently cruises at a level of approximately \$550 bn. per year, and, even more alarming, the trade balance for high tech products, which has been positive until 2001, has now fallen into the red at a level of \$100 bn. annually.

In this issue, besides very interesting application information on joining and the wavelength influence on laser cutting, a preview on the LIA's Lasers for Manufacturing Event (LME®) in Chicago is given. The event focuses on the industrial world of suppliers and users of laser technology, and thus is a very efficient and hopefully effective format. It is designed for visitors, who do not really care about the details of how the things work, but take the challenge of establishing and innovating U.S. manufacturing for the benefit of their enterprises as well as for the country – a true challenge. LIA wants to do its best to support these activities and the LIA President will support it by being there and giving tutorials and training personally.

I wish you good health, success and today especially, good business!

Sincerely Yours,



Reinhart Poprawe, President  
Laser Institute of America

*Sources:*

*Census Bureau*

*Frankfurter Allgemeine Zeitung: Niebel 14.8.2012*

*National Network for Manufacturing Innovation NNMI*

## EXECUTIVE DIRECTOR'S MESSAGE

### LIA's Application Strategy Bears Fruit

LIA's third strategic guidestar is "LIA will adapt and package its laser application and safety knowledge and become a preferred source for the global laser community."

The first manifestation of this was five years ago when we launched our successful workshop on Laser Additive Manufacturing (LAM), which is now being touted as the future of manufacturing. It has recently attracted U.S. government support, so grant money is forthcoming and consortia are springing up.

This year will see our second Lasers for Manufacturing Event (LME®), which helps traditional manufacturing people understand the value of lasers, learn which application areas are viable and connects them with the laser and system manufacturers who can help them introduce laser technology into their own manufacturing operation.

This year we have significantly increased the education component of LME by increasing the 101 courses, adding some 102 courses, adding tutorials on laser welding and joining and ultrafast manufacturing, as well as presenting our first Laser Welding & Joining Workshop.

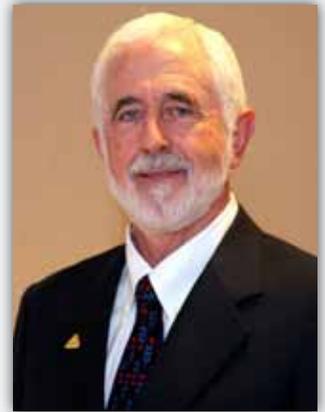
Of course, the thousand or so attendees at LME represent a small fraction of the people who should benefit from the LME educational program, so we are planning to capture this vital content and package it as a series of online courses to benefit a wider audience.

As you can see, we are working diligently to carry out our mission to "foster lasers, laser applications and laser safety, worldwide."

Attend LME and see for yourself!



Peter Baker, Executive Director  
Laser Institute of America  
pbaker@lia.org



# LME 2012 – THE INDUSTRY’S LEADING ARENA FOR LASER PROCESSING NEEDS

By Geoff Giordano



What a difference a year makes. In 2011, the Laser Institute of America unveiled its one-of-a-kind Lasers for Manufacturing Event (LME®) to an enormously enthusiastic response. The two-day gathering in the cradle of U.S. manufacturing proved a vital one-stop resource for engineers, job shops, automotive and aerospace specialists — anyone keen on adding the production power, efficiency and cost-effectiveness of laser systems to their processes.

Now LIA, the recognized authority in laser applications, safety and research since 1968, has fired up round two of LME in a big way — with an expanded educational program including new fundamentals courses, a pair of two-hour tutorials detailing the basics of welding and joining and ultrafast machining, and a companion two-day Laser Welding & Joining Workshop.

Another first on the show floor this year will be the presence of working laser systems. Now, not only can attendees talk directly with a show floor full of experts knowledgeable in every aspect of laser-based manufacturing, they can witness first-hand what these systems can achieve. Add to that the return of the highly popular Laser Technology Showcase, where exhibitors can share insights into their approaches with laser technology, and the stage is set for another information-packed session.

LME, returning to the Renaissance® Convention Center Hotel in Schaumburg, IL, Oct. 23-24, is unique to the laser industry in that it focuses exclusively on providing an overview of every conceivable aspect of choosing lasers for manufacturing, creating production systems, operating them safely — and realizing a solid profit.

Unlike other shows, LME offers a concentrated experience “where you can walk through and go right from the people doing advanced research and development — companies like Fraunhofer and EWI — then see every ingredient you need to put a laser into manufacturing, including the robots, the chillers and the coordinate machines,” explains Bill Shiner, vice president of industrial market sales at IPG Photonics in Oxford, MA. “You can go through, and in a very short period of time, understand not only what you need, but get an opportunity to talk to people about applications and see what the equipment looks like.”

Not only does LME draw a technical audience, but it also

attracts small company presidents, engineers who make buying decisions — industry players ready to take advantage of the bold leaps lasers can make in terms of cutting material usage, costs and time.

## GET UP TO SPEED

Among LME’s benefits is the ability to hear some of the top minds in the laser industry provide highly focused presentations on laser fundamentals.

Once again, LIA has slated recognized speakers to address key areas in the “101-level” basic courses covering the types of lasers used in manufacturing, laser system components and options, return on investment and laser safety. Besides these “101-level” courses, LIA has added three “102-level” courses to address the fundamentals of laser cutting, robotics and additive manufacturing.

In addition, four other experts will share up-to-the-minute insights into major applications and markets, requirements for the automotive industry, and the impact of lasers in manufacturing for the aerospace and plastics industries.

And after those sessions are completed, attendees can follow up on the exhibition floor at the “Ask a Laser Expert” booth manned by Rob Mueller of NuTech Engineering and a team of industry experts.

## PROFIT WITH PHOTONICS

The momentum behind this lineup is the wealth of opportunities presenting themselves in a number of industries.

“The automotive industry is very, very hot — direct automotive as well as the tier 1 and tier 2 companies,” notes Shiner. “There’s a huge market developing that never existed. Worldwide, people are converting to high-strength steel. You can’t stamp it; you’ve got to use either plasma or laser. And lasers greatly outshine plasma machines in speed and quality.”

Add to that the fact that weight reduction of components — and hence final products — is a significant goal of today’s carmakers, who are employing lasers in the manufacture of seats, electric car batteries and other components. “People aren’t just replacing lasers to increase production,” Shiner says. “New material is making them make new capital investments. That benefits people who make beam-delivery equipment, motion equipment and robotics.”

In the meantime, aerospace “is in a buying mode because there’s a world shortage in hole-drilling capability, and they’re extremely interested in newer lasers as they expand production,” Shiner continues. “Aerospace hasn’t made a major investment, probably for a decade, in drilling and cutting machines. But now they’re looking at these new lasers.” And for makers of medical devices, the ability of lasers to join plastics is a continuing boom.



LME 2012 will feature an expanded educational program including tutorials.

*LME con't on page 8*



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## NEXT-LEVEL INSTRUCTION

Taking the fundamentals track several steps farther, LIA has added two tutorials to the LME program to highlight the basics of ultrafast laser machining and the critical aspects of laser welding and joining. So vital is the latter topic to a diverse array of industries that a separate two-day workshop will run concurrently with LME 2012.

### LASER WELDING & JOINING WORKSHOP

Chaired by Prof. Eckhard Beyer of Fraunhofer IWS, LIA's Laser Welding & Joining Workshop will appeal to representatives from the aerospace, defense, automotive, energy and medical industries. The extensive agenda will give attendees a comprehensive look at current practices and future applications for cladding, brazing and different types of laser welding — conduction, penetration, hybrid and remote, as well as macro and micro applications.

Beyer and his team have assembled a schedule of 18 presentations by “industrial research experts to give a sound overview of laser basics and current developments,” he says. “End users with longstanding experience will present their solutions to the typical challenges of laser applications.”

While laser welding is relatively traditional process, newer and better lasers and systems are greatly advancing its possibilities.

“We still see a big impact of the tremendous rise in beam quality and energy efficiency,” Beyer claims. “Here the application fields are expanded in many ways: ultra-low distortions or the realization of new mixed-material joints like copper-aluminum using precisely shaped weld pools. Also, remote-beam applications are now standard; that was a field restricted to expensive high-brightness lasers just a few years ago. Furthermore, laser size reduction is a key development: Many lasers are now so small that machine integration is much simpler and can be done in a way not possible before.”

Attendees will learn from the perspectives of large companies like GE, as well as integrators and research experts, according to Dr. Gunther Göbel, a special joining technologies expert with Fraunhofer IWS.

For example, “ESAB will give us insights into the impact of lasers in heavy industry and how it is changing this industry from essentially low-tech, high-craft operations to more high-tech, low-cost production,” Göbel notes.



**LME is the place to get new ideas and application questions answered by industry-leading companies.**

Göbel and Jens Standfuss will address the welding of mixed materials using high brightness lasers — a vital application in the automotive industry.

“A very prominent example is still the powertrain industry,” Göbel explains. “This also includes off-highway drivetrain components. In this domain, the laser is a very important tool as it enables significant advances: higher productivity, higher efficiency, low heat input, low distortion, etc.”

Attendees of LME will have exclusive access to expertise in a special two-hour tutorial on the basics of ultrafast laser machining taught by Prof. Reinhart Poprawe of Fraunhofer ILT, president of the LIA, who is no stranger to pushing the boundaries of laser manufacturing. Having earned

Aviation Week's 2012 Innovation Challenge award for producing a vital multiblade compressor component far faster and more cheaply with lasers than with traditional milling, he is at the forefront of exploring the fast-improving technology. Groundbreaking achievements in the context of ultrashort laser processing at ILT in Aachen are world records in fs-lasers, industrial systems in the kW-class have been developed and are available in the market now via spin offs like EdgeWave or Amphos. The outstanding characteristics in terms of precision immediately are convincing.

“The development of ultrafast lasers on an industrial scale, with pulse durations of 100 femtoseconds to 10 picoseconds and powers up to the kilowatt class, has led to a new level of laser processing — with ultimate processing quality,” Poprawe explains.

Poprawe's tutorial at LME will feature technical examples of the technology as well as a survey of fundamentals, the processes, systems, materials and applicable markets. The target audience of engineers and scientists from machine suppliers and end users will learn the advantages and potential of the technology.

“Manufacturers of ultrafast lasers and optical systems will learn about the requirements on system technology with respect to laser parameters and processing parameters,” Poprawe says. “Users of precision machining applications with accuracies in the range of 10 microns and below should attend to learn how this new technology could improve the performance of existing components by adding functions through laser-based surface functionalization or how ultrafast laser machining could lead to new high-precision products. Ablation rates of the order of 10 mm<sup>3</sup>/s have been demonstrated and shall be presented.”

Starting with the physical basics of ultrashort pulse interaction phenomena, the tutorial will survey a broad array of



**New laser systems and processes will be on display during LME, including working lasers.**

applications — tool and molding, automotive engine components, LED and OLED light-guiding systems, photovoltaics and energy storage, biomedical applications and general surface processing. In addition, various approaches for setting up ultrashort pulsed lasers will be addressed, as will system requirements for high-speed scanning and modulations systems.

## LME: LIKE NO OTHER LASER EVENT

LME, being held once again in proximity to many of the top automakers and laser job shops in the U.S., is geared to be one-stop shopping for those either seeking to refine current laser systems and applications or assessing potential new ways to employ photonics in production.

“As many laser manufacturers and system builders are engaged in the workshop, this would be an ideal opportunity to get application-related questions answered and get new ideas on how to use lasers,” Beyer notes. “We are going to unite many people from the laser community who were and are shaping the way the world of lasers is today. This will make it possible to address lasers from basics to high-end applications.”

At the inaugural LME in 2011, auto manufacturers were out in force.

“I had one guy asking about a battery welding application (and another guy asking about glass processing; they do automotive glass mirrors and asked about laser scribing,” Mueller recalls from manning the expert booth in the exhibit hall. “There are enough

lasers in automotive now that they’re starting to look around and go, ‘OK, where else can I do it?’ Management is comfortable to a certain extent with existing applications; now we can look around a bit farther.”

One of those auto-industry attendees was Octavio Islas, an automotive product engineer with Magna/Cosma in Mexico. For him, LME is “a good opportunity for everybody to learn about all the technologies in the same place. You can get a lot of information from all the suppliers. If you have any specific requirement, you have people with a lot of knowledge and experience, and they can tell you about your application and all the details.”

For attendees and exhibitors alike, LME creates a powerful networking environment.

“We’re seeing new blood at this exhibition,” asserts Shiner, who had a significant role in crafting the inaugural LME and chairs the committee that oversees LME. “I’m seeing people I didn’t even know.”

The thing to remember in the laser processing arena, he counsels, is that, “Almost any machine for production is a custom design; you have to listen to the customer.” With LME, the industry now has the perfect venue for those conversations to take place. ■

*Geoff Giordano is a freelance writer.*



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# LASER BEAM WELDING WITH HIGH FREQUENCY

By Mathies Kraetzsch

Copper is known for its excellent electrical properties that make it predestined for the production of cables and electrical connections. Aluminum, which is lighter and cheaper than copper, also provides very good electrical properties. The Fraunhofer IWS Dresden has set the task to join both materials in a professional and long-lasting way. Some approaches could be developed. They provide solutions for a multitude of joining tasks that are demanded in the field of electromobility.



**Electric car model**

© Secret Side – Fotolia.com

## LASER BEAM WELDING

Laser beam welding stands for efficient joints with optimized weight and performance properties. A multitude of different materials and their combinations can already be welded by laser, e.g., aluminum/steel or cast iron/case-hardened steel. The researchers of the Fraunhofer Institute for Material and Beam Technology IWS Dresden have now developed a technology that enables the laser welding of mixed materials such as aluminum/copper, aluminum/magnesium or stainless steel/copper with clearly better qualities.

The improvement results by the benefits of brilliant laser beam

sources and using a highly dynamic 2D scanner with high scanning frequencies (up to 2.5 kHz max.). The system and a number of technological parameters have been developed within the BMBF funded joint project WELDIMA.

Brilliant laser beam sources in connection with a high frequency beam oscillation make it now possible to join metallic material combinations, which have been conventionally non-laser weldable up to now. It concerns especially such



**Laser beam welding of Al-Cu compounds (process).**

© Fraunhofer IWS Dresden

combinations like Al-Cu, where brittle intermetallic phases occur. Extreme small weld seam with high aspect ratio leads to very short melt pool life time. These allow an extensive reduction of the heat input. On the other side, the melting behavior at metallic mixed joint, seam geometry, chemical composition, melt pool turbulence and solidification behavior can be influenced by a high frequency time-, position- and power-controlled laser beam oscillation.

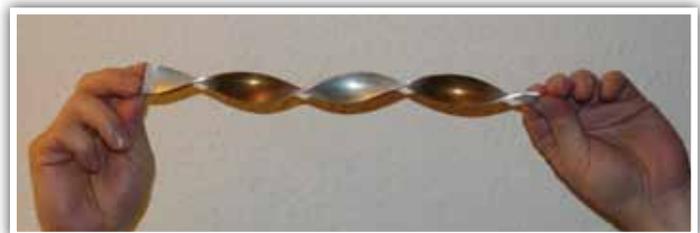
An additional lateral beam shifting in the welding joint region allows the control of the mixing ration of both material partners. In combination with structural analysis, the width of the intermetallic phase seam with unwanted intermetallic joints, generated in the weld, can be specifically set. The smaller the intermetallic phase seam, the lower the tensile strength of the welded joints. For the aluminum/copper compounds welded at IWS with a highly dynamic beam scanner, phase seam values less than  $10\ \mu\text{m}$  have been measured. The tensile strength of the compound achieves the same values as the similar joint aluminum/aluminum and, after all, 70 percent of the non-affected basis material.

## LASER INDUCTION ROLL PLATING

The generation of Al-Cu interconnections for the packaging of lithium ion cells is a focal point of the research project DeLIZ. The researchers in Dresden are developing a new laser induction roll process for industrial use. This process combines the advantages of cold and hot roll cladding and enables large-area material joints of bands made from aluminum and copper.

During the process, a laser beam heats the inner surfaces of the metal bands immediately after induction preheating. Thereby, the deformation in the roll gap is largely localized to the (very limited) highly heated volume. Under the influence of the roll pressure, permanent, precise and interface-free transition joints can be generated between the metal bands. Analytical investigations have shown that the formation of the welding zone can be substantially influenced by the choice of the process parameters. The intermetallic phases which are typical for aluminum/copper interconnections can be avoided completely. The band plated at rolling speeds up to  $8\ \text{m}\ \text{min}^{-1}$  can be well deformed in the roll-plated state and directly finished. The measured shearing strengths of the compound were on the order of 30 to 40 MPa. ■

*Mathies Kraetzsch is an engineer for Fraunhofer IWS Dresden in the Welding Group.*



**Roll plated and twisted band made from aluminum and copper.**

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# WAVELENGTH DEPENDENCY IN HIGH POWER LASER CUTTING

By Stephen Ziermann and David Havrilla

Laser cutting and welding have been around for more than 30 years. Within those three decades there has never been a greater variety of high power laser types and wavelengths to choose from than there is today. There are many considerations when choosing the right laser for any given application. However, one of the most fundamental questions that must be asked and answered is - "what type of laser is best suited for the application?"

Manufacturers and users alike are realizing what, in retrospect, may seem obvious – there is no such thing as a universal laser. This article will examine the application fields of high power, high brightness 10.6 and 1 micron laser 3D cutting, and will provide general guidelines for selecting the laser that is best suited for each application. Processing speed and edge quality serve as the key criteria.

Before investigating the cutting performance on the most common industrial metals, it is important to note that both the 10.6 and 1 micron lasers have their niches. The CO<sub>2</sub> laser continues to reign over several applications. We can start with the obvious niches – polymers, glass, wood, paper, fabric and other non-metallic materials. The longer wavelength of the carbon dioxide laser simply absorbs much better into these materials compared with the disk or fiber lasers. Of course, the 1 micron lasers have their absorption niches as well. These lasers open the door to processing highly reflective materials such as copper, brass and gold.

The direct comparisons presented below, however, will consider the most common industrial materials – mild steel and stainless steel. Speed and cut quality (roughness, dross and burr) will be compared using a 3 kilowatt disk laser (TruDisk 3001) with 1.03 mm wavelength and a 5 kilowatt CO<sub>2</sub> laser (TruFlow 5000) with 10.6 mm wavelength. The focus conditions for both lasers are comparable.

As a rule of thumb it can be said that the cutting of mild steel with oxygen assist gas is very similar for 1 and 10.6 micron lasers at the same laser power. Surface roughness for material thicknesses exceeding 4 mm are comparable, but for thinner materials, the 1 micron cutting quality is even higher than the already excellent

CO<sub>2</sub> results (see Figure 1). Since the cutting speed in oxygen cutting of mild steel is driven by the exothermic process, the laser power used at each thickness is optimized for speed and quality, while averting excessive burning. Due to this phenomenon, the cutting speeds with oxygen are somewhat limited.

For cutting stainless steel with thicknesses up to about 3 mm with nitrogen assist gas, roughness values are quite similar, but the 1 micron wavelength provides greater cutting speeds at lower laser power (i.e. 3 kW disk or fiber is comparable to 4 kW CO<sub>2</sub>). However, for thicknesses over 4 mm, although speeds are very similar, the cutting quality isn't. With 1 micron some burr and a rougher surface compared to CO<sub>2</sub> laser cutting results can not be avoided (see Figure 2). Table 1 gives a simplified summary of cutting stainless.

Material thickness	Solid State Laser (1 μm wavelength)	CO <sub>2</sub> (10.6 μm wavelength)
Very thin sheet metal (<1 mm)	Outstanding cutting results	Good cutting results
Thin sheet metal (1-3 mm)	very good cutting results (higher speed)	Very good cutting results
Medium sheet thickness (3-5 mm)	Limited cutting results (burr)	Outstanding cutting results
Thick sheet metal (>5 mm)	Critical cutting results (roughness & burr)	good cutting results

Table 1: Relative ratings, nitrogen cutting of stainless steel.

Thin thicknesses of mild steels can be cut with nitrogen, too – at much higher speeds than is possible with oxygen. For up to about 2.5 mm thickness, cutting quality, and for some thicknesses even speeds of the 1 micron fiber delivered lasers, are superior to 10.6 micron CO<sub>2</sub> laser results (at 5 kW). Cutting speeds of up to 30 m/min (for 1 mm material) make the fiber delivered lasers the perfect tool for cutting hot formed 3D parts, which is a booming market.

With all the excitement about the newer, high brightness 1 micron lasers like disk, fiber, or in the not too distant future, direct diode, some thought it sounded the death toll for the older, well established lasers like the 10.6 micron CO<sub>2</sub> laser. However, there are niche applications and application regimes where each laser type excels. In fact, there is no one type of laser that can accomplish all tasks equally well. There is strength in diversity. ■

Stephan Ziermann is an engineer for TRUMPF in laser applications both in Germany and the U.S. and David Havrilla is the manager of the Product & Applications Group at TRUMPF.

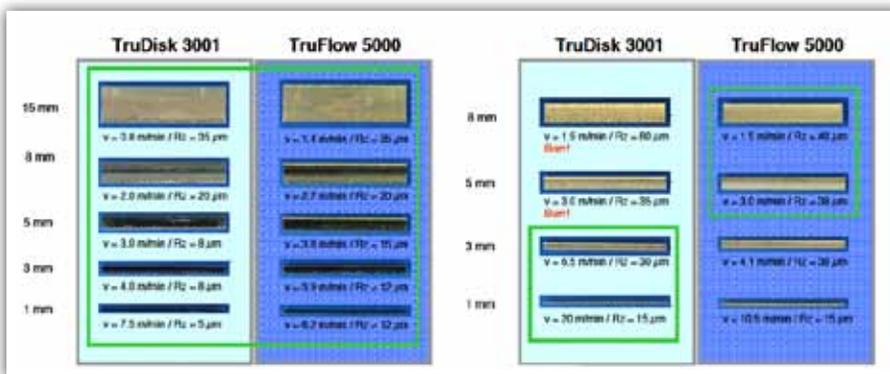


Fig. 1, left – Cutting of mild steel with oxygen assist. Fig. 2, right – Cutting of stainless steel with nitrogen assist (fusion cutting).

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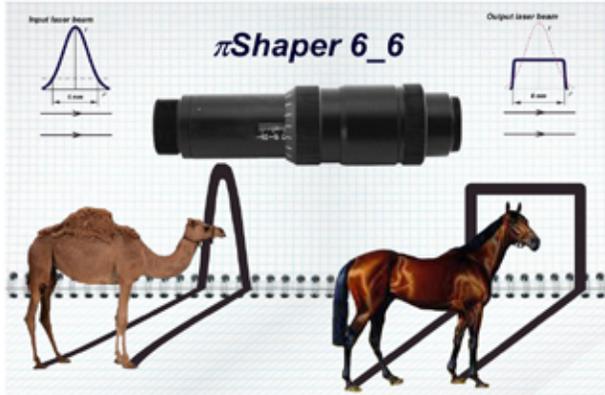
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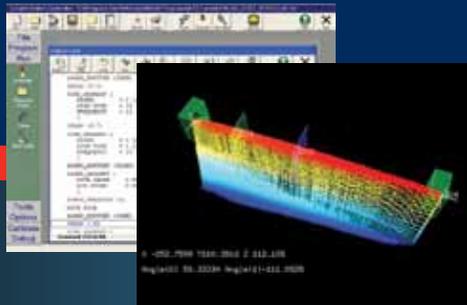
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# ICALEO 2012 PRESENTS THE LATEST IN LASER MATERIALS PROCESSING RESEARCH

By Geoff Giordano

Not only are lasers bridging worlds by offering solutions useful across the macro-, micro- and nanoprocessing spheres, but they're building a better world as vital components in the facilitation of green energy technologies.

From beginning to end, the Laser Institute of America highlighted these themes in a broad-ranging program for the 31<sup>st</sup> International Congress on Applications of Lasers & Electro-Optics (ICALEO®) from Sept. 23-27 in Anaheim. Nearly 500 attendees, including about 40 first-timers, from 33 countries gathered in southern California to take in as many of the more than 200 presentations as they could while interacting with peers and vendors.

LIA Executive Director Peter Baker and President Prof. Reinhart Poprawe presided over another collegial gathering that saw them exchange good-natured gifts to one another at the Wednesday awards luncheon — during which they announced that LIA easily overshot its financial projections for 2012. Earlier in the week, attendees were treated to an exciting president's reception on Monday at the Marconi Automotive Museum in Tustin. Attendees eagerly shared insights and experiences while being bused to and from the event, where they witnessed a collection of vehicles valued at more than \$30 million.

The chief honoree of ICALEO 2012 was Prof. Isamu Miyamoto, who won the Arthur L. Schawlow Award for his body of pioneering work on laser welding and materials processing. While he might have attended solely to enjoy this acknowledgement, Miyamoto instead remained busy to the very last day. Not only did he give presentations on welding characteristics of faturan glass and nondimensional evaluation of nonlinear absorptivity in internal modification of glass,



2012 Schawlow Award winner Isamu Miyamoto.



LIA President Reinhart Poprawe welcomes attendees to the President's Reception held at the Marconi Automotive Museum.

but he also delivered a luncheon keynote titled "Origin and New Wave of Laser Welding" and a closing plenary address surveying operational details among Germany's laser centers.

"From the scientist's point of view, ultrashort laser pulse applications are most exciting," Miyamoto noted while staying after one of his presentations to answer questions and sketch out ideas with an attendee. "I used to be involved in macro processing in the high-power region, (which) is also very interesting, but the most important part has been finished, I think. With short laser pulses there are many problems (to solve); there are a lot of new physics. When I started welding by ultrashort laser pulse, there were many researchers in that field. They did not agree with me because they believed that the ultrashort pulse laser is nonthermal."

Noting the challenges of understanding the "real physics" of ultrashort pulse lasers, Miyamoto emphasized that more research is needed to help industries embrace applications with those tools. Development in that regard is moving quickly, he says. "For example, at (Fraunhofer) ILT they are developing a 1 kilowatt femtosecond laser. As I mentioned in the award address, the ultrashort pulse process is complicated, but sometimes it's very simple. If you make the power, pulse or repetition rate double, the performance becomes double. Unfortunately, it's an expensive area. But I think it's the most exciting (area of study)."

## A WEALTH OF KNOWLEDGE

In his opening remarks, ICALEO General Chair Kunihiko Washio emphasized a program geared more to industry and technology as opposed to last year's focus on material and nanotech sciences. As he did while serving in the same role in 2011, Washio attended many sessions, often fueling further discussion with his post-presentation queries.

The opening plenary sessions, kicked off by Dr. Thomas Baer, executive director of the Stanford Photonics Research Center at Stanford University, amounted to the firing of a starting gun in researchers' race to find more efficient means of producing effective alternative energy with laser-based light sources.

Baer, who gave his first ICALEO presentation in 1982 while with Spectra-Physics, asserted that "it's surprising what a role photonics plays" in renewable power sources including hydro, wind, wave and solar. Noting that he installed 5 kilowatts of solar panels on the roof of his home, and that his Chevrolet Volt contains a 400-pound battery, he asserted that the power to dramatically increase the impact of alternative energy rests in the hands of the laser establishment.

"Part of the challenge we face as a photonics community and material science community is learning how to make good single-crystalline CIGS, or as close as we can get to single-crystalline CIGS — cad-tel and amorphous silicon — rapidly in a reel-to-reel process." He noted that First Solar "claims that they can take a piece of glass in and 45 minutes later they have it assembled onto

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a module, which is an amazing feat, and they do indeed have the lowest-cost panels on the market.”

While the silicon market still dominates vis-à-vis thin film, Baer noted the thin-film market is increasing. “We have continued to have innovation in this area largely due to research around the world, and there is still great potential for these technologies to improve. The bottom line is they don’t have to improve much to have commercial impact.”

Using a video of a windmill destroyed by an approaching storm, Baer explained that lasers can have a role not only in a light detection and ranging (LIDAR) system that would sense wind velocity to adjust the pitch of the blades and protect them, but also could add 10 percent efficiency to the unit. Furthermore, lasers can monitor processes associated with consuming fossil resources — for example, within a coal-fired boiler to reduce the amount of unburned or partially burned fuel.

ICALEO emphasized research geared to these areas and more, especially with educational tracks devoted to processing of dissimilar materials, thin-film processing and the use of lasers in energy generation and storage. Among the many highlights:

- Consultant Sami Hendow of Los Altos, CA, showed how using laser pulses of 10 to 30 nanoseconds versus 200 nanoseconds allows thermal diffusion within the material being worked to improve micromachining precision, for example in ITO/silicon scribing. “If you give it some time, you can remove ITO. If you deposit a certain pulse and wait a little bit, you’re allowing for the heat to diffuse into the remainder of the substrate, and that makes it easy for the second pulse to come in and remove the remainder.”

- Qiying Chen of the Memorial University of Newfoundland described using femtosecond lasers to structure optical fibers, creating advanced sensing devices such as Fiber Mach-Zehnder Interferometers and long-period gratings.

- Dongsik Kim of POSTECH in South Korea detailed droplet optohydrodynamic processing, in which high-speed cleansing microjets can be created by firing lasers into liquid droplets. This allows for nonthermal micromachining of materials by removing nanoscale metallic or ceramic materials, and can even remove dental hard tissue.

- Ville Hautala of Finland presented the Tampere University of Technology’s work in local laser joining of two types of glass to silicon with a picosecond pulsed fiber laser at a wavelength of 1060 nanometers.

- Kerstin Kowalick of Germany’s Ruhr University Bochum echoed Baer’s advocacy of green research with a comprehensive



**ICALEO Congress General Chair Kunihiko Washio and Nano Conference Chair Yongfeng Lu.**

discourse on the multiple values of lasers in producing thin-film photovoltaics.

- Paul Denney of Lincoln Electric gave an overview of laser additive manufacturing — and a preview of the LAM workshop he’s chairing for LIA in Houston this February. “There’s a lot going on in 3D rapid fabrication, or full functional deposition, whether it’s medical/dental, even aerospace. My point was there is a lot of activity and interest in surface technology — call it 2D-plus if you would. It’s large surfaces (using) thin or moderately thin buildups (of powder or wire), for corrosion protection, wear protection, repair. Some of that’s being driven by energy. We’re drilling deeper, we’re digging up oil sands, and we have to be able to recover that material in an economical fashion.” Laser processing has advantages over other technologies, he says, but it still needs to be faster and cheaper.

“The people who came to ICALEO get a lot of benefit out of these papers,” noted Milan Brandt, chair of the dissimilar materials track. “There’s a lot of exchange of information in terms of what research is being done in the U.S., Europe and Asia. The researchers get a picture of where things are and what’s happening in different regions.”

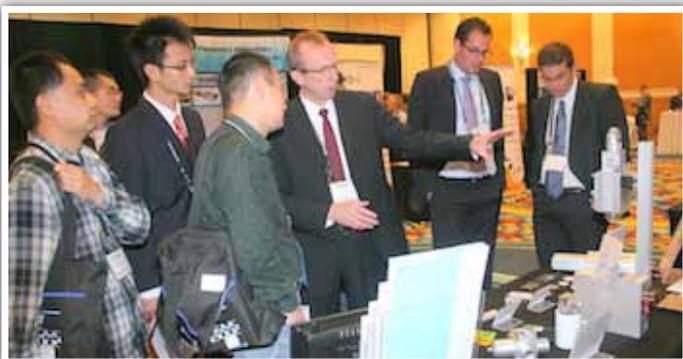
Laser development and research advances “go hand in hand,” he noted. “Maybe five to 10 years ago, the power levels out of fiber lasers were simply not there to be effectively used in any of these applications, so most of the work was done with CO<sub>2</sub> lasers. Now you’ve got developments in fiber lasers and disc lasers, so most of the research that was done with CO<sub>2</sub> has shifted to fiber and disc. Fiber-delivery systems make life so much easier for everybody.”

## **BUT IS IT PROFITABLE?**

Of course, profitability is a driving factor in refining existing technologies and exploring new ones. For example, “I think there’s money to be made in switching to photovoltaics; there’s certainly a lot of incentive,” Baer noted. To that end, LIA invited Dr. Larry Marshall of Southern Cross Ventures in Palo Alto, CA, to give a short course detailing how researchers can think like entrepreneurs.

“Reinvent yourself every five years,” Marshall advised. “Technology has a wonderful way of pulling us out of a financial crisis. Many scientists are too smart to be entrepreneurs; stop being so complicated. Put down the technology and think like a customer.”

Marshall, who came to the U.S. from Australia during the 1987 financial crisis, recalled how he created Light Solutions using about 40 credit cards to raise \$250,000 to fund the company. They



**ICALEO Vendor Reception and Tabletop Display allows exhibitors to show off their latest technology to the attendees.**

created a shoebox-size solid-state green laser and targeted makers of far larger units for ophthalmology. While their competitor needed a truck to get its laser to a hospital, Light Solutions could FedEx its product to clinics and physicians, tripling the market.

The company's crowning achievement was a laser that treated retinopathy of prematurity, in which children born more than six weeks prematurely are rendered clinically blind because their retina isn't formed and excess blood vessels must be "killed" to restore vision. Light Solutions replaced cryotherapy, which was about 60 percent effective, as the standard of care by building an infrared laser at a wavelength capable of penetrating the sclera. The optic system created a large beam to enter the eye without damaging tissue, then focused down inside the eye so the physician could selectively burn excess blood vessels.

But success doesn't always afford the best lessons. "It's OK to fail," Marshall explained. "As an engineer or scientist, we abhor failure. There is no such thing as failure in the entrepreneurial world. You learn infinitely more from something that doesn't work than you do when you happen to get lucky and find something that does work. It's very important when you find success to acknowledge that it's luck. If you acknowledge it's luck, you'll stay humble."

## IMPRESSIONS OF ICALEO

While critical research is always at the heart of ICALEO, it is a chance for the global laser community to connect on many levels in ways other conferences might not allow.

One first-time attendee, Prof. Walter Weingaertner, came to engage with industry professionals as he creates a laser institute in Brazil, one in a system of 38 being built under government and industry auspices. Having used lasers for 10 years, he has sent people to Germany to build Brazil's photonics knowledge base, which has been oriented more toward welding and cutting and needs growth in the optics field. ICALEO is "an excellent opportunity," he concluded. "I've had a lot of very nice experiences at this conference."

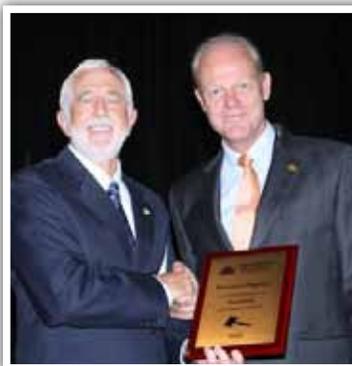
Howon Lee, a post-doctoral researcher from MIT, was another first-time attendee who doesn't even use lasers in his microfabrication system, but was eager to attend ICALEO to hear how researchers are using spatial light modulators (SLMs). He came "to meet people who are interested in 3D microfabrication, to share common interests and get some feedback from this community. There are a lot of interesting talks."

One of the sessions Lee attended was Dr. Stuart Edwardson's discussion of the University of Liverpool's advances using SLMs to split beams for high-throughput patterning of silicon, titanium and thin-film electrodes on flexible and glass substrates. Edwardson had attended his first ICALEO in 2001.

"It's getting busier," he noted. "The quality of presentations is certainly going up, and the breadth of what's being discussed and presented is increasing. Every time I come here there's a new component. The latest in laser materials processing is here; it's one of my favorite conferences."

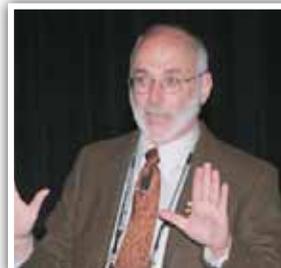
To order the highly detailed ICALEO 2012 conference proceedings, visit [www.lia.org/store/icaleo](http://www.lia.org/store/icaleo). To register for ICALEO 2013 to be held Oct. 6-10 in Miami, stay tuned for updates at [www.icaleo.org](http://www.icaleo.org). ■

*Geoff Giordano is a freelance writer.*



LIA's Peter Baker presents Reinhart Poprawe with his 2012 President's plaque, top left, and Plenary Speaker Eckhard Beyer, top right.

LIA Past President Steve Capp presents first place poster award to presenter Qiying Chen, bottom left, and Keynote Presenter Thomas Baer, bottom right.



From left to right – LIA President Elect Klaus Loeffler, LIA President Reinhart Poprawe, 2012 Schawlow Award recipient Isamu Miyamoto, LIA Executive Director Peter Baker, LIA Past President Stephen Capp and LIA Treasurer Yongfeng Lu.

### Student Award Winners

1<sup>st</sup> Place: 1003: Peter Stritt; University of Stuttgart, Stuttgart, Germany, "New Hot Cracking Criterion for Laser Welding in Close-Edge Position"

2<sup>nd</sup> Place: N404: Wei Xiong; University of Nebraska-Lincoln, Lincoln, Nebraska, USA, "Three-Dimensional Micro/Nano-Fabrication by Integration of Additive and Subtractive Femtosecond-Laser Direct Writing Processes"

3<sup>rd</sup> Place: M1104: Krste Pangovski; University of Cambridge, Cambridge, Great Britain, "Designer Pulses for Precise Machining of Silicon - A Step Towards Photonic Compositions"

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### LASER World of PHOTONICS CHINA

Jenoptik, Leoni, Physik Instrumente, Huagong and Chutian, amongst others, have applied for LASER World of PHOTONICS CHINA 2013. The exhibited products include lasers and optoelectronics, optics, manufacturing technology for optics, sensors, test and measurement, laser systems for production engineering, optical measurement systems, optical information and communication, biophotonics and medical engineering, imaging, illumination and energy, security and services. During its three-day show in 2012, LASER World of PHOTONICS CHINA attracted 475 exhibitors from 19 countries and districts, an increase of 31.6 percent compared to 2011, as well as 34,326 professional visitors from 40 countries and districts, a 19 percent growth over 2011. These record numbers have confirmed its leading position in the Asian laser and photonics market.

At the same time, the PHOTONICS CONGRESS CHINA will be held in conjunction with LASER World of PHOTONICS CHINA 2013 again. PHOTONICS CONGRESS CHINA covers several sectors in lasers and photonics. Topics range from latest research and development in laser procession, lasers, optical technology to renewable energy. The Congress includes four programs: 8<sup>th</sup> International Conference on Laser Processes and Components (LPC 2013); Optics Frontier – The 8<sup>th</sup> Conference on Laser Technology and Optoelectronics and Release of 2012 China Optics Outstanding Achievements and Products; OSA Photonics Technology Program and Technical Training Courses Series. The combination of science, research and industrial applications both in the conferences and the trade-fair supports the exchange between the scientific and industrial sectors and emphasizes its unique practical value. PHOTONICS CONGRESS CHINA in 2012 attracted 1,266 audiences.

For more information, visit [www.photonicschina.net](http://www.photonicschina.net). ■



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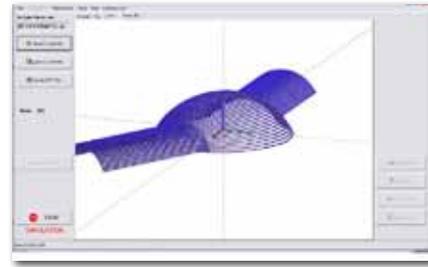
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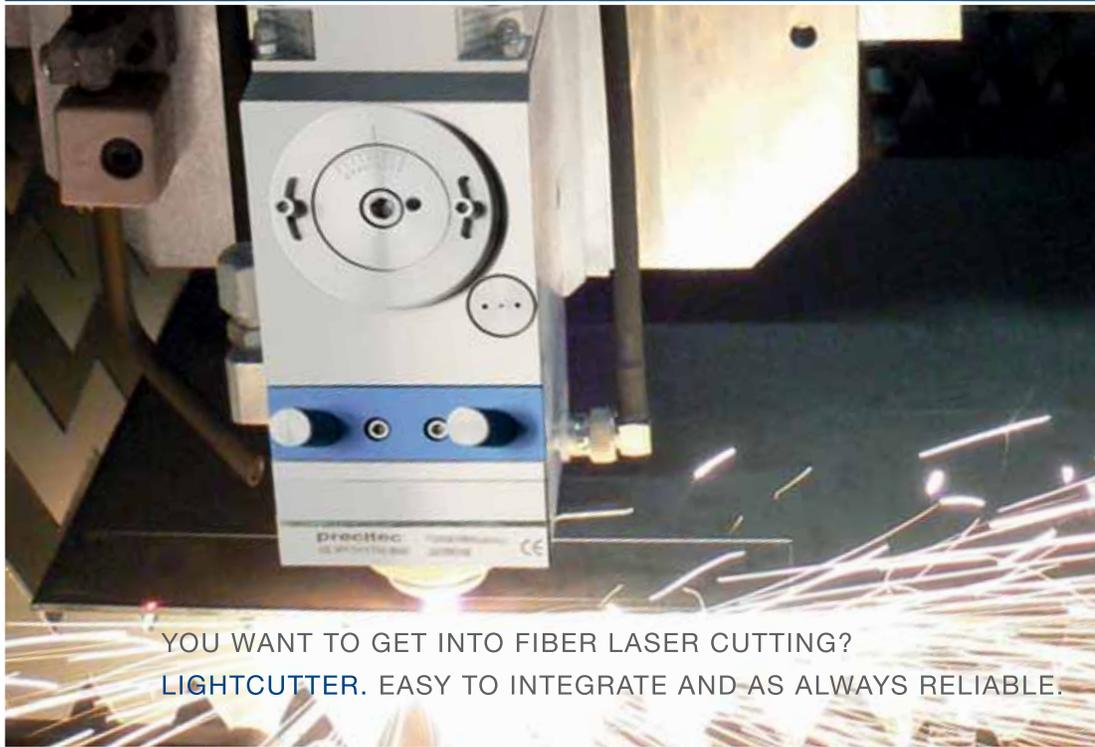
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## CORPORATE MEMBER PROFILE

## SPECTRA-PHYSICS

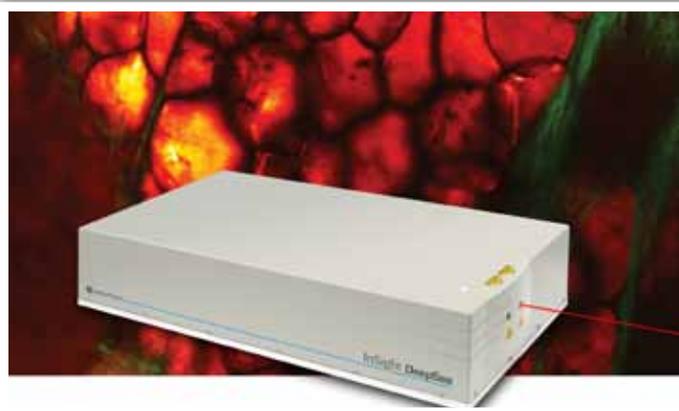
LIA Corporate Member Spectra-Physics, a division of Newport Corporation, Santa Clara, CA, is a world premier supplier of innovative solutions for precision laser applications. The company's broad portfolio of lasers are proven in 24/7 applications and are backed by a global support team. Spectra-Physics' innovation-driven culture strives to create breakthrough products that achieve new levels of cost-performance that power customers' success.



Newport Corporation provides photonics solutions to make, manage and measure light. With over 40 years of industry knowledge and expertise across a broad range of technologies, Newport delivers innovative products and solutions in the areas of lasers, photonics instrumentation, sub-micron positioning systems, vibration isolation, optical components and subsystems and precision automation to enhance the capabilities and productivity of its customers' manufacturing, engineering and research applications.

### COMPANY BACKGROUND

Spectra-Physics was founded in 1961, only a year after the invention of the laser, as the first commercial laser company. Over the past 51 years, Spectra-Physics has lead the way in introducing many innovative "firsts" – including the first commercial cw, ultrafast Ti:Sapphire and Q-switched Nd:Vanadate DPSS lasers – that have gone on to become industry standards.



**InSight™ DeepSee™ ultrafast laser performing the application of CARS microscopy and SHG microscopy on bovine muscle tissue.**

Spectra-Physics became a part of Newport Corporation in 2004. Newport Corporation was established in 1969. Newport has acquired a number of other companies over the years, such as the commercial optics division of Corning, New Focus and Ophir.

Newport has an extensive worldwide presence, with manufacturing facilities located in the United States, China, France, Germany, Austria, the United Kingdom and Israel, and a sales, support and service organization that spans the globe.

### TODAY'S LINEUP

Spectra-Physics offers a broad portfolio of laser technology products and services to original equipment manufacturers and end-user customers across a wide range of markets and applications. Laser and laser-based systems including ultrafast lasers and amplifiers, diode-pumped solid-state lasers, diode lasers, high-energy pulsed lasers, tunable lasers, gas lasers and fiber lasers and amplifiers. Spectra-Physics' ultrafast and DPSS lasers are market-leading product lines.

"With thousands of these lasers deployed worldwide in very demanding applications, we are excited about how we help our customers succeed in their applications and endeavors," said Herman Chui, senior director of product marketing for Spectra-Physics.

Spectra-Physics invests heavily in research and development of new laser technologies and products.

"As we have demonstrated with the many groundbreaking innovations over the past years and decades, we continue to innovate novel technologies that drive new applications and solve challenging problems for our customers," said Chui.

Spectra-Physics also participates in a wide variety of application segments across multiple end markets.

"With the continuing trend in improved cost-performance, our lasers are used in increasingly more applications. For example, we are seeing growing demand in the manufacture of mobile devices in components such as printed circuit boards, touch screen displays and high density semiconductor packaging. Similarly, in the life and health sciences, we are seeing increasing use of our lasers in precision laser surgery and bio-instrumentation applications. We are excited about the prospects for laser technologies and applications," he said.

Spectra-Physics values its membership and participation in LIA. In fact, as a testament to that, a couple of years ago the company's director of Strategic Applications and Marketing was the president of LIA.

"We believe that LIA is an important means for us to interact in a meaningful way with scientists and engineers in developing new laser applications that will help grow the lasers industry both in the U.S. and the broader global community," said Chui.

For more information, visit [www.spectra-physics.com](http://www.spectra-physics.com). ■

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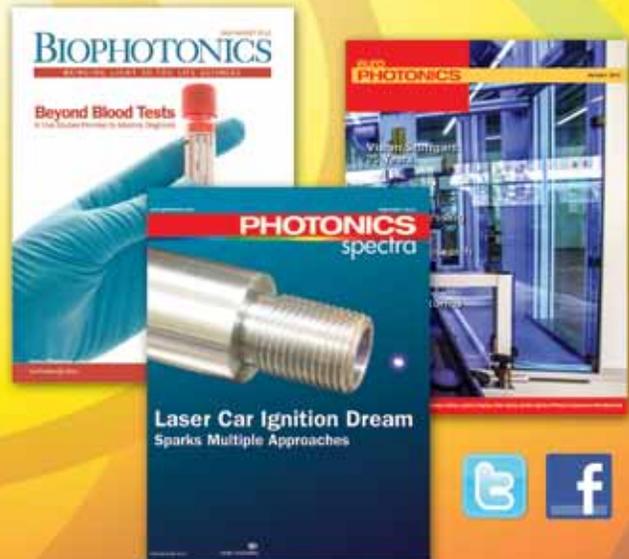
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# ASC Z136 UPDATE

## Standards on the Horizon, Part II

Reported in the May/June issue of the *LIATODAY*, standards recently approved and impending releases were reviewed. In this issue, we would like to share which documents are preparing to enter the revision process.

**Z136.7, American National Standard for Testing and Labeling of Laser Protective Equipment** – the first edition of this standard was published in early 2008; the standards subcommittee responsible for its development is SSC-7. Dr. James Sheehy was reinstated as the subcommittee's chair last summer (June 2011); the public notice for revising the document was announced in ANSI's *Standards Action* this past February.

The scope of the document is to provide recommendations for the testing requirements and labeling of protective equipment (devices) designed for use with lasers and laser systems that operate at wavelengths between 180 nm and 1 mm. The stakeholders have been defined as the user base of DoD (military) and industry, e.g., medical device manufacturers including manufacturers of protective eyewear, laboratories, health physicists and safety engineers. A subcommittee meeting is scheduled to be held this fall in San Antonio, TX, the specific date yet to be determined.

**Z136.4, American National Standard Recommended Practice for Laser Safety Measurements for Hazard Evaluation** – a companion document to ANSI Z136.1 *Safe Use of Lasers*, this standard provides practical guidance for the measurement of those parameters necessary for the classification and evaluation of optical radiation hazards associated with lasers.

Mr. Jeffrey Pfoutz, who was approved as SSC-4 chair at the annual meeting in February, will be reconstituting standards subcommittee 4 (SSC-4) following public notice that the revision process is imminent. Plans are underway to hold a kick-off meeting in conjunction with the International Laser Safety Conference (ILSC®) in March 2013.

We would like to take this opportunity to extend an invitation to anyone who either falls into one of the stakeholder groups or has a material interest in the development of either document to apply for subcommittee membership. The majority of subcommittee work (as well as main committee work) is conducted via the Z136 website and by email correspondence. Apply directly through the Z136 website at [www.z136.org](http://www.z136.org), or for more information contact Barbara Sams at +1.407.380.1553 or [bsams@lia.org](mailto:bsams@lia.org). ■



**New**

# ANSI Z136.8

## 2012 Safe Use of Lasers in Research, Development, or Testing



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## Upcoming Activities for Certification Maintenance Points

With the end of the year rapidly approaching, many certified laser safety officers (CLSOs and CMLSOs) will complete their 3-year certification cycle and are starting to tabulate certification maintenance (CM) points. Some may be in need of a couple more points to recertify. Others may be in the process of forecasting next year's travel budgets. In any case, the following is a list of upcoming courses, meetings and conferences in which CM points can be earned.

**October 20-21, MLSO Training**, Chicago, IL. This course is designed to give operating room personnel a basic foundation in laser biophysics, tissue interaction and laser safety. Other dates and locations this training course will be offered: **February 9-10, 2013** in San Antonio, TX; **March 2-3, 2013** in San Diego, CA and **March 16-17, 2013** in Orlando, FL. *CMLSO exam opportunities follow each course!*

**October 23-24, Lasers in Manufacturing Event (LME®)**, Schaumburg, IL. Again this year, LIA will be providing a one-stop event for companies interested in integrating laser technology into their production. Attendees will learn about automation equipment, laser choices, beam delivery, safety considerations, and applications development, as well as meet exhibitors that supply these products and services. *Earn BLS CM points by attending!*

**November 5-9, LSO with Hazard Analysis**, San Antonio, TX. This course is designed to teach the knowledge required to perform the duties of Laser Safety Officer as described in the *ANSI Z136.1 Safe Use of Lasers* standard. Other dates and locations for this course include: **January 28-February 1, 2013** in Orlando, FL and **March 11-15, 2013** in Phoenix, AZ. *CLSO exam opportunities follow each course!*

**March 17, 2013, ASC Z136 Annual Meeting**, Orlando, FL. *Observers welcome!* If you are interested in participating on the committee or just wonder how the standards development process works, this meeting will give you the opportunity to learn firsthand just what it takes. *RSVP to Barbara Sams, bsams@lia.org or call +1.407.380.1553 to ensure seating availability.*

**March 18-21, 2013, ILSC®**, Orlando, FL. The International Laser Safety Conference (ILSC) covers all aspects of laser safety practice and hazard control. Scientific sessions will address developments in regulatory, mandatory and voluntary safety standards. The Practical Applications Seminars (Medical on Mon-Tues, Technical (i.e., non-medical) on Wed-Thurs) complement the scientific sessions by exploring everyday scenarios that the LSO and MLSO may encounter. *Earn up to 4 CM points by attending!*

**Questions?** Contact the Board of Laser Safety at [bls@lasersafety.org](mailto:bls@lasersafety.org). ■



Board of Laser Safety



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# LASER INSIGHTS

*Laser Insights is a feature to give insight into the very latest developments in laser safety and the possible applications of laser materials processing. These overviews are designed to give you insight into the content and applications of the papers presented at our conferences and workshops. Visit [www.lia.org/laserinsights](http://www.lia.org/laserinsights) to begin your search.*

## A NOVEL LASER TREPANNING SYSTEM FOR RESEARCH & PRODUCTION

by Christian Scholz

To exploit the advantages of laser technology for material processing, e.g., micro drilling and cutting, versatile trepanning systems based on rotating optics have been designed and implemented. Depending on the development stage, the trepanning systems enable the controlled adjustment of beam displacement and inclination during fast rotation.

## LASER DIRECT DEPOSITION OF NICKEL-BASED METAL MATRIX COMPOSITION

by Yung Shin

Ceramic particulate reinforcement enhances the already

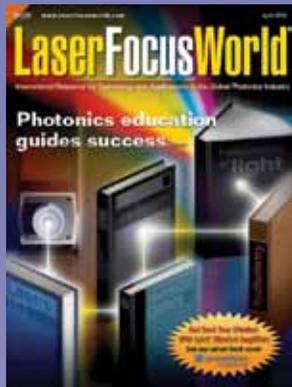
superior mechanical properties of nickel-based super alloys. Reinforcement particles alter the matrix microstructure of the metal matrix composites (MMC) to improve wear resistance, hardness, etc. Laser direct deposition allows localized addition of MMC with properties tailored to the application.

## NEW INDUSTRIAL SYSTEMS & CONCEPTS FOR HIGHEST LASER CLADDING EFFICIENCY

by Eckhard Beyer

Over the past decade, laser buildup welding transitioned from mostly specialized laboratory efforts into an established industrial technology for high quality and precise surface coating deposition. Compared to traditional plasma powder buildup welding processes, laser cladding generates superior corrosion and wear protective coatings. The laser process can also generate localized surface functionalities. ■

View complete articles at [www.lia.org/laserinsights](http://www.lia.org/laserinsights) under the Featured Category.



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## JLA UPDATE

The *JLA* is published four times a year in February, May, August and November. It is available electronically to LIA members as a member benefit. To view the journal online, please make sure your membership is current.



The Laser Institute of America has made its official publication the *Journal of Laser Applications*® (*JLA*), an online-only journal, complete with new features for a broader audience. *JLA* is hosted on AIP Publishing's robust Scitation online platform, providing the journal with great functionality and the ability to leverage a wide range of valuable discoverability features. *JLA* now features nine topic sections, a faster peer-review process and a more functional website ([jla.aip.org](http://jla.aip.org)) that makes content easier to access and more interactive. Readers will find full-text HTML rendering featuring inline reference links and the ability to enlarge tables and figures by clicking on them. Among the new features are enhanced search functions with more options and better controls to explore returned content in more useful ways.

For non-members of LIA, call the American Institute of Physics at 1.800.344.6902 for subscription information. Sign up at [jla.aip.org/alerting\\_services/table\\_of\\_contents\\_alerts](http://jla.aip.org/alerting_services/table_of_contents_alerts) to receive your *JLA* table of contents email alerts.

### Research Highlight – Flexible and Efficient Laser Remote Welding of Ultra-Thin Metal Foils

Andreas Patschger, Jens Bliedtner, Matthias Hild and Jean Pierre Bergmann

This paper discusses investigations regarding flexible and efficient strategies of laser remote welding of ultra-thin metal foils ( $\leq 50 \mu\text{m}$ ) which are applied in the fields of electronics, packaging and construction. A single-mode fiber laser was used, equipped with a scanner head and diverse objectives. Thus, different optical settings and material thicknesses could be tested and compared with regard to process stability, reliability and efficiency. The long-term stability of the optical setting was determined related to focus shift and beam shape in the working plane. The specimens were analyzed with methods of micro-sections, microhardness and tensile strength tests. In this way, it could be shown that laser remote welding of ultra-thin metal foils is a well-suited modern technology which is able to substitute former slower or inflexible techniques, respectively, compound materials with a high in-house production depth.

View complete articles at [jla.aip.org](http://jla.aip.org).

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# MEMBERS IN MOTION

## OPHIR'S BEAMTRACK WINS AWARD

Ophir Photonics' BeamTrack™ Laser Power/Position/Size Sensors were recently chosen by the editors of *R&D Magazine* as one of the 100 most technologically significant products introduced into the market over the past year. BeamTrack is a unique series of thermal detectors that combine multiple functions in one device: power, energy, beam position and beam size. They are the first on the market to allow users to monitor all of a laser's main parameters with a single device.

"The R&D 100 Awards are well known as a benchmark of R&D excellence, identifying revolutionary technology that has just entered the market," stated Gary Wagner, general manager, Ophir Photonics (U.S.). "We are honored that BeamTrack has received this year's award."

Winners of the 50<sup>th</sup> Annual R&D 100 Awards will be recognized at a Nov. 1 banquet in Orlando, FL. For a list of winning innovations, visit [www.rdmag.com](http://www.rdmag.com).

## MOUND LASER EXPANDING

In July 2012 Mound Laser & Photonics Center, Inc., Miamisburg, OH, broke ground for a new building in the Miami Valley Research Park (MVRP).

The event was hosted by Bruce Pearson, CEO of the MVRP. Congressman Mike Turner also addressed the audience to show his support for small business and the advanced manufacturing Mound Laser is bringing to the Dayton Region to serve the medical device, aerospace and defense communities. Over the

past 10 years, Mound Laser has grown from five to 40 employees and has increased sales by 20 times. This growth has led to the need for a new facility to continue to grow and to better serve its medical and defense customers.

The new building will be 20,000 square feet and will feature 10,000 square feet of manufacturing space with 1,000 square feet for a Class 10,000 Clean Room. Mound Laser received a \$175,000 ED/GE grant from Montgomery County to assist with the project. The building will be a state-of-the-art R&D and manufacturing facility and highlight Mound Laser's focus on laser-based advanced manufacturing and R&D. It will house more than 20 laser systems.

## IPG PHOTONICS ACQUIRES JPASA

IPG Photonics Corporation, Oxford, MA, has acquired the privately held New Hampshire-based J.P. Sercel Associates Inc. (JPASA), a global supplier of UV excimer and diode-pumped solid-state (DPSS) industrial laser micromachining systems for precision processing in high-volume manufacturing. JPASA is anticipated to add approximately \$4 million to IPG's revenues for the remainder of 2012. The acquired business will operate under the name IPG Microsystems LLC.

The acquisition enables IPG to expand its integrated laser systems product offerings for fine-processing, precision cutting, drilling and micromachining of non-metals, including glass, semiconductors and ceramics. JPASA's systems perform advanced laser micromachining, micro cutting, scribing and laser lift-off for semiconductors, microfluidics, LEDs, thin film solar panels, micro-electro-mechanical systems, biomedical technology and industrial automation applications.

"This acquisition broadens our customized laser-based systems offerings and provides significant sales synergies," said Dr. Valentin Gapontsev, IPG Photonics Chief Executive Officer. "The combination of JPASA's specialized laser systems and the UV and short pulse fiber lasers that IPG is developing now should allow us to deepen our penetration of the \$800 million fine-processing market. At the same time, we plan to capitalize on opportunities to expand the global reach of JPASA's products through IPG's extensive sales and service network. In addition, we expect that the development expertise of the very experienced JPASA team would benefit our capabilities in other micromachining applications."

Visit [www.jpasalaser.com](http://www.jpasalaser.com) or [www.ipgphotonics.com](http://www.ipgphotonics.com) for more information.

## LIA INVOLVED IN LIM

Laser in Manufacturing 2013 (LiM) will be held May 13-16 in Munich, Germany. Organized by the German Scientific Laser Society, LiM is a scientific conference that focuses on the latest developments as well as future trends in the field of laser materials processing. LIA is pleased to announce it is a partner organization in this conference. It is the aim of LiM 2013 to bring together international experts from research and industry in order to match scientific advances and economic needs for mutual benefit. For more information, visit [www.wlt.de/lim](http://www.wlt.de/lim). ■

## MEMBER INNOVATIONS

### NEWPORT INTRODUCES INTEGRATING SPHERES

Newport Corporation, Irvine, CA, has introduced the Series 819C/D high power silicon-based integrating sphere detectors that operate in the ultraviolet and can handle up to 10 watts of optical power. The new CAL2 models feature a built-in temperature sensor and OD1 attenuator sensor. When connected to Newport's power meter models 1830-R, 1918-R, 1936-R or 2936-R, they automatically recognize the attenuator on/off position and the detector head temperature.

The company has also developed a new series of pneumatic vibration isolators for platform loads up to 3200 lbs. The I-800P Series isolators feature unmatched performance based on Newport's Stabilizer™ hybrid-chamber design to deliver the best vertical and horizontal isolation available in this size range. The patented self-centering design makes the I-800P isolators easy to integrate into OEM machinery and other process equipment.

For more information, visit [www.newport.com](http://www.newport.com).

## JLA OPEN ACCESS HIGHLIGHTS REVOLUTIONARY RESEARCH

The ability to view and download for free a special issue of the *Journal of Laser Applications*® (JLA) is currently being offered. The issue, "Generation of Sub-100 nm Structures by Nonlinear Laser-Material Integration," is a midterm progress report on a six-year study initiated in 2008 by the German Research Foundation (DFG). The special September edition, co-edited by Dr. Andreas Ostendorf of Ruhr-University Bochum with Drs. Karsten Koenig of Saarland University and Yongfeng Lu of the University of Nebraska, demonstrates the versatile methods such as near infrared femtosecond laser exposure to generate structures even below 100 nm, i.e., far below the diffraction limit. JLA, the official journal of the LIA, is offering this open-access edition to all viewers at [jla.aip.org/resource/1/jlapen/v24/i4](http://jla.aip.org/resource/1/jlapen/v24/i4) under "browse special issue."



## NEW LIA COURSE – COMING SOON!

The inaugural Laser Safety Officer in the R&D Environment class will be held December 12-14, 2012 and be taught by Ken Barat, chairman of the committee that put together the ANSI Z136.8 *Safe Use of Lasers in Research, Development, or Testing* standard. This new LIA course prepares laser safety officers (LSOs) to oversee the safe use of laser systems in oftentimes ad hoc situations.

Given that research environments often feature "home-built" lasers, the course will teach research LSOs how to characterize such devices, as well as give examples of how to set up labs and establish control measures to mitigate hazards. The emphasis on properly assessing such lasers is even more critical in the Wild West atmosphere of research as opposed to, say, in a stable, regulated production line. LIA's new course provides a roadmap for navigating what might be uncharted territory for someone who is appointed an LSO but comes from a more medical discipline than a laser background. To register for this new LIA course, visit [www.lia.org/education](http://www.lia.org/education) or call 1.800.34.LASER.

## COMING IN 2013 – LAM

LIA's 5<sup>th</sup> annual Laser Additive Manufacturing Workshop (LAM) will bring industry specialists, executives, users and researchers from around the world to show how cladding, sintering and rapid manufacturing can be applied effectively and affordably to today's manufacturing challenges. This workshop will have a significant impact on the widespread industrial implementations of laser additive manufacturing in what is a rapidly growing industry. Mark your calendars now to attend LAM, to be held Feb. 12-13, 2013 in Houston, TX. Sponsorship of LAM 2013 is a valuable way to reach a highly-qualified target audience.



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## ILSC ALSO COMING IN 2013

Make plans now to be in Orlando, FL March 18-21 in order to attend the 2013 International Laser Safety Conference (ILSC®). ILSC is a comprehensive four-day conference covering all aspects of laser safety practice and hazard control. Scientific sessions will address developments in regulatory, mandatory and voluntary safety standards for laser products and for laser use. The Practical Applications Seminars (PAS) complement the Scientific Sessions by exploring everyday scenarios that the Laser Safety Officer (LSO) and the Medical Laser Safety Officer (MLSO) may encounter. Professionals in all fields and applications will find ILSC a tremendous source for information and networking opportunities.

Sponsorship of ILSC 2013 is still available and a valuable way to reach a highly-qualified target audience. For more information, visit [www.lia.org/ilsc](http://www.lia.org/ilsc) or contact Jim Naugle at [jnaugle@lia.org](mailto:jnaugle@lia.org), 1.800.34.LASER. ■



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