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: LME 2011 | VOLUME 19 NO. 4 | JULY / AUGUST 2011

LME 2011

LIA'S LASERS FOR MANUFACTURING EVENT

September 27-28, 2011

One Show, One Voice, One Mission - Understanding Laser Technology

pg. 6

IPG PHOTONICS — The Power to Transform®

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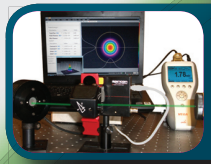

Why the Need for Industrial Laser Beam Profiling - pg. 16

New Industrial Systems for Laser Cladding - pg. 18

Laser Institute of America

Laser Applications and Safety

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DEPARTMENTS

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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*® 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 407.380.5588, or send material by e-mail to lia@lia.org.

2011 LIA OFFICERS

EDITORIAL STAFF

BUSINESS STAFF

CALENDAR OF EVENTS

Laser Safety Officer Training
Dec. 6-8, 2011 | Orlando, FL

Laser Safety Officer with Hazard Analysis*
Sept. 12-16, 2011 | Washington, DC
Oct. 24-28, 2011 | Orlando, FL
**Certified Laser Safety Officer exam offered after the course.*

Advanced Laser Safety Officer Training
Sept.19-21, 2011 | Silver Spring, MD

Medical Laser Safety Officer Training*
Sept. 17-18, 2011 | Washington, DC
Nov. 12-13, 2011 | New Orleans, LA
**Certified Medical Laser Safety Officer exam offered after the course.*

Advanced Medical Laser Safety Officer Training
Feb. 23-26, 2012 | Atlanta, GA

Attend a classroom course prior to Sept. 27, 2011 and receive a complimentary registration to LME 2011.

LME 2011
Sept. 27-28, 2011 | Schaumburg, IL

ICALEO® 2011
Oct. 23-27, 2011 | Orlando, FL

LAM 2012
Feb. 29-Mar. 1, 2012 | Houston, TX

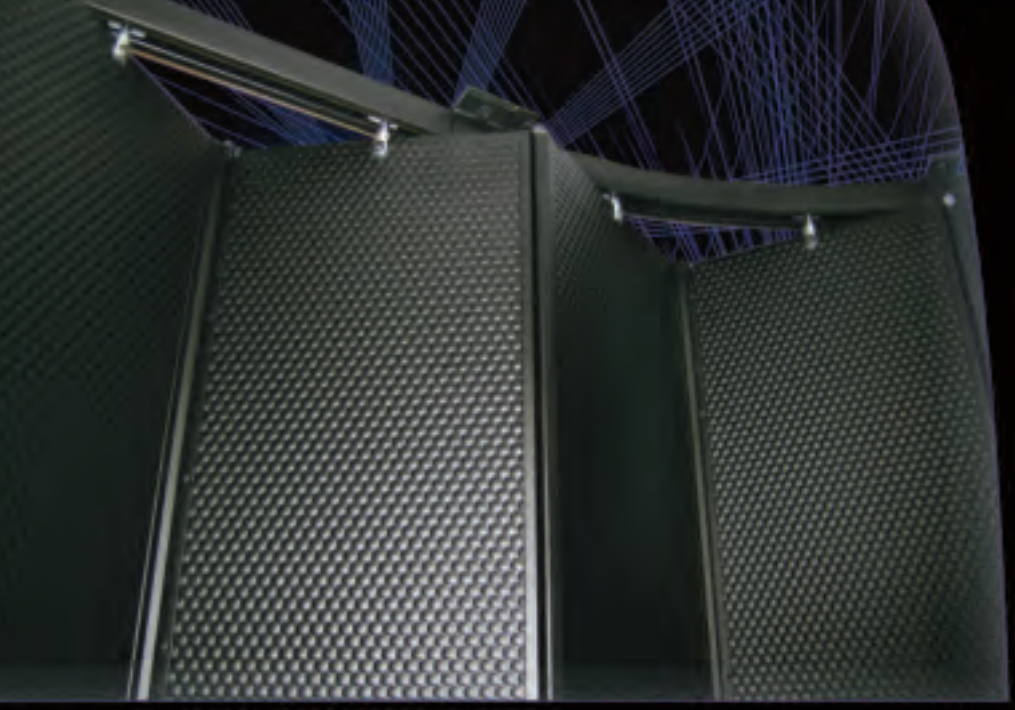
*Visit **www.lia.org** for all course and event listings.*

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.



LASER SAFETY BARRIERS

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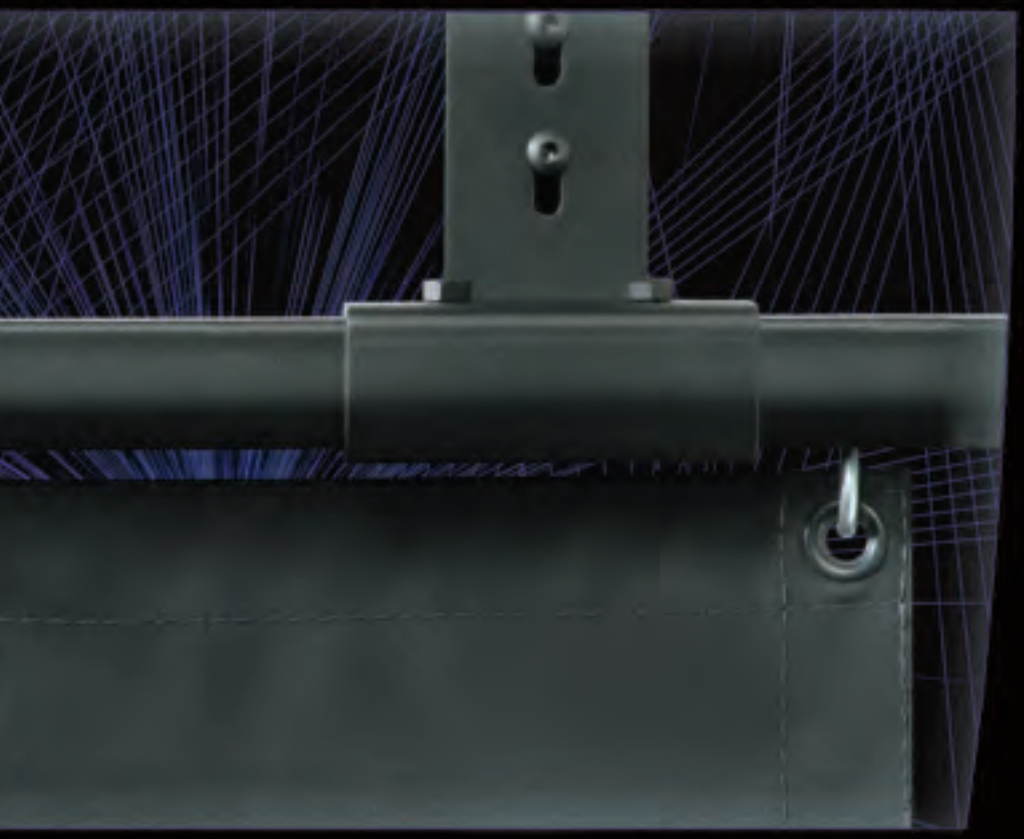

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Laser Curtains

Flex-Guard™ heavy duty matte finish fabric is ideal for blocking diffuse and low power laser radiation. Durable and flame retardant materials are suspended from ceiling- or floor-mounted coated black steel track engineered for low-friction operation. Virtually any configuration is possible using curves, by-pass rollers and other accessories. Each system is rated up to 200W/cm² for 100 seconds and is available in stock and custom sizes.

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PRESIDENT'S MESSAGE

Even a quick glance at the latest economic forecasts indicates that we're far from emerging fully from the Great Recession. While this puts pressure on manufacturers to cut costs by not spending money on capital equipment, it's a golden opportunity for properly equipped job shops to perform the kind of laser-based work other firms find more cost-efficient to outsource. The more different laser capabilities a shop has, the better positioned it will be to take advantage of these opportunities. And the opportunities are unquestionably there. For instance, a bit dated but still good information, a 2007 survey of the laser processing business found that it generated $5 billion in total revenue, about a 15 percent growth over 2005.

That's where LIA's first-ever Lasers for Manufacturing Event (LME) can be a major step toward your success. LME, taking place Sept. 27-28 in Schaumburg, IL, is designed expressly to help companies expand their repertoire. There's no other show in North America where you'll be able to talk to several different manufacturers of laser equipment in the same place.

At LME, cutting-edge laser technology and related automation equipment will be on full display, with exhibitors providing examples of their capabilities and talking about how their equipment achieves a broad array of laser manufacturing tasks. Whether a company wants to broaden its horizons in the areas of welding, cladding, machining, drilling or engraving, or brush up on the latest types of lasers, equipment and their uses, LME will provide two information-packed days, educational sessions and tutorials. If you haven't signed up to attend already, visit **www.LaserEvent.org** to learn how you can take a big step toward becoming a more versatile, in-demand – and profitable laser processing shop!

For more information about LME please see page 6.

Stephen Capp
President, Laser Institute of America

EXECUTIVE DIRECTOR'S MESSAGE

FOLLOWING THE STARS

Reinhart Poprawe, left and Eckhard Beyer, right – photo courtesy of Kunihiko Washio.

Two strategic guidestars for our society are: Guidestar 1 – "LIA will protect, nurture and develop its position as 'the source' of laser applications and safety knowledge" and Guidestar 3 – "LIA will adapt and package its laser application and safety knowledge and become a preferred source for the global end-user community." I want to update you on some interesting and very positive progress in each area.

Guidestar 1 relates to things such as ICALEO® and ILSC® that serve as a forum for the latest advances in laser materials processing and laser tissue interaction. Our new partnership agreement with the American Institute of Physics (AIP) with respect to publication of our *Journal of Laser Applications®* (JLA) will bring more of AIP's resources to bear on improved marketing of JLA to libraries and institutions worldwide both through direct sales and consortium agreements. JLA authors and editors will also benefit greatly from improved submission and review of papers using AIP's Peer x-Press online manuscript and review system.

Editor-in-Chief Reinhart Poprawe has appointed editors for subject areas ranging from nanomanufacturing to safety (as previously reported in the November/December 2010 issue). He has now appointed LIA Secretary Klaus Löffler of TRUMPF as the 9th editor covering "Laser Systems and Markets." Each of the editors is committed to submitting and gathering high quality papers in their subject area. JLA also provides an excellent forum for the best papers from the upcoming ICALEO (October 23rd-27th in Orlando, FL).

In addition to our three highly successful Laser Additive Manufacturing (LAM) workshops, we are preparing to significantly increase our commitment under Guidestar 3 by launching our inaugural Lasers for Manufacturing Event (LME), September 27th and 28th in Schaumburg, IL. LME will be a huge benefit to the end user community by providing education and information to the manufacturing community on the virtues and benefits of lasers in manufacturing and production (see page 6).

LIA is in the unique position of providing a valuable forum for those researching the interactions between lasers and materials and then, when the process has matured significantly, we can present the process, all tidy and ready to go, to the end users who need it.

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

P.S. Were you wondering about Guidestar 2? This states "LIA will seek strategic alliances at its boundaries." We have cooperative agreements too numerous to mention here with JLA, ICALEO, ILSC, LAM, LME and just about everything else we do. We follow Guidestar 2 as well!

LME PROVIDES OPPORTUNITY TO FIND LASER SOLUTIONS

By Geoff Giordano

All the pieces are in place and the stage is set for the first-of-its-kind Lasers for Manufacturing Event (LME), LIA's showcase for the bottom-line benefits of laser technology in the 21st Century.

Stellar roster of renowned experts giving up-to-the-minute information on laser rudiments? Check. Four intensely focused 30-minute industry highlight overviews focusing on the impact of laser technology in aerospace, medical devices, the automotive industry and additive manufacturing? Check. A comprehensive array of top-tier exhibitors demonstrating cutting-edge laser equipment in a highly interactive environment? Check.

LIA Executive Director Peter Baker has called LME "a unique opportunity." Nowhere else in the industry will laser users looking to maximize return on investment find the combination of educational sessions and presentations LIA has put together. LME, to be held Sept. 27-28 in Schaumburg, IL, will give attendees a chance to brush up on laser fundamentals before learning about the latest production applications and market opportunities.

The four 30-minute industry highlight overviews will be a key component of LME's benefits. Led by four leaders in their respective industries, these quick-hit overviews will be part history lesson, part forecast and part tutorial. Here's a look at the insights three of the four session leaders will be sharing at LME:

IMPACT OF LASER TECHNOLOGY ON AEROSPACE

Todd Rockstroh, General Electric - Sept. 27, 10:15 a.m.

Since embracing the power of lasers in earnest during the 1980s, the aerospace industry has used the technology to solve increasingly complex manufacturing problems with each passing decade. And far more opportunities lie ahead.

Noted GE aviation consultant engineer Todd Rockstroh will address the various applications of lasers in the manufacture of vital components for jet and gas-turbine engines. He will detail research that arose from — and solved — issues in the production and maintenance of jet-engine fans, compressors and combusters.

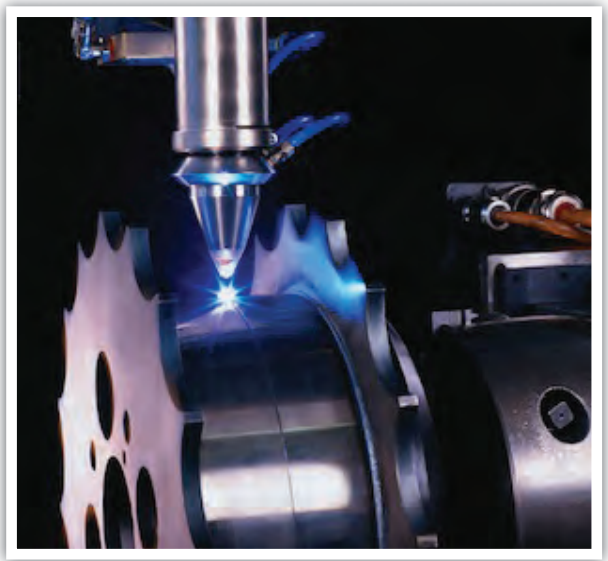

Photo courtesy of TRUMPF, Inc.

Having joined GE's laser material processing group in 1986, Rockstroh has gone on to earn more than 20 patents in the field and in 2007 was named the GE Aviation Edison Engineer for his contributions. He will explain how lasers have been extraordinarily useful in the creation of complex shapes required of aviation parts. Whereas the industry initially was adding material to the tips of turbine airfoil castings, "now we're fabricating nearly the entire component out of flowing powder," he says. "The advent of the fiber laser enabled us to run very long-cycle additive projects, which are technically welding."

In the early '80s, he says, the industry began drilling holes in turbine airfoils with ruby lasers. "We kind of leapfrogged over CO_2 lasers because they're more amenable to welding," he says. "We do use CO_2s for some welding but very little. It's the fiber laser that's really gotten us over the economic and maintenance hump." Fiber lasers "get rid of all the moving optics so we can manipulate the focus beam across a complex part to do the weld.

In the '90s emerged laser shot peening for fan blades. "Those were solid-state glass lasers. Later we started using solid-state pulsed YAG lasers."

Rockstroh will discuss the pivotal role high pulse energy lasers had in solving a critical operational issue afflicting the B1 bomber fleet in the 1990s. Laser shock processing (LSP) helped prevent damage to the leading edges of stage one fan blades by producing a deep compressive effect that halted the propagation of cracks. Previously, if a blade had been damaged on a mission, ground crews would have to crawl into each of the plane's four engines to examine each blade of the stage one fans; the two-to-four-hour inspection could result in the plane being grounded up to three days while a replacement part was sought. LSP has dramatically lengthened the maintenance cycle.

In the 2000s, Rockstroh explains, the aviation industry embraced nanosecond and picosecond lasers when developers used them as part of the process of milling cooling holes in the complex shapes of advanced gas turbine blades. "GE has now installed over a dozen laser milling workstations into our supply chains," he says.

In the next five to 10 years, Rockstroh says, "(use of) the fiber laser is going to continue to grow because they're just getting to the point where they can actually modulate the laser and drill instead of weld and cut. They're drilling holes very similar to what a pulsed YAG laser can do today. That's promising. The things we see evolving are the short-pulsed lasers — pico, nano, microsecond-type pulse durations — getting more and more average power to the point where they can be used for some micromachining vs. just straight drilling and cutting. We're already using short-pulsed Q-switch lasers to mill features into turbine airfoil castings — shaped holes for example. The problem is they don't have enough power to drill the through-hole yet. We have to use a two-step process: We laser the shape into the surface, then plunge the through-holes. We'd like to have enough power in the laser that we

do everything in one operation."

The learning curve for the early-adopters in the aerospace wasn't terribly long, Rockstroh says — a point he will emphasize to LME attendees looking to enter the realm of aviation manufacturing.

"The smaller job shops — the tier 1 vendors, even tier 2 vendors — adopted the laser for cutting, welding, probably in the '80s and '90s, even before we did," Rockstroh recalls. "Drilling was rather unique because those vendors don't usually process our turbine casts — we do. That was in the '80s, '90s and even the 2000s."

LME attendees will learn how the leading aerospace firms continually interact with their laser vendors to ensure high-quality and efficient processes.

"GE, Boeing, General Dynamics, Pratt, Rolls … we all have small-business and medium-business forums routinely with our sourcing organizations," Rockstroh says. Top-tier aerospace firms, the laser industry, and laser researchers have been and will continue to be productive partners in seeking new laser-based manufacturing solutions.

Additive-material fabrication is going to be the next big focus in aerospace, he asserts.

"As far as cutting, welding, drilling, we don't see a lot of need to invest in research. Between putting some seed money into the laser vendors — short-pulsed lasers — and testing some systems that are already out there, that's good enough for us now. It's the additive field (that is of primary interest). DARPA (the Defense Advanced Research Projects Agency) recently had an open-manufacturing call. They're trying to seed tens of millions of dollars into the R&D sector. When you're laser fusing powders or (using) electron beam (in) fusing powders it's like a casting, You're going to get shrinkage, distortion and deformation. Can you create models to predict that and models to then circumvent that distortion?"

In short, additive manufacturing presents great new opportunities in the aviation industry and others. "The Air Force has got it on their road map to start some larger programs in the

LME AT A GLANCE

1-Hour Laser Basic Training Courses

- *Main Laser Types Used for Manufacturing – Key Properties and Key Applications*: Tom Kugler, Laser Engineer, Laser Mechanisms, Inc.
- *Laser Systems – Key Components and Options*: Wayne Penn, President, Alabama Laser
- *Choosing the Low Cost Method for Manufacturing*: Dr. Robert Mueller, Senior Laser Solutions Engineer, NuTech Engineering
- *Laser Safety – Simple Keys to A Safe Environment*: Gus Anibarro, Education Director, LIA

UNIQUE FEATURES

Technology showcase: The show floor will be equipped with a theater area in which more than 20 exhibitors will present slides and videos of their equipment and examples of parts manufacturing their equipment. Exhibitors will discuss the advantages of their approaches. Examples of laser-manufactured parts will also be on display at their booths.

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ManTech realm," Rockstroh advises. Those who attend his LME session will be a step closer toward understanding aviation's key players, their current and future requirements, and how laser manufacturers can benefit the industry — and themselves.

IMPACT OF LASER TECHNOLOGY ON ADDITIVE MANUFACTURING

Bill O'Neill, University of Cambridge - Sept. 27, 1:15 p.m.

Additive Manufacturing includes techniques such as cladding and sintering, in general the addition of wire or powder together with a heat source to either add a layer of material to a part or even create the whole part.

The advent of lasers, with their high precision, high intensity and flexibility has made Laser Additive Manufacturing (LAM) a critical and fast growing technique in industries as diverse as aerospace, automotive, medical, military and many others.

LAM can be used to increase the life of parts by cladding them with hard or tough coatings. It can be used to repair and remanufacture turbine blades in jet engines and power stations, radically extending the time between replacement of very expensive turbines.

The technique can even be used to manufacture parts from scratch, depositing layer after layer of powder. The completed part has excellent mechanical properties, can have cooling holes built in and the material properties can be varied so that the body of the part has good thermal conductivity and the wear surfaces can be hard and durable.

Attendees at this session will gain understanding of the various laser additive manufacturing techniques and their areas of effective application.

IMPACT OF LASER TECHNOLOGY ON MEDICAL DEVICES

Roberto Alzaga, Medtronic - Sept. 28, 10:15 am

The future of laser applications is very much on the mind of Roberto Alzaga, a senior manufacturing engineer with Medtronic in Puerto Rico.

LME "will give me the chance to share our perspective on the benefits of this important manufacturing technology and the opportunities we have to improve existing processes and develop new applications for future products," he says. "In addition, we will have the opportunity to benchmark our experiences with other industries."

Photo courtesy of Laserage Technology Corporation

His presentation will include an overview of some of the significant advances in medical device laser applications in the past five years, including:

- The development of new lasers with the same power capabilities as the original "workhorse" Nd:YAG lasers. "These new lasers have provided improvements in beam quality, in the process control at low power levels and in pulse shaping stability, which are important to ensure product quality, he says. "They have also enabled the use of smaller spot sizes that support miniaturization initiatives and the use of new design features on parts with spatial constraints. The significant reduction in the size of laser enclosures has allowed for easier integration and freeing of valuable manufacturing space. Other advantages include the significant improvements in the energy efficiency and reduction in alignment procedures, maintenance and cooling requirements."
- The development of short pulse width lasers for micromachining.
- Improvements in the vision system integrations to automate pre- and post-laser process inspection and increase manufacturing yields and product reliability.
- Development of new laser integrations with adapted Galvo Head technology that provide faster cycle times than conventional laser head assemblies.

Given all those advancements, the medical device industry is ripe for opportunities, he predicts.

"Laser job shops have the opportunity to provide services to startup medical device companies in the early development of prototype products and in the supply chain of assembly components," he advises. "They will need to specialize in micromachining laser processing with the high level of reliability and compliance required by an FDA-regulated industry."

The industry will continually seek solutions that reduce costs and replace other manufacturing technologies (for example, curing processes or material removal). Lasers will prove particularly useful as joining interfaces grow more complex and dissimilar materials must be welded.

To take advantage of the opportunities, however, he says manufacturers should focus on "developing knowledge and experience in the laser processing of materials compatible with the human body (e.g., titanium, stainless steel, gold and platinum)" as well as the need to develop "proven, real-time tracking and real-time monitoring feedback systems to guarantee a high-quality weld similar to the systems in use in the automotive industry."

IMPACT OF LASER TECHNOLOGY ON AUTOMOTIVE MANUFACTURING

Mariana Forrest, LASAP - Sept. 28, 1:15 pm

When the "laser lady of Chrysler" addresses LME attendees, she'll be sharing insights from her extensive experience with developing laser-based manufacturing solutions for one of the world's major automakers.

Dr. Forrest is the founder and president of LasAp, an engineering and manufacturing consultancy in Troy, MI, that

is dedicated to accelerating the development and transfer into production of advanced manufacturing technologies.

In her most recent 15 years at Chrysler, Mariana fervently pursued her belief in laser technology, advocating for previously untried methods in car production. Now, based in part on her work, many applications she championed are being implemented.

"I worked in the research and development group in laser processing of sheet metal," she recalls. Lasers had already become a well-established technology in the production of power trains. "I was the senior manager of advanced joining technology development. Laser processing was a very big part of it."

Forrest worked for Chrysler (later DaimlerChrysler) for 30 years, beginning work with lasers in 1989. She moved into the research and development group in 1992, and through 2007 specialized in "pushing and pulling technology," a concept that is key for those who wish to explore new business opportunities in laser manufacturing.

"We were either taking things that were becoming available from outside suppliers and universities and trying to work with other suppliers to develop something to push into production," she explains. "You're pushing something that is already becoming available — you're trying to convince people to use it inside your plants. Pulling meant going to research and suppliers and telling them, 'We need this new capability, can you develop something?' "

Despite the then-lesser reliability of lasers in the mid-'90s, and the perception that using them presented high risk, Forrest

LME con't from page 9

never wavered in her confidence that lasers would ultimately provide a great return on investment. During her tenure, she advocated that, among other things, her engineers consider laser welding instead of resistance spot welding. Innovations emerged from instances such as those — for example, having to develop new ways to weld materials that hadn't been previously joined successfully by lasers.

"We were the advanced group — not very big but very creative in trying to take things from outside and present them to our internal staffs designing the new cars," she says. "We found out what problems existed in the plants and went outside to the research facilities that could do the work, contracting out different projects. We were in the middle managing the projects or participating directly or sometimes even creating innovations ourselves."

In fact, Forrest earned several patents in the course of pursuing development of effective and efficient use of lasers on the assembly line. She points to significant improvements in laser equipment reliability and energy efficiency as having been a boon to proving lasers' bottom-line benefits.

By incorporating laser manufacturing in new ways, the automotive industry has:

- Created new styling for parts such as for roofs and deck lids via laser brazing, which is accelerated by fiber-delivered direct-diode lasers.
- Improved flexibility and productivity in sheet-metal assembly with remote welding using high-power fiber and disc lasers with high beam quality.
- Increased passenger safety by employing laser cutting to create hot-formed structural parts.
- Enhanced interior components through a variety of innovative laser-based solutions.
- Improved product quality through use of real-time process monitoring and control.

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Laserline — Simplicity by Design

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LME con't from page 10

Now a highly sought-after consultant, Forrest envisions a bright future filled with new opportunities for laser manufacturing in the automotive realm. She foresees:

• Light-weight vehicles designed for laser processing.

• Rapid advances in understanding laser processing that will stimulate innovative product designs using either current materials or a synthesis of new material systems, which in turn will lead to new opportunities to improve automotive performance while reducing costs.

• New designs for laser processing of chassis and power-train systems, including in alternative power trains.

• Innovative beam generation and delivery solutions for optimal spatial and temporal processing.

At LME, Forrest hopes to impart her optimism to those who attend her educational session.

"Lasers are highly reliable and controllable tools that can be used to produce innovative designs with high quality and productivity," she emphasizes. "When we started with the technology in the early '90s, the lasers were the weak link. Since then a lot of progress has been made. Now in a big laser system, the laser is likely the most reliable part — other equipment may fail, not the laser." Of course, she explains, "the product needs to be designed for laser processing. Process substitution generally does not work."

To further that idea, she says, "laser technology education needs to be accelerated to meet near-future manpower needs. This area is highly interdisciplinary; it is not enough to be a mechanical, optical or electrical engineer. You have to either work with a lot of specialists or you have to know a lot yourself, which comes with experience."

Her advice to manufacturers who wish to begin using lasers to manufacture parts for the automotive industry?

Photo courtesy of IPG Photonics.

"Train your staff ahead of time," she asserts. Then, "make every effort to understand the details of what you will be expected to produce; leave room for the unknowns."

Furthermore, she urges, "consider equipment recommendations, but also verify them yourself. Process and application development is a must. Cutting corners usually will lead to trouble." Lastly, "Tooling is very important and should be considered in parallel with product design if at all possible."

All this is to say that there are emerging broad opportunities for independent laser-based manufacturers to work closely with the aforementioned industries in further shaping 21st-century applications. Attending LME — the latest and boldest among LIA's extensive — is a wise step for suppliers who wish to further their knowledge of how to fully investigate a range of new projects before taking on the work. To further your success with cutting-edge knowledge, register for LME by visiting **www.LaserEvent.org**. ■

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Agie Charmilles
Alabama Laser
Altos Photonics, Inc.
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GSI Group, JK Lasers
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September 13, 2011 Cambridge, England
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October 18, 2011 Cary, NC
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DRIVING BLIND: WHY THE NEED FOR INDUSTRIAL LASER BEAM PROFILING?

By John McCauley

It's time to buy another car. Like everyone else these days, you're a bit cost-conscience, so you're looking at getting the most for your money. You decide to see what the local used car lot has to offer. Before you get out of your car, the slick used car salesman approaches you, shoves a card into your hand and is a little too happy to help you find a new automobile. You approach a couple of cars that you think might fit your budget. The closer you get, you notice something that seems odd. You're standing in front of two identical cars – same make, same model, same year, same color, even the same warranty. But you see that one is $5,000 less than the other. Hmm. The first, more expensive car seems to be in good order, looks nice, smells okay. You climb into the second car and it hits you why there is a difference in price – the second car has no dashboard instrumentation panel! No speedometer, no fuel gage, no warning lights.

Mr. Slick sees the concern on your face and quickly tries to thwart off any objections, "Don't worry about not having a speedometer, you can just go along with traffic. Not a problem with not having a fuel gauge, it starts making a knocking noise when you need to fill up. And these are great cars, you shouldn't worry about not having any warning lights." Oddly enough, this all makes sense to you. You make the decision that these kinds of indications really aren't that important and decide on the less-expensive car.

Of course you don't decide on the car that doesn't give you any indication on how it's performing! That doesn't make any sense to you at all! Yet, there are many laser operators and laser jocks out there that do just that when it comes to their lasers. They are content to be blissful in the ignorance of their own laser's performance. They rely on simple sometimes time-consuming methods of beam diagnostics that are oftentimes subjective to the technician, don't comply with industry standards and rely on a skill set that is difficult and time-consuming to transfer to other employees.

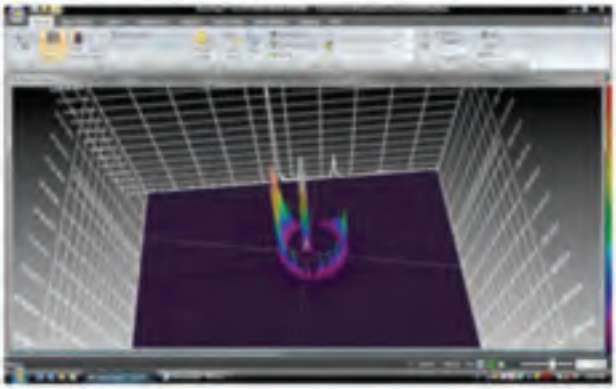
Or, even worse, some laser technicians employ a "don't fix what isn't broken" approach to their laser performance monitoring, which can and have resulted in poor process, scrapped or failed parts, or even worse, product recalls. Several industry experts, from laser manufacturing engineers, research scientists, process engineers, to name just a few, agree that the best way to accomplish a comprehensive laser maintenance program is with a planned maintenance schedule that includes beam power/energy measurement along with a process called beam profiling.

ABOUT BEAM PROFILING

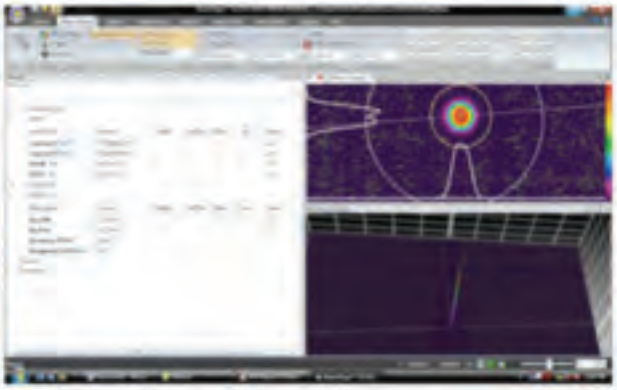
Laser beam profiling can be described as using an imaging device, such as a camera or a scanning slit profiler, to capture and display the spatial intensity of a laser's energy. The software that is interfaced with this imaging device will then perform attribute measurements such as beam size, beam wandering, peak energy to centroid (or the geometrical center of the beam) location, as well as other beam characteristics and even using the latest in software developments to incorporate an average power or energy per pulse measurement to calibrate these measurements. There are even devices that will give you all of this information in one package. Bottom line is that it can be as simple or as complex as you want it to be, but the benefits of implementing laser beam profiling practices can be very beneficial at the end-user stage of a laser's life.

Laser power/energy measurement is a quick and basic, yet certainly a vital practice to monitoring your laser's performance and efficiency. Laser engineers will use such equipment for measuring the laser's average power or energy per pulse over time to predict and plan for flash lamp changes or optics alignments or replacements. The equipment can also be used to characterize a laser for purposes of process validation or run off of new equipment. However, as important as this information is, it does not tell you all you need to know about your laser. For instance, the laser's average power could be stable while the laser's mode could be unstable or not optimized, ultimately causing undesired effects during your process.

Depending on the process that the laser is intended for,



Focused Spot of Marking Laser With Severe Fiber Misalignment

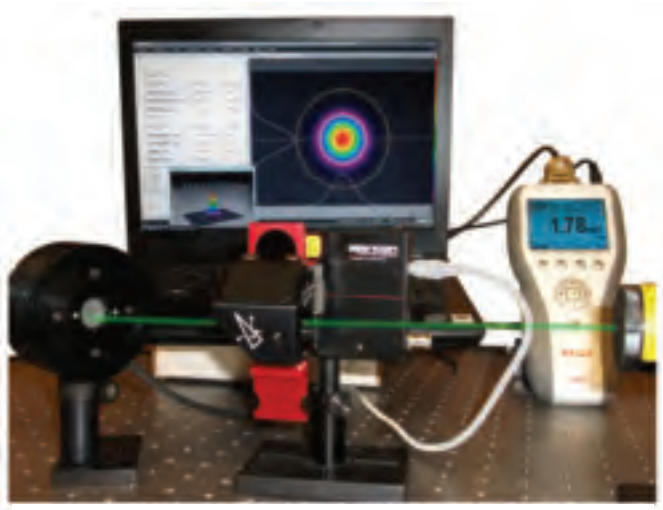


Focused Spot of Same Marking Laser After Fiber Realignment

the laser's mode, or structure of energy distribution, should be optimized for that process. For instance, a Gaussian, or "cone-shaped" mode, with a relatively high peak power near the centroid of the beam, should be achieved for marking, etching, micro-welding and some cutting applications. A flat-top mode should be achieved for most welding applications. And a TEM_{01} or TEM_{01*} (or "donut") mode is common for high-powered cutting lasers. Several different factors come into play when trying to optimize your laser's mode; process parameters, optical alignments, condition of laser components are just a few.

Driving an automobile without an instrument panel and not monitoring your laser's performance on a regular basis can oftentimes have the same results. You can wait for an expensive and time-consuming laser failure the way you could use a policeman to provide you with information about your speed. You wouldn't ever operate a motor vehicle without knowing how it's performing because it's just not safe to. With consequences being far more serious, why would you operate your laser without knowing how it's performing? ■

John McCauley is the Midwest Regional Sales Manager for Ophir-Spiricon, LLC, with a background as an applications engineer working with laser marking and engraving systems.



Spiricon BeamGage Software: integrated laser beam power/energy measurement and beam profiling system.

NEW INDUSTRIAL SYSTEMS FOR HIGH PERFORMANCE LASER CLADDING

By E. Beyer, S. Nowotny, F. Brueckner, H. Hillig, A. Techel

Laser buildup welding is an established industrial technology for high quality and precise surface coating deposition. Compared to low cost plasma powder buildup welding processes, laser cladding excels with excellent coating properties and technical advantages that have led to the industrial breakthrough of the technology. Laser-produced coatings offer superior corrosion and wear protection. The technology is highly flexible, enabling the engineering of very complex and localized surface functionalities as well as the fabrication of modern metal matrix composite (MMC) structures. For an increasing range of applications in mining, oil and gas production and tool and die making, there is no acceptable alternative to the laser technology.

However, the low deposition rates associated with laser cladding due to the localized material buildup has limited its application to extended surface areas, such as those, for example, required for hydraulic cylinders. Thus potential users are facing the dilemma that they need the quality of laser deposited coatings but also require highly efficient processes to improve productivity and cost efficiency.

LATEST SOLUTIONS

The latest laser and laser-hybrid technologies offer two very practical solutions to overcome these limitations and to achieve high deposition rates for large area applications in combination with improved energy efficiency. Firstly, the commercial availability of high-power lasers and in particular of diode lasers up to 10 kW[1] have led to substantial progress in terms of deposition rates. Using new coaxial and rectangular powder nozzles with such a laser achieves a deposition rate of 9 kg/h of INCONEL625, which is used for corrosion protection of large cylindrical parts. A remarkable track width of 1 inch can be deposited using a wide beam processing head as shown in Figure 1. This head is limited to the use of metallic alloys such as Inconel, Stellite, steel and bronze.

Secondly, even higher deposition rates with improved energy efficiency were achieved by hybrid technologies, which are based on the combination of energy sources. One of the hybrid variants couples the additional energy into the welding material wire feedstock. The wire is very practical and is an increasingly important alternative to powder for surface coating and generative fabrication processes[2]. The related technology of hot wire buildup welding is a principally known technology[3], which is performed typically using conventional lateral wire feed mechanisms. The key technology concept of the new process variation of hot wire buildup welding is the centric wire feed within a specially shaped laser beam[4]. This solution provides directional independence to the welding process and substantially improves the long-term process stability. First experiments show that process efficiency and deposition rates improve 30-60 percent compared to cold wire processes.

The other hybrid process variation is based on coupling the additional energy into the substrate material. From the current experience, it is the most effective solution for high-performance laser cladding. Fundamentally, heat conduction energy losses into the base material during the buildup welding processes are inductively compensated through this hybrid technique[5]. Subsequently, a substantially reduced fraction of laser energy is required to provide the temperature field necessary for forming the deposition weld track on the substrate surface. The energy balance for the laser process is shifted to just melting the welding material, which leads to an increased deposition rate. Additionally, it is possible to modify temperature-time dependencies to achieve reduced cooling rates and temperature gradients, which is beneficial to avoid crack formation in very hard material combinations[5].

Technically, these physical mechanisms are implemented in the form of the hybrid laser cladding head as shown in figure 2. This processing head is compatible with diode, fiber and disk lasers up to 10 kW and can be coupled with an integrated and localized acting induction module. The producible weld track widths are between 4 and 8 mm and can be mechanically varied by adjusting the head's z-axis position. The coaxial powder nozzle itself can handle a powder throughput of up to 18 kg/h. Typical practical deposition rates for INCONEL 625 are about 14 kg/h with the simultaneous application of 8 kW laser and 12 kW induction power. A typical welding process at these power levels is shown in figure 3.

Figure 1: Flat jet nozzle.

The localized and simultaneous heat input leads to additional benefits in terms of residual stresses. The substantially increased cooling time t8/5 and the low spatial temperature gradients reduce the stresses in the deposited coatings. As a result, it becomes possible to process very hard materials, which would not be crack free weldable with conventional methods. An example is a protective coating from Stellite 20 with a hardness exceeding 60 HRC.

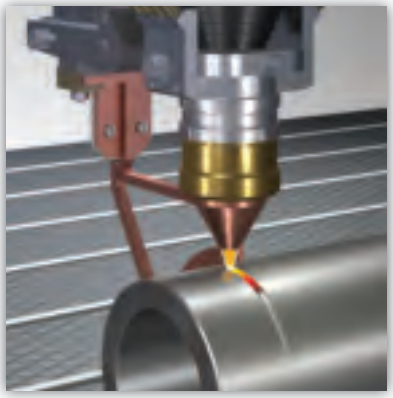


Figure 2: Hybrid COAX head.

The improved cost

Figure 3: Hybrid cladding process.

efficiency of the hybrid processes is based on the 50 percent reduction of specific investment costs for the energy sources while doubling the energy efficiency.

Examples of high performance laser cladding processes include the deposition of corrosion protective coatings on large hydraulic cylinders (figure 4), hard facings on screw-conveyors and carbidic functional coatings on drill tools in metallurgy. ■

Executive Director Eckhard Beyer, Group Leader Laser Cladding Steffen Nowotny, Staff Members Laser Cladding Frank Brueckner and Holger Hillig and Deputy Director Anja Techel are with Fraunhofer IWS Dresden.

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Figure 4: Hydraulic cylinder.

LASER WORLD OF PHOTONICS MUNICH 2011
PHOTONICS KEY FUTURE TECHNOLOGY

Munich is the world capital of the photonics industry. The leading lights from industry and research met at LASER World of PHOTONICS 2011. The 20th event ended with a substantial increase of 27,500 visitors and a new record rise to more than 1,100 exhibitors and represented companies. The four days of the trade fair showed that the manufacturing industry is brimming with confidence as it looks to the future; the stage is set for growth. The exhibitors', visitors' and organizers' credentials were outstanding. They were full of praise for the biggest and best LASER World of PHOTONICS to date.

The LASER World of PHOTONICS is the laser and photonics industry's most international event. This statement is underpinned by the high proportion of 58 percent of foreign exhibitors and 53 percent of visitors. The leadership status is also reflected among the international guests as the top five visitor countries apart from Germany were France, Great Britain, Switzerland, Japan and the U.S.A.

TOP MARKS

Market research Institute TNS Infratest conducted a representative poll and found that almost all visitors to the trade fair (98 percent) rated the LASER World of PHOTONICS 2011 as being "excellent to good" and 97 percent intend to return. Ninety-nine percent of visitors were satisfied with the completeness and breadth of the offering and 98 percent with the presence of the market leaders while 96 percent praised the exhibitors' international makeup. Additionally, 97 percent consider LASER World of PHOTONICS to be the industry's flagship trade fair and 95 percent praised the quality of the content at the photonics forums. Most exhibitors (94 percent) also awarded the trade fair an overall rating of "excellent to good."

The LIA booth at LASER World of PHOTONICS MUNICH, a flagship show in the photonics industry.

FAIR FOCUSED ON FUTURE TOPICS

In the industrial production and research world, optical technologies are considered to be emerging technologies. With its focus on "Lasers and Laser Systems for Production Engineering," "Green Photonics" and "Biophotonics and Life Sciences," the event was deliberately putting its chips on the topics that will dominate the industry's future.

The outstanding visitor numbers and the satisfaction of the exhibitors prompted Norbert Bargmann, deputy chairman of the Messe München GmbH Board of Management, to draw a positive conclusion, "Munich has further enhanced its status as the venue of the world's leading trade fair. The Munich trade fair has demonstrated once again that it ranks alongside LASER World of PHOTONICS CHINA as the industry's leading champion. I particularly welcome the fact that the federal government chose this venue to unveil its future support for the photonics industry. This is very important especially for the numerous small and medium-sized enterprises."

SCIENTIFIC EXCELLENCE IN THE WORLD OF PHOTONICS CONGRESS

Over 3,250 international participants attended the total of six conferences taking place during the World of Photonics Congress. The predominant impression was of a lively exchange of ideas between scientists, students and users from diverse countries. The participants praised the technical level and scope of the offerings.

Prof. Dr. Peter Loosen, president of the steering committee of the World of Photonics Congress and deputy head of the Fraunhofer Institute for Laser Technology ILT said, "The combination of trade fair and congress here in Munich is unique in the world. The congress comprises the six conferences as well as the practical lectures in the photonics forums in the trade fair halls. These forums are outstanding and made a significant contribution to opening the congress up to industry. The congress is one of the greatest photonics events in the world of its type, the atmosphere here was very good."

The next LASER World of PHOTONICS will be held from June 17-20, 2013. Visit **www.munich-tradefairs.com** for more information. ■

MUNICH PROGRESS

- Visitor numbers increase more than 8 percent up to 27,500
- Visitors from 80 countries
- Growth areas: Medical technology, biophotonics, renewable energies and electro-mobility

UV LASER SCRIBING PROCESS FOR LED SAPPHIRE WAFERS

By Ashwini Tamhankar and Rajesh S. Patel

"Going green" has been a buzz phrase in the global lighting sector for a long time. Consumers are taking steps towards greener solutions by replacing incandescent bulbs with energy efficient alternatives such as compact fluorescent bulbs, but the next big thing in lighting is the use of light emitting diodes (LEDs). LEDs are "greener" and efficient offering up to 80 percent more energy savings than compact fluorescent bulbs. LEDs are becoming the most widely used optoelectronic devices in the market. Today, LEDs are used in automotive, consumer electronics, display, illumination, transportation, mobile and photosensor applications.

With increasing demand for LEDs, there is a continuous need to improve process technology to manufacture brighter, more efficient and less expensive LEDs. LED devices such as InGaN blue, green and white LEDs are fabricated on a single crystal sapphire (Al_2O_3) substrate that has excellent thermal conductivity. A typical 2-inch processed LED wafer contains several thousand LED devices. The individual LEDs are separated in the end using a die separation process. The street width available between active LED devices are shrinking to typically 20 to 50 μm. Traditional mechanical and diamond saws used in the past for die separation produces too wide a cut (>50 μm kerf width) and also can produce undesirable effects such as chipping, micro-cracking and delamination, negatively impacting die yield and throughput.

LASER SCRIBING

Laser scribing has rapidly become the industry standard for separating high-brightness LEDs. Laser scribing technology has proven to be an efficient technique for LED separation with overall advantages of increased throughput, low cost, ease of use and high yields. Also, laser scribing is a non-contact process that allows better scribing of hard or brittle materials while reducing micro-cracking and damage to the wafer substrate. The wider process tolerance of lasers and the elimination of blade wear and breakage translate to a more robust manufacturing process at a lower cost.

Sapphire is relatively transparent in the visible and near visible wavelength portion of the electromagnetic spectrum. Thus, frequency tripled (355 nm) and frequency quadrupled (266 nm) diode-pumped solid-state (DPSS) Q-switched lasers are the most commonly used lasers for LED scribing. Typically, the laser is tightly focused on the wafer substrate to ablate the material and create a narrow scribe line between the active devices. Scribe depth of one-third to one-half the substrate thickness is required to achieve a clean break during subsequent mechanical breaking step. The need for both narrow and deep scribe lines at high speed can be met using a laser with high beam quality, high peak powers and high repetition rates such as a DPSS laser.

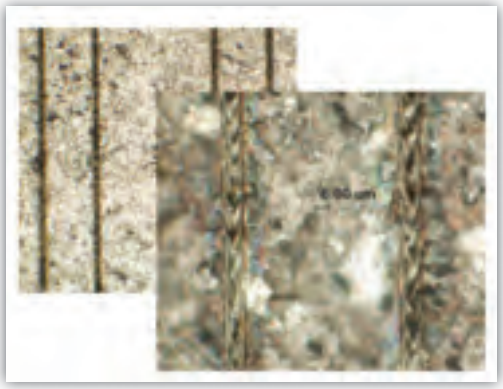


Figure 1

For 266 nm laser-based processes, the laser is typically irradiated from the front side of the sapphire wafer. In contrast, backside scribing is a preferred technique while using 355 nm wavelength lasers to scribe sapphire wafer <150 μm thick. Scribing from the backside of the device has been shown to have an advantage of reduced impact on LED performance.

EXPERIMENTAL RESULTS

In Spectra-Physics' Industrial Laser Applications Lab, we have characterized the effect of pulse width and repetition rates of a 355 nm DPSS Q-switched laser on sapphire scribe depth. A 400-μm thick blank single crystal sapphire wafer was used for this study. All of the laser processing was performed at room temperature on the diffused backside of the wafer with no assist gas. The lasers used were the Spectra-Physics Tristar 355-3 with >3 W at 50 kHz and the Pulseo 355-10 with >10 W at 90 kHz. Both had <23 ns pulse durations and good beam quality. Figure 1 shows a top-view of example scribes on a sapphire wafer. Figure 2 is a cross-sectional edge view demonstrating scribe depths at various focal planes. The "processing focal plane" during the experiments was selected at a location where the deepest scribe was achieved.

Our results indicate that the sapphire material removal threshold is dependent upon pulse duration. Shorter pulse width lasers (<30 ns) tend to have lower material removal threshold than longer pulse width lasers (>40 ns). Figure 3 shows the advantage of shorter pulse width. The shorter pulse width of laser allows material removal at lower fluence with exceptional scribing quality. It also produces negligible HAZ and minimal heating of the wafer and surrounding circuitry that is essential for higher yield and higher brightness LEDs. Also, we discovered that deeper scribes are achieved by operating lasers at higher repetition rates.

Today's laser products offer ever increasing power levels – and this also holds true for short pulse width, 355 nm wavelength lasers. With this trend, it can be challenging to effectively use the power and pulse energy as efficiently as possible for material

Figure 2

removal. Hence we have explored techniques to increase process efficiency while maintaining the quality of sapphire scribes using different lasers and beam delivery systems.

With lower power laser systems such as Tristar 355-3, we have shown that the optimal results are achieved by operating the laser at low fluence and high repetition rates (up to 150 kHz). With higher power laser systems such as the Pulseo 355-10, we have shown that the potential gain of up to 75 percent in processing speed can be achieved by a beam splitting technique, as illustrated in figure 4. For a scribe depth of 25 μm, a scribing speed of up to 188 mm/s can be achieved.

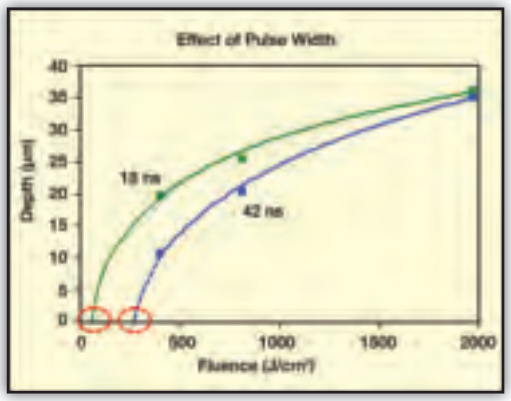
BRIGHT FUTURE

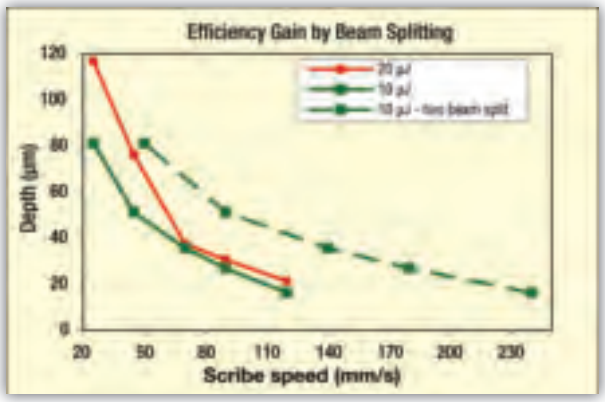
The demand for LEDs has exploded due to the significant energy efficiency gain it offers over traditional incandescent lighting. Laser scribing has enabled big improvements in quality, performance and yield of LED manufacturing. The DPSS 355 nm Q-switched lasers with the shorter pulse widths, higher repetition rates and higher power provides an effective tool for LED sapphire wafer singulation process. ■

Editor's note: Portions of the content in this article first appeared in the October 2010 issue of Photonics Spectra.

Ashwini Tamhankar is a senior laser applications engineer and Rajesh S. Patel director of strategic marketing and applications at Newport Spectra Physics.

Figures 3 (top) and 4





CORPORATE MEMBER PROFILE | ALTOS PHOTONICS INC.

LIA Corporate Member Altos Photonics Inc. offers femtosecond, mode locked and Q-switched lasers and tunable systems for research and industrial customers. Additional products include non-linear crystals (BBO, KTP, ZGP, Yb:KYW; Yb:KGW, etc), optical mounts, USB-controlled stages and other related products. Altos Photonics sells and services products from EKSPLA, EKSMA Optics, Light Conversion and Standa.

Altos Photonics' goal is to be the expert in the field in order to understand their customer's objectives and pair them with products and solutions.

COMPANY BACKGROUND

Founded in 1995 by Bob Tamosaitis, Altos Photonics is currently managed by Lucian Hand, president and shareholder, together with major shareholders Light Conversion Ltd. and EKSPLA Ltd. Consisting of seven employees and located in Bozeman, Montana, the company's main markets are research labs and laser/systems manufacturers.

Altos Photonics started out facilitating cooperation between U.S. researchers in non-linear spectroscopy and companies in Lithuania who had developed picosecond laser technology, along with related OPG/OPA systems and components. The company has grown into a manufacturer's representative for four Lithuanian companies, offering pulsed laser systems and related components. The first products that began the company were high-energy picosecond tunable laser systems.

Altos Photonics' partners – EKSPLA, EKSMA Optics, Light Conversion and Standa – use in-house R&D for product design and optimization and Altos provides input to their design teams.

TODAY'S LINEUP

The company currently has an impressive list of offerings from which to choose. Altos' pulsed lasers range from high-energy systems used in high-energy physics and non-linear spectroscopy to DPSS systems used in micro-machining and ultra-fast applications. The company's femtosecond, mode-locked and Q-switched lasers and tunable OPO/OPA systems are used by leading scientists and engineers around the world.

Laser components include UV and IR optics, non-linear crystals (BBO, KTP, ZGP, Yb:KYW, Yb:KGW, etc), optical mounts, motorized stages and positioners and laser safety glasses/shielding. Opto-electronic products include laser power supplies (diode and flashlamp drivers), Pockel's cell drivers and laser pump chambers. Additionally, Altos is happy to provide custom solutions and specifications for research and OEM applications.

EKSPLA NT242 Tunable DPSS laser/ OPO system from Altos Photonics.

Tunable laser systems make up the largest share of Altos Photonics' market, followed by laser components (especially Pockel's cell drivers and laser crystals).

"Together with our outstanding customers, we are working to improve our environment and human health by enabling advances in nuclear fusion, solar cell manufacturing, bio-medical polymers, heart stent manufacturing, battery technology and fuel injector nozzle drilling," explained Altos' President Lucien Hand.

And soon to be introduced to the market courtesy of Altos Photonics is a new compact 2W DPSS femtosecond laser that will be spec'd for industrial applications but priced competitive with Q-switched lasers.

"We expect this to open up significant new opportunities," Hand said.

STAYING CURRENT

Although only 15 years old, Altos Photonics has already seen significant changes in the industry.

"As lasers have become more widely used in research, increasingly we see research labs without a 'laser jock' to support complex maintenance – meaning that manufacturers must deliver robust systems that still have the flexibility and specs to support fields like non-linear spectroscopy. We have responded by developing diode-pumped solutions to replace flashlamps and by computer automating systems. Computer automation provides the additional benefit of letting us provide a lot of support remotely," explained Hand.

An LIA corporate member since 2002, Altos Photonics sees great benefits to being a member.

"LIA supports safe use of lasers, which helps with their adoption across many fields. Accidents are bad for business. We appreciate and support efforts to implement standards and train users to use lasers safely across a variety of applications," Hand said.

For more information, visit **www.altosphotonics.com**. ■

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WELCOME ASC Z136 NEW MEMBERS

A membership ballot was conducted during June and the following applicants were overwhelmingly approved for membership:

Dr. Brian Biesman – the director of the Nashville Center for Laser and Facial Surgery, Nashville, TN, Biesman will be replacing Dr. Jerome Garden as the alternate representative for the American Society for Laser Medicine and Surgery (ASLMS).

Dr. Hong Chen – Assistant researcher at the Institute of Laser Engineering, Beijing University of Technology, Beijing, Chen is responsible for the education of laser safety for graduate students. Her application to the committee was fully supported by the university. Chen is also involved in the work of the National Technical Committee 284 on Optical Radiation Safety and Laser Equipment of Standardization Administration of China.

Mark Festenstein, CLSO – currently with BE Meyers Company, Bellevue, WA, Festenstein has worked with lasers/electro-optics for over 13 years and as an LSO since 2005. He is responsible for training all employees on laser safety and clean room protocol. Festenstein earned his CLSO in March 2009.

Patti Owens, RN, MHA, CMLSO – Owens is the manager of the laser/aesthetic program at Olympic Dermatology and Laser Clinic, Olympia, WA, as well as owner/consultant of Northwest Laser Aesthetics, LLC. She has been a member of SSC-3 for the last 11 years, board member of ASLMS for the last four years, a member on the initial BLS committee for CMLSO development and a CMLSO for the last eight years, and recently approved to IEC TC76 WG4.

Additionally, the committee approved the appointment of Dr. James Sheehy as SSC-7 chair. SSC-7, the standards subcommittee responsible for the development and maintenance of the *Z136.7 American National Standard for Testing and Labeling of Laser Protectice Equipment* is being re-established to initiate the revision of this document. ■

HOW TO PARTICIPATE

If you are interested in participating on ASC Z136 or any of its subcommittees, please contact Barbara Sams at 407-380-1553 or e-mail bsams@lia.org. To view committee activities or apply online, go to **www.z136.org**.

IT'S TIME TO VOTE!

This year we have moved to an all electronic ballot to make voting more convenient for you! Please be sure to watch your email with instructions and the web address so you can submit your vote by Monday, September 26th. Your vote is important as it influences the future of our society.

WELCOME NEW & RENEWING CORPORATE MEMBERS

- Onefive GmbH

Zurich, Switzerland

For a complete list of corporate members, visit our corporate directory at **www.lia.org/membership**.

For professionals working around lasers, becoming certified by the BLS is one of the highest credentials a laser safety officer can earn. BLS certification demonstrates that individuals in the laser safety field have agreed to adhere to higher standards of safety and professional practice.

Reasons to become certified in today's economy include:

• *Improving your competitive advantage* – Working in laser safety can be highly competitive, and becoming certified can help you stand out from other job candidates. Simultaneously, becoming certified adds a higher level of credibility to your "on-the-job" experience. The combination of laser safety experience and certification demonstrates to current and potential employers that you are accomplished and qualified in the field.

• *Increasing job security* – Laser safety is a necessary function for many companies, even in a down economy. As a result, becoming certified may enhance job security. If companies are considering cutting back on staff, managers may be more likely to retain certified professionals who have a specialized skill such as laser safety.

• *Enhancing the opportunity for advancement and earnings* – While the primary goal in our current economy is to stay employed, it is important to plan for the future, looking toward potential career advancement opportunities and increased earnings. By taking the time now to become certified, you will be ready for better opportunities that arise as the economy improves.

• *Complying with OSHA regulations* – OSHA requires employers to provide a working environment free of recognized hazards and to comply with OSHA's regulations—regardless of the current economic conditions. This certainly pertains to laser safety because Class 3B and Class 4 lasers pose a recognized hazard. By passing the CLSO/CMLSO exam, a person is officially recognized as having a thorough understanding of laser safety concepts, practices and state and federal regulations. When an organization has a CLSO/CMLSO on staff, it demonstrates to OSHA that the company has high standards in place with regard to its laser safety program.

When compared to going back to college or obtaining a higher degree, becoming certified is much faster and cost-effective. The examination process to become a CLSO or CMLSO is relatively short, and enables you to quickly receive a recognizable and respected credential that is indicative of upholding a higher standard of laser safety.

For more information about the Board of Laser Safety's certification exams, and to find out if you qualify, visit **www.lasersafety.org**. ■

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** to begin your search.*

ENERGY, COST AND THROUGHPUT EFFICIENT PROCESSING OF SOLAR CELLS WITH TAILORED LASERS

by Alexander Schell

In order to reduce production costs and to increase throughput, great efforts have been put to explore efficient processing in full-automated manufacturing lines. Because of non-contact processing and high flexibility, the use of lasers in photovoltaic production has grown in popularity, for example laser fired contact, drilling contact holes, edge isolation, scribing, edge deletion, etc. Different applications need different laser parameters such as wavelength and beam profiles.

LASER APPLICATIONS IN THE AUTOMOTIVE INDUSTRY

by Klaus Löffler

The automotive industry has been a target market for the laser soon after the invention of the laser in 1960. Mass production and flexibility have been the arguments for the laser. The first installations in 1973 all the way to late 1980 have been successful due to the missing industrial ready laser resonators. But the laser has seen a fast development over the years and with it the use of lasers in the automotive industry.

LASER SHOCK PROCESS

by Che Zhi-gang

The technique of laser shock process (LSP) is an advanced surface treatment, which import high pressure shock wave induced by laser beam into target materials to improve their performance. The fatigue life of the materials is prolonged by times through changing the stress distribution. The hardness and strength are increased remarkably and corrosion resistance is improved after LSP. Compared with other treatment techniques, LSP have many advantages, such as high pressure, high energy, high strain rate, noncontact, no heat-affected zone, better controllability and roughness and remarkable processing effect. ■

View complete articles at www.lia.org/laserinsights under the Featured Category.

JLA UPDATE

The JLA is published four times a year by the LIA 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 greater functionality and the ability to leverage a wide range of valuable discoverability features. JLA now features eight topic sections, a faster peer-review process and a more functional website (**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. To receive your JLA table of content e-mail alerts, sign up at http://lia.aip.org/alerting_services/toc_alerts

Research Highlights

The Effect of Multiple Laser Alloyed Tracklines on the Corrosion Properties of Al-NMC

In real life engineering applications, production of large area coverage is often required especially for preventing material loss and component damage. To enhance such applications, multiple tracklines laser surface alloying of Al/TiB2 was performed to obtain a large area coverage using Nd:YAG laser.

Innovative Approach of Joining Hybrid Components

Joining of dissimilar materials is gaining more and more importance especially in the automotive industry. The latest international initiatives concerning the average fleet CO2-emissions are forcing manufacturers to reduce fuel consumption and exhaust gas output. This can mainly be achieved by reducing the weight of the vehicles.

View complete articles at jla.aip.org.

MEMBER INNOVATIONS

COHERENT LAUNCHES LASER

Coherent Inc., Santa Clara, CA, has released a new 10 Watt, very low noise, CW green (532 nm) laser intended for cost-effective pumping of titanium:sapphire oscillators and amplifiers. The new Verdi G10 now becomes the highest power model in the Verdi™ G family, which utilizes Coherent's next-generation, optically-pumped semiconductor laser (OPSL) technology to deliver a unique combination of high performance, exceptional reliability, compact size and low cost of ownership. The Verdi G10 laser is ideal for pumping ultrafast and CW titanium:sapphire laser systems for all applications in spectroscopy, pump-probe dynamics and materials research. For more information, visit **www.Coherent.com**.

OPHIR INTRODUCES PYRO-C LINE OF LASER ENERGY SENSORS

Ophir Photonics Group, Munich, Germany, has introduced the Pyro-C line of Pyroelectric Laser Energy Sensors. An upgrade to the company's PE line of pyroelectric pulsed sensors, the Pyro-C detectors provide the industry's lowest measurable energy, longest measurable pulse width and highest accuracy. The sensors are compact devices that provide a user adjustable threshold, preventing false readings in noisy environments. For more information, visit **www.ophiropt.com/photonics**.

NEWPORT INTRODUCES CONTROL SYSTEM

Newport Corporation, Irvine, CA, has introduced the Integrity VCS Series vibration control system designed specifically to provide an economical and stable platform for basic photonic research and development at universities, government or corporate labs. All Integrity VCS systems include a steel honeycomb damped optical platform and a mating support frame. I

Newport has also introduced a new series of ultrafast variable attenuators (UVA). Compact, robust and easy-to-use, the ultrafast attenuators are available in manual (UVA-800-M) and motorized (UVA-800-CONEX) versions. The new attenuators are designed to address the challenge of safely attenuating the output of ultrafast amplifiers. For more information, visit **www.newport.com**. ■

MEMBERS IN MOTION

NEWPORT TO ACQUIRE OPHIR

Newport Corporation, Irvine, CA, has signed a definitive agreement to acquire Ophir Optronics Ltd., a leader in precision infrared optics, photonics instrumentation and three-dimensional non-contact measurement equipment. The aquisition price will be approximately $230 million in cash. The transaction is expected to close in the fourth quarter of 2011, subject to receiving required regulatory approvals. Ophir is headquartered in Jerusalem, Israel, with manufacturing operations in Israel and the U.S. and sales offices in the U.S., Japan and Europe.

Newport has also entered into an agreement to acquire High Q Technologies GmbH, a leading developer and manufacturer of ultrafast lasers under its High Q Laser® brand. Terms of the transaction, anticipated to close before the end of the third quarter, were not disclosed. High Q, headquartered in Rankweil, Austria, expects 2011 revenues of approximately $20 million, with three-fourths of its sales to customers in Europe.

The acquisition will be completed through a merger of Ophir with a newly formed subsidiary of Newport, with Ophir becoming a wholly owned subsidiary of Newport following the closing.

CLEAN ROOM AT OPHIR

Ophir-Spiricon, Logan, UT, has opened a clean room at its new facility in Logan. The 840-square-foot clean room is used for manufacturing the solid-state, pyroelectric detector arrays used in the company's Pyrocam™ beam profiling cameras. The new clean room houses photolithography and thin film deposition processes. The room complies with ISO 7 standards for airflow and filtration. For more information, visit **www.ophiropt.com/photonics**.

RESOURCE FOR RESEARCH

Newport Corporation, Irvine, CA, has published a catalog titled *Newport Resource* for photonics research products and related applications. The catalog encompasses products from all Newport brands, including Corion®, New Focus™ , Oriel® Instruments, Richardson Gratings™ and Spectra-Physics® Lasers, and will be available in English, French, German and Chinese. *Newport Resource* is designed as a learning resource and product guide for optoelectronics engineers, universities and photonics researchers and features 1,632 pages and highlights 2,440 new products. There are over 202 pages of technical and application notes, reference information and definitions. To order the free catalog online, go to **www.newport.com/NewportResource**.

SHANGHAI APPLICATIONS FACILITY

Coherent, Inc., Santa Clara, CA, Höganäs Co. Ltd., (China, a producer of iron and metal powders) and ABB (a supplier of industrial robots) have opened a laser applications center at the Höganäs facility in Shanghai. This new facility offers access to a Coherent HighLight 4000L, 4 kW, direct diode laser system, mounted on a ABB IRB 2600 robot, enabling users to utilize lasers as part of the metal cladding process. Application center personnel will supply the knowledge and experience to optimize cladding process parameters. For more information, visit **www.Coherent.com**.

LME SPONSORSHIP OPPORTUNITIES AVAILABLE

The mission of LIA's Lasers for Manufacturing Event (LME) is to provide a one stop event for companies interested in integrating laser technology into their production. Attendees will learn about laser choices, beam delivery, automation equipment, safety considerations, applications development and meet exhibitors that supply these products and services. LME, being held Sept. 27-28, 2011 in Schaumburg, IL, will be the place to see the latest in laser technology, network with the industry's elite and find solutions to current and future manufacturing needs.

Be a part of the first ever and exclusive event for lasers in North America as there are a variety of sponsorships and exhibitor space still available for LME. LME is developed as the ultimate marketplace for laser companies/manufacturers (the sellers) and other industries that use or can use lasers (serious buyers) so be sure and take advantage of this opportunity to showcase your products. For more information, contact Jim Naugle at jnaugle@lia.org/407-380-1553.

Additionally, anyone that attends an LIA classroom course prior to Sept. 27, 2011 will receive a complimentary registration to LME 2011. For a list of courses, visit **www.lia.org/education**. Visit **www.laserevent.org** for more information on LME.

ICALEO 2011 ADVANCE PROGRAM AVAILABLE, REGISTRATION OPEN

The International Congress on Applications of Lasers & Electro-Optics (ICALEO®), which has a 29-year history as the conference where researchers and end-users meet to review the state-of-the-art in laser materials processing, laser microprocessing and nanomanufacturing as well as predict where the future will lead, will be held Oct. 23-27 at the Hilton located in Walt Disney World® Resort in Orlando, FL. From its inception, ICALEO has been devoted to the field of laser materials processing at macro, micro and nanoscales and is viewed as the premier source of technical information in the field.

Each year ICALEO features areas of topical interest. This year's featured sessions include diode lasers for processing and pumping, laser process monitoring and control, laser processing of biological materials, lasers in nanotechnology and environmental technology, laser hybrid processing, laser manufacturing for alternative energy sources and laser business development.

The Advance Program, which gives full details on all conference events, speakers and topics, is now available for free download at **www.icaleo.org**. Get yours now to plan out your trip!

Attendee bonus – anyone that registers online by Sept. 1 will receive $25 off the early bird full conference registration price.

Additionally, there are various sponsorship and vendor opportunities available to give your company or organization added promotional exposure at ICALEO 2011. For information on these opportunities, contact Jim Naugle at 407-380-1553/1-800-34-LASER or e-mail jnaugle@lia.org.

LAM 2012 SPONSORSHIPS

LIA's 4th annual Laser Additive Manufacturing Workshop (LAM), which will bring industry specialists, executives, users and researchers from around the world to show how cladding and rapid manufacturing can be applied effectively and affordably to today's manufacturing challenges, will be held Feb. 29-Mar. 1, 2012 in Houston, TX. This workshop will have a significant impact on the widespread industrial implementations of laser additive manufacturing (cladding, sintering and rapid manufacturing). The sponsor brochure is now available that lists all levels and opportunities for you to be part of this great event that's targeted to such a specific audience. Visit **www.lia.org/conferences/lam** for more information.

LIA PUBS DISCOUNTS

Act now to get your hot summer sale reading materials from LIA! During this special you can get 20% off *LIA's Guide to Laser Cutting* for $40 (member price: $32) and the *Laser Safety Guide*, a handbook for all laser personnel that outlines potential hazards for all types of lasers and provides easy to understand guidelines for controlling laser hazards for $21.60 (member price: $17.60). *Hybrid Laser Arc Welding, Introduction to Laser Technology, 3rd Edition* and *Understanding Lasers: An Entry-Level Guide, 3rd Edition* are being offered at member pricing; $225, $127 and $83 respectively.

We've saved the best for last! The *ANSI Z136.1 – Safe Use of Lasers* is 30 percent off this summer. The parent document and cornerstone of the Z136 series of laser safety standards, the ANSI Z136.1 (2007) provides guidance for the safe use of lasers and laser systems by defining control measures for each of the four laser classes. It is recommended that this standard be obtained by all laser end users and is a must for users of class 3B and 4 lasers.

Now is the time to invest in the foundation of a successful laser program! To order these publications at the discounted prices, visit www.lia.org/store and enter the discount code LMETODAY11. ■

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Laser Applications and Safety

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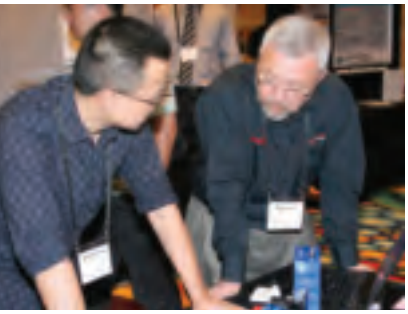

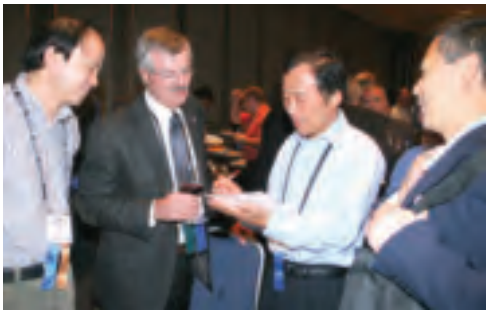

ICALEO® brings together the leaders and experts in the field of laser materials interaction, providing the world's premier platform for sharing new ideas and discovering breakthrough solutions.

Presented by:

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