THE OFFICIAL NEWSLETTER OF THE LASER INSTITUTE OF AMERICA

LIA TODAY

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& ITS PROTECTION TIME EVALUATION METHOD
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EVOLVING LASER SAFETY CLASSIFICATION CONCEPTS
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GATHERS GLOBAL LASER SAFETY PROFESSIONALS
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Focus: LASER SAFETY

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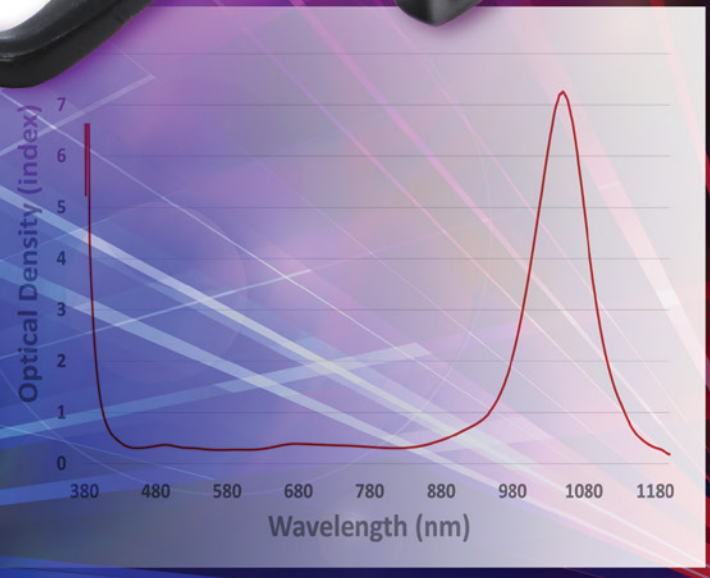

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LIA TODAY

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ABOUTLIA

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.

CALENDAR OF EVENTS

Laser Safety Officer Training

Dec. 6-8, 2017	Orlando, FL

Laser Safety Officer with Hazard Analysis*

Sept. 18-22, 2017	Chicago, IL
Oct. 16-20, 2017	Phoenix, AZ
Nov. 6-10, 2017	Miami, FL

*Certified Laser Safety Officer exam offered after the course.

Industrial Laser Safety Officer Training

Aug. 16-17, 2017	Novi, MI
Nov. 15-16, 2017	Novi, MI

Medical Laser Safety Officer Training*

Aug. 12-13, 2017	New York, NY
Sept. 16-17, 2017	Chicago, IL
Oct. 14-15, 2017	Phoenix, AZ
Nov. 4-5, 2017	Miami, FL

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

International Congress on Applications of Lasers & Electro-Optics (ICALEO®)

Oct. 22-26, 2017	Atlanta, GA

Laser Additive Manufacturing Conference (LAM®)

Mar. 27-28, 2018	Schaumburg, IL

Lasers for Manufacturing Event (LME®)

Mar. 28-29, 2018	Schaumburg, IL

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President's Message

This month's *LIA TODAY* is dominated by Laser Institute of America's core mission statement, which is "...to foster lasers, laser applications, and laser safety worldwide." I am proud of what LIA has done to support laser safety, which has been vital to its industrial acceptance. In this issue, we address laser safety, beginning with an article by Kunihiko Washio on new standards for laser guard materials and protection. As lasers change and improve, the ways we can evaluate and improve on safety must evolve. Likewise, Karl Schulmeister's article on laser exposure limits is a reminder that the laser is a tool and we have to know how to use that tool safely. In addition, there is a recap of this year's successful ILSC 2017 in Atlanta. While many may think that laser safety is a mature area, the ILSC showcases how new laser technology, capabilities, new applications, and markets require constant updates and modifications to the laser safety standards and recommended practices.

As I am writing this, we are approaching the last days with Peter Baker as LIA's Executive Director. For me, it has been great working with Peter over many years. Peter has done a great job building and guiding the organization through each season. I wish Peter well in his retirement and hope that he will continue to be a mentor to me and the next LIA Executive Director.

And as for the new LIA Executive Director, as a member of the Selection Committee, I can tell you it is not easy trying to find "The Next" Peter Baker. We are working hard to select the right person to lead LIA. The Selection Committee has involved a variety of LIA staff members, including Peter, to try to find that person that can help guide us to a bright future. The Committee hopes to have an announcement in June.

Enjoy Spring! I look forward to what is to come.

Paul Denney, President
Laser Institute of America

Executive Director's Message

For me, 1988 was a big year. That October, Sunny and I were married. In November, I became LIA's Executive Director. These were two positive, life-changing experiences!

In LIA's early years, our society was run from the homes and offices of its President and Officers. Then, in the late 1970s, LIA established an office in Toledo, Ohio with General Manager Haynes Lee, his wife Marge, Jack Dyer, and others. This team worked with Dave Belforte and Professor Arata to launch LIA's first conference, the International Laser Material Processing Conference, held in Anaheim in 1980. My first interaction with LIA was as a speaker at the conference.

We opened our Orlando office in April 1989 and have been busy here ever since, adding conferences, standards, courses, and publications for all of our members and clients.

Now, after 28 plus years, I will retire on May 1st and we will hopefully have a new Executive Director to build on the foundation we have created together.

I want to express my profound gratitude for the opportunity to work with everyone, including members, presenters, instructors, conference chairs, our Board, Officers and fine staff. It was a pleasure and I will miss you all.

Thank you and Farewell!

Peter Baker, Executive Director
Laser Institute of America

Proposal of a New Laser Safety Guard Material

& Its Protection Time Evaluation Method

KUNIHIKO WASHIO, TAKASHI KAYAHARA, YOSHIHIRO EMORI AND AKIRA FUJISAKI

Thin metallic sheets made of aluminum or steel with a thickness of 1 to 2 mm are often used as laser guard materials. However, metallic laser guards are easily penetrated by high power laser irradiation due to quick melting. Therefore, their protection times are short. Current problems of metallic laser guards are: (1) A tendency toward generating a large through hole due to quick melting if irradiated with high-power laser; (2) Protection times are significantly influenced by surface reflectivity conditions and reflectivity changes over time.

Contrary to ordinary metals, pitch-type carbon fibers have desirable features such as non-melting, high-sublimation temperature and low-reflectivity. Therefore, we have conducted experiments to evaluate pitch-type CFRP (carbon-fiber reinforced plastics) as a new guard material for high-power lasers. These 3-mm thickness, lightweight CFRP plates incorporate industry grade pitch-type carbon fibers K13916 having tensile modulus of 760 GPa, fabricated by Mitsubishi Plastics Inc. The specific gravity is only 1.7. The CPRP plates consist of stacked multi-layers with carbon fiber orientation orthogonal to each other, layer by layer. The carbon orientations of the top and bottom layers are designed to be in parallel. The fabricated CFRP plates have strong anisotropy in thermal conductivity: 60 W/(m•K) for X and Y directions vs. 1 W/(m•K) for Z direction. Therefore, the heat generated at the irradiated front surface is effectively prevented from reaching the rear side due to the very low thermal conductivity in Z direction.

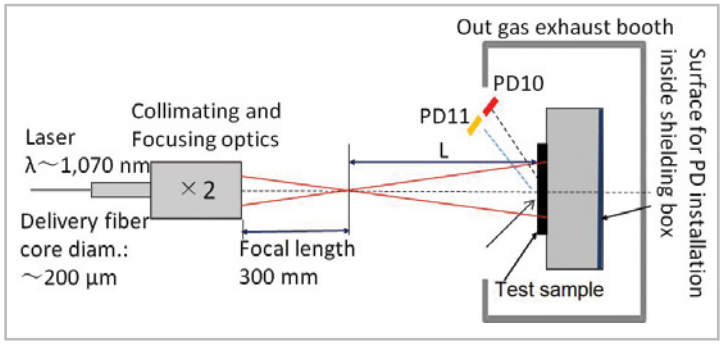


Figure 1. Schematic diagram of experimental setup

Figure 1 shows the schematic diagram of experimental setup. A CW fiber laser capable of emitting up to about 10 kW at a wavelength of about 1,070 nm was used. The laser beam was irradiated at test samples with a focusing lens having focal length of 300 mm. The length L from the focal point to the test samples was adjusted so that the irradiated beam diameter becomes either 60 mm or 30 mm. Two silicon photodiodes PD10 and PD11, equipped with 50-nm bandwidth bandpass filters having different center wavelengths (1,075 nm and 1,000 nm, respectively), were used in the front side to differentiate scattered laser radiation and thermal radiation.

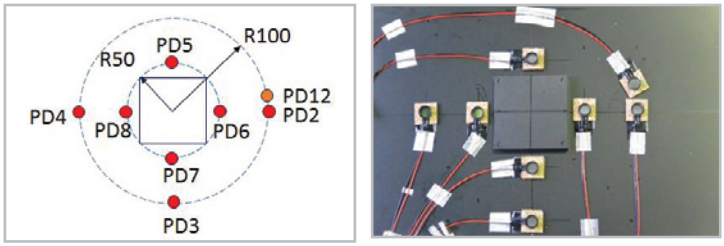
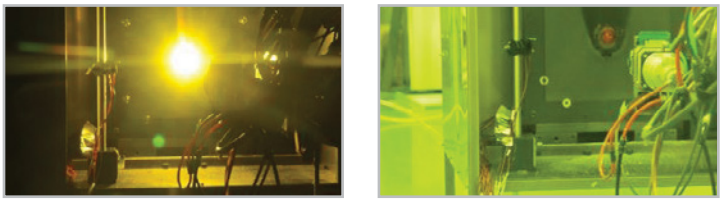


Figure 2. Layout of eight photodiodes located on the back plate inside the shielding box
a) Location map of the eight photodiodes
b) Photograph showing layout of photodiodes equipped with bandpass filters.

Figure 2 shows the layout of eight photodiodes located on the back plate inside the shielding box. Seven photodiodes from PD2 to PD8 are with bandpass filters having a 1,075 nm center wavelength. One photodiode PD12 is with a bandpass filter having 1,000 nm center-wavelength. All the photodiodes were used in photovoltaic mode without applying any bias voltage. The output waveforms from the photodiodes were simultaneously recorded with a 10-channel data logger. The input resistance of the data logger was set to be 2.4 kΩ.

Three different types of materials were used for test samples. They are: 3-mm-thickness CFRP, 1.6-mm-thickness zinc-coated steel and 1.5-mm-thickness aluminum. The top surfaces of aluminum test samples were gray coated to suppress strong reflection. Two types of sample-holding arrangements were used for test samples having two different sizes. One arrangement is for 300-mm-square, larger size samples and is designed to thermally insulate them from the shielding box to ensure natural air cooling. The other arrangement is for 150-mm-square, smaller-size samples and is designed to test small samples economically by utilizing partial and indirect peripheral cooling by attaching the sample to a rear-side panel having four water-cooled heat sinks. Figure 3 shows pictures taken during and after laser irradiation for a 300-mm square, pitch-type CFRP test sample.



(a) (b)

Figure 3. Pictures taken during and after laser irradiation at a 300-mm square CFRP test sample
a) A video shot taken during irradiation of 30-mm-diameter, 9 kW laser beam
b) PA photograph taken just after laser irradiation

Table 1 shows the comparison of test results for partially and indirectly cooled, 150-mm-square test samples irradiated with 60-mm-diameter laser beam at 3 kW. Average values of experimentally measured penetration times for ten samples of 1.6-mm-thickness zinc-coated steel and 1.5-mm-thickness gray-coated aluminum were 55.89 s and 3.96 s, respectively. The relevant standard deviations were 3.13 s and 0.14 s, respectively. Penetrated large holes are clearly visible for metallic test samples. On the other hand, for the case of 3-mm-thickness pitch-type CFRP, we could not observe any penetration for all the tested ten samples, even after more than three minutes of irradiation, although slight texture and color change could be seen on the rear surfaces.

When pitch-type CFRP test samples were irradiated with laser beams having much higher irradiation densities, we could observe rising, but from complex signal waveforms from the photodiodes located inside the shielding box. To interpret photodiode signal waveforms, a small mirror was placed in the rear side to monitor the phenomena occurring on the rear surface. By comparing the video data and photodiode signal waveforms, we have found that rear-side ignition starts much earlier than the penetration, or burn-through. Therefore, we have decided to use this rear side ignition time, instead of penetration time, as the experimental limiting time-base for the statistical calculation of protection time.

Figure 4 shows an example of irradiation test results for 300-mm-square, larger size, naturally air-cooled CFRP test samples, irradiated with 30 mm-diameter laser beam at 9 kW. The rear side ignition time has been measured to be 23.5 seconds for this sample. A tiny hole can be seen in the bottom picture for the rear surface. Figure 5 a shows histogram of rear-side ignition times observed for 300-mm-square, naturally-air-cooled ten

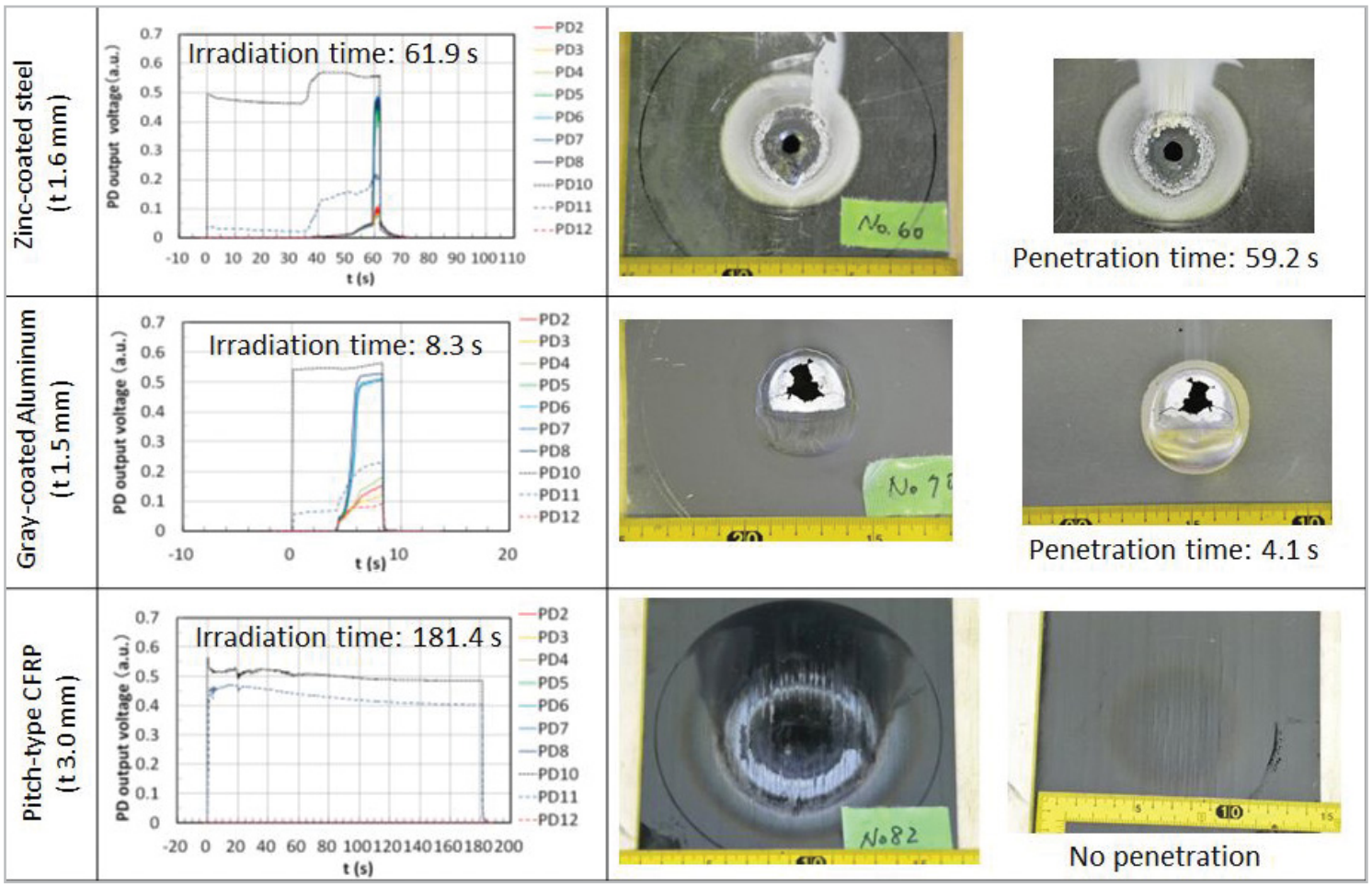


Table 1. Comparison of test results for partially and indirectly cooled, 150-mm-square test samples irradiated with 60-mm-diameter laser beam at 3 kW.
Left: Photodiode signal waveforms; Center: Front surfaces; Right: Rear surfaces.

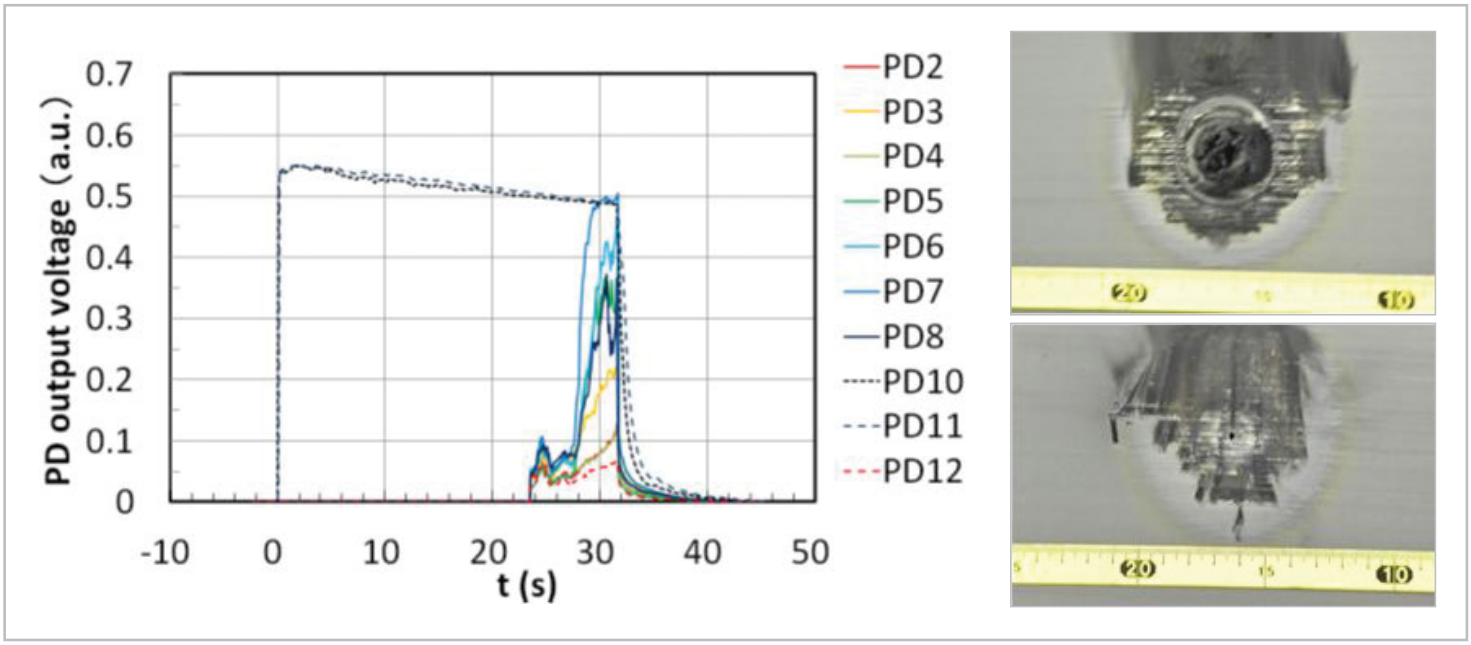


Figure 4. An example of irradiation test results for 300-mm-square, larger size, naturally air-cooled CFRP test samples, irradiated with 30 mm-diameter laser beam at 9 kW.
a) Photodiode signal waveforms
b) Top: Photograph of front surface; Bottom: Photograph of rear surface.

test samples. The average value of rear-side ignition time has been measures to be 24.89 s with standard deviation of 3.61 s. From these data, the protection time of 3-mm-thickness pitch-type CFRP plates for irradiation of 30 mm-diameter laser beam at 9 kW (power density of 1.27 kW/cm^2) has been calculated to be 9.8 s, which is very close to satisfy T3 class condition of minimum inspection interval of 10 s according to IEC 60825-4 Ed. 2.2: 2011, Safety of laser products – Part 4: Laser guards.

In conclusion, it has been demonstrated that lightweight pitch-type CFRP plates (with density of about 1/4 of steel) can provide remarkably long protection time against multi-kW high power fiber laser irradiation when used as a passive laser guard. Pitch-type CFRP would be also useful as a key component material for construction of active laser guards.

It must be pointed out here, however, that proper precautions against the flames and fumes generated at the irradiated front surfaces of pitch-type CFRP plates become necessary. ■

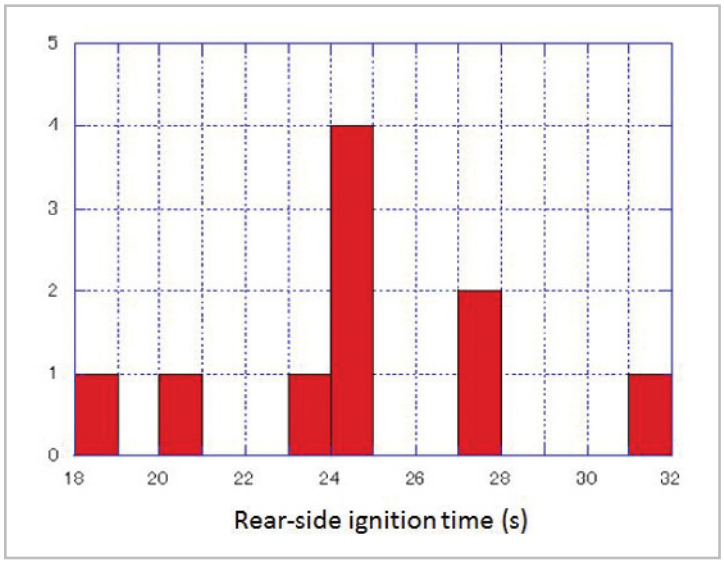


Figure 5. Histogram of rear-side ignition time for 300-mm-square, 3-mm-thickness, pitch-type CFRP test samples irradiated with 30-mm-diameter laser beam at 9 kW.

The authors greatly acknowledge funding of METI standardization project "International Standardization for Highly Laser-Resistant Laser Guards." The authors also thank the committee member of OITDA on high strength laser guards for helpful and valuable discussions and encouragement.

Kunihiko Washio is president of Paradigm Laser Research Ltd. Takashi Kayahara, Yoshihiro Emori, and Akira Fujisaki are engineers at Furukawa Electric CO. LTD.

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Evolving Laser Safety Classification Concepts
& New Products

BY KARL SCHULMEISTER

The classification of lasers by the product's manufacturer – from Class 1 to Class 4 – is a valuable means to provide the end user with simplified information about the potential hazards to the eye and skin. The concept of product classification can be considered a success story. Developed in the USA by the CDRH in the 1970s, it has been accepted internationally for more than 30 years, based on the standard IEC 60825-1.

While the basic system of classification has remained unchanged since its inception, some adjustments were necessary over the years and will also be necessary in the future, when reacting to new types of lasers and scientific data on injury thresholds.

Image 1. Gesture Controls & 3D Cameras for Consumer Electronics.

For a few years, diffractive optical elements (DOE) and micro-scanners have driven a large group of new products; mainly gesture controls and 3D cameras for consumer electronics (see Image 1), but also scanned lidars for machine vision and autonomous cars, as well as pico-projector scanners. For these new products, the combination of factors results in challenges for product safety and standardization. They are not intended as specialized professional products, such as lidars have been for the military, but are for consumer use. Therefore, in practice, they would need to be Class 1, Class 2 or Class 3R devices (depending on the wavelength range and country) but at the same time, for a satisfying performance in terms of detection distances, emission levels need to be relatively high. Because of the diverging or scanned nature of the emission, these systems suffer particularly from the conservative combination of classification rules of a 7-mm diameter pupil, an assumed exposure distance of 10 cm from the DOE or from the scanning mirror, together with an assumed accommodation to the apparent source at such short distance. While laser safety classification was always historically on the conservative side, it might be possible in the future to consider that the combination of those three exposure conditions is not only highly unlikely, but there are also reflexes (the near triad of accommodation) that result in pupil constriction when accommodating to a close target.

Defining measurement (pupil) diameters smaller than 7 mm for very close distances and as function of accommodation target might be a possible relaxation for future amendments, but would make the analysis even more complex. Also, possibly, emission limits can be raised somewhat in the higher nanosecond and lower microsecond regime, which is a task for the International Commission on Non-Ionizing Radiation Protection, ICNIRP to which the IEC refers for bio-effects committee work. Particularly for a change in the emission limits the general "predicament" exists that the injury thresholds depend in a very complex manner on wavelength, pulse duration and retinal spot size. When emission limits for products (or exposure limits for the eye) are to be made to reflect the thresholds more accurately to reduce needlessly large safety margins, it automatically makes the limits more complex since simple limits by default would be, for many scenarios, over-restrictive. One exception in the 2014 IEC and ANSI revision applied to small retinal sources, where it was possible to greatly simplify the analysis of pulsed emission by setting the multiple pulse correction factor C_P (or C_5) to unity, at the same time permitting significantly higher emission levels as compared to earlier editions. On the other hand, in the same revisions, the analysis of extended retinal images became more complex by permitting significantly higher emission levels for devices in the range of the lower "safe" classes.

Besides possible adjustments in the emission limits, two concepts based on engineering safety features are currently in development in the responsible standardization committee at IEC to permit higher emission levels for divergent or scanned systems - but still achieve classification as "safe" class, such as Class 1 for IR and Class 2 for visible emission.

The first is a virtual protective housing (VPH) where the emission is automatically reduced when an object enters the VPH. In such a device, one or more sensors monitor the protected volume. Outside of the protected volume, the emission needs to be below the limits for the class that is to be achieved, such as Class 1. When the VPH is free of relevant objects, the emission level within that volume can be higher: as long as human access to this radiation is prevented by the system, it is not relevant for product classification. The sensor system thus establishes a virtual protective housing instead of a real one, and defines what is referred to as the "closest point of human access".

The second type of engineering measure to raise permitted emission levels applies to lasers mounted on vehicles and other moving platforms. When the vehicle is stationary, only normal emission levels are permitted. When the vehicle is at a certain speed, it can be assumed that another vehicle that is driving at the same speed will do so with a minimum distance. Thus the speed of the platform is the basis to define the closest point of human access that is to be considered for classification, which can for instance be 1 or 2 meters from the car with the laser.

Both types of engineering features have the advantage that the emission is tested against permitted levels at farther distances than usual, resulting in significant increases of the permitted emission level for diverging or scanned emission. While the IEC standard can already be interpreted in a way as to permit classification on engineering features that prevent human access, in order to assure international standardized testing conditions, it is necessary to update the IEC standard and provide specific performance requirements. For instance, for the virtual protective housing, it will be necessary to define probes used to test if the emission is reduced when an object enters the VPH. For the "moving platform" concept, it will be necessary to define the measurement distance as function of vehicle speed, as well as additional requirements to prevent that people on or in the vehicle have access to hazardous levels of laser radiation, such as when the laser is mounted on the roof of the car and there is a sunroof, or people on a pickup truck's bed. A virtual protective housing might be needed to prevent access for these cases and to ensure that the concept of "moving platform" is internationally accepted for formal product classification. After all, it needs to be appreciated that classification of products following IEC 60825-1, as a basic principle, can only rely on engineering performance of the device and cannot depend on proper installation or behavior of the user. ■

Several of the issues discussed in this article were also topics of ILSC 2017 papers, including the history of CDRH and IEC standards in invited presentations by Jerome Dennis and David Sliney, respectively, as well as the moving platform concept. The 2014 updates of IEC and ANSI standards were discussed in earlier ILSC papers.

Karl Schulmeister was project leader for the 3rd Edition of IEC 60825-1 and is a consultant on laser product safety at Seibersdorf Laboratories in Austria. For more information, visit ***http://laser-led-lamp-safety.seibersdorf-laboratories.at****.*

ILSC 2017

Gathers the World's Medical & Industrial Laser Safety Professionals

ILSC
INTERNATIONAL LASER SAFETY CONFERENCE

BY JAMIE KING

Laser Institute of America's (LIA) International Laser Safety Conference (ILSC®) was held from March 20-23, 2017 at the Sheraton Atlanta Airport in Atlanta, Georgia. With over 200 laser safety professionals from around the world attending, medical and industrial workers from novice to expert discussed everything from laser generated air pollution to non-ionizing radiation.

Held concurrently with a full week of meetings by laser standards committees and punctuated by a host of networking events, ILSC 2017 deftly balanced technical and practical information through over 80 presentations and plenaries.

Pre-Conference Highlights

The day before the official kickoff of the conference, the Accredited Standards Committee (ASC) Z136 assembled to receive updates from the subcommittee chairs and to discuss the future move to vertical/horizontal standards. Robert Thomas, the ASC Z136 chair, thanked the attendees for their diligent and focused work as a committee.

The ILSC Welcome Reception was held on the evening before the conference started in the Sheraton Atlanta Solarium. Designed as a destination to meet with friends and acquaintances, safety professionals from around the globe reconnected.

Opening Plenary Focuses on Outside Interests

The Opening Plenary began in the International Ballroom where Conference Chair John O'Hagan of the Public Health England welcomed two invited speakers.

Laser Safety Scientific Session (LSSS) Chair Karl Schulmeister of Seibersdorf Laboratories, Medical Practical Applications Seminar (MPAS) co-chairs Kay Ball of Otterbein University, Vangie Dennis of Emory Healthcare, Patti Owens of AestheticMed Consulting International, Leslie Pollard of Southwest Innovative Solutions, Inc., Technical Practical Applications Seminar (TPAS) co-chairs Jamie King of Lawrence Livermore National Laboratory, and Eddie Ciprazo of University of California, Berkeley were also acknowledged for their efforts.

The first presenter, Professor Jacques Abramowicz, discussed the need for an international standard on non-ionizing safety. He stated, "There is no framework and there are gaps in and a lack of consistency. There are recommendations, but no standard." Professor Abramowicz also discussed infrasound, a phenomenon for which there is limited information. He said, "People who think that they may have seen a ghost, may actually be experiencing results of infrasound effects."

In further emphasizing the need for medical standards, he proclaimed that, "Ultrasounds of babies can be performed by non-qualified or certified people and no regulation on ultrasound to do body sculpting and liposuction exists."

Jeffrey Luttrull, M.D. finished up the plenary session with a talk about how lasers are the future of blindness prevention. He stated that, "Up until April 2000 they damaged the retina to treat it. Photocoagulation is found to not be a treatment. Once you take retinal damage away, it is like pushing the reset button."

From Bioeffects Research to Consumer Products

The Laser Safety Scientific Session (LSSS), chaired by Karl Schulmeister of Seiberdorf Laboratories, provided an assortment of presentations from all fields of laser safety, from safety management programs and the design of products, to bioeffects research to probabilistic risk assessment.

As the week progressed, LSSS moved away from the biological arena and into consumer products. Issues covered ranged from Laser Illuminated Light Sources to LEDs. Most of the attention, however, was directed at Class 3R and laser pointers. One talk hinted at the FDA's proposed change to regulations. Laser pointers less than 610nm would be deemed "defective". This would inevitably eliminate the use of the green laser pointer from consumer use.

New and Innovative Medical Laser Practices

The Medical Practical Applications Seminar (MPAS) ran from March 20-21. The two-day seminar is designed for medical laser safety professionals who work in operating rooms, surgical centers, aesthetic clinics and medical spas. This year's focus was biological topics. Co-Chair Vangie Dennis welcomed attendees and discussed the latest insights in plume hazards. Fellow Co-Chair Kay Ball explored hazards, odors, and particulate matter present in plume and named the standards from AORN, ALSMS, OSHA, & LIA and recommendations to reduce plume in the operating room.

Attendees were reminded about the need to evaluate facility policies and standard operational procedures and guidelines and adapt to the new upcoming changes ahead. She went on to say, "Situational awareness is now a risk assessment. Smoke is a hazard when it becomes a plume."

Moving from plumes, Julie Smith and Lois McIntosh showed the before and after pictures of burn victims with the use of laser treatments to even out skin tones and diminish the grafting skin elevation. Edwin Barry covered the use of high intensity laser therapy as an alternative to opioid prescription drugs and gave viable examples of laser treatment for humans and dogs for back pain and accidents. During LSSS, Jack Lund explained how in 1973 there were wavelength dependent MPEs based on a limited number of lasers available.

Adam Boretsky described how high intensity lasers are expanding rapidly and how the Air Force Research Lab (AFRL) could procure a new femtosecond laser. They are performing testing on synthetic tissues with the ability to vary pigments. He went on to explain that, "Ultrafast lasers pose risk to the skin and cornea and their work is helping to develop future standards." Plans include the investigation of nonlinear interactions with tissue and to characterize tissue breakdown.

From Basic Optics to Cutting Edge Technologies

The Technical Practical Applications Seminar (TPAS) was themed, "Back to the Basics."

Eddie Ciprazo led the session with, "So You are the LSO, Now What?" which discussed mastering the challenges that LSOs face today. Following his presentation were talks on splitting up the standard operating procedure into more manageable documents, setting up a laser lab, and automating laser safety programs.

Josh Hadler presented his studies of ultrafast pulse laser safety eyewear concluding, "With all of the variables involved, you just may have to test the laser eyewear with your laser to ensure it provides the protection needed." After this, there were talks on outdoor and high-powered laser operations. The Food and Drug Administration (FDA) discussed what laser professionals need to know and where to find it on their website, followed by a panel session open forum.

Sponsor Reception Highlights

During the Sponsor Reception, laser safety professionals seized the opportunity to explore what new products are available and to allow relationships to be forged between customer and vendor. Platinum sponsors Rockwell Laser Industries and Honeywell were joined by other industry-leading sponsors including ASC Z136, BEAMSTOP'R Laser Barriers, Inc., Buffalo Filter, Engility, Innovative Optics, Inc., Kentek Corporation, Laser Safety Systems, Laservision USA, Lighting Systems Design, Inc., NoIR LaserShields, Ophir-Spiricon LLC, and RT Technologies.

Awards Luncheon & Certification Appreciation Banquet

The ILSC 2017 Awards Luncheon & Certification Banquet recognized top professionals and organizations in laser safety. Bob Thomas of the U.S. Air Force Research Lab (AFRLB) presented the R. James Rockwell Educational Achievement Award to John O'Hagan and the George M. Wilkening Award to Wesley J. Marshall.

The Board of Laser Safety (BLS) Illumination Award was created to recognize an institution, company or organization that directly employs a certified laser safety officer and provides encouragement and support for employee participation within the laser safety community and/or has made outstanding contributions to the field of laser safety. Mount Sinai Health System was recognized this year with employee Jacob Kamen accepting the accolade.

"The Mount Sinai Health System is very proud to be a recipient of the BLS Illumination Award. This award validates Mount Sinai has been a significant supporter of laser safety education," Kamen said.

ILSC will return to Orlando March 18–21, 2019 at the Embassy Suites® Lake Buena Vista South. Check the ILSC website at **lia.org/ILSC** for updates, and if you are interested in joining the ILSC program committee, email **ILSC@lia.org**. Visit our website **www.lia.org/conferences** to stay informed on other LIA conferences coming up in 2017. ■

(Continued on page 14)

DR. JACQUES ABRAMOWICZ ADDRESSES THE ILSC 2017 AUDIENCE DURING HIS PLENARY PRESENTATION.

ILSC 2017 MEDICAL PRACTICAL APPLICATIONS SEMINAR (MPAS) CO-CHAIRS, LEFT TO RIGHT: KAY BALL, VANGIE DENNIS, PATTI OWENS, AND LESLIE POLLARD WITH GENERAL CHAIR JOHN O'HAGAN (CENTER)

LIA PAST PRESIDENT ROBERT THOMAS WITH ILSC 2017 GENERAL CHAIR JOHN O'HAGAN

ILSC 2017 TECHNICAL PRACTICAL APPLICATIONS SEMINAR (TPAS) CO-CHAIRS JAMIE KING (LEFT) AND EDDIE CIPRAZO (RIGHT) WITH GENERAL CHAIR JOHN O'HAGAN (CENTER)

ABDALLAH SAMMANEH OF LASERVISION SHOWCASES PRODUCTS TO ATTENDEES.

ILSC 2017 LASER SAFETY SCIENTIFIC SESSIONS (LSSS) CHAIR KARL SCHULMEISTER WITH GENERAL CHAIR JOHN O'HAGAN

WESLEY J. MARSHALL (PICTURED WITH WIFE GINGER) RECEIVED THE 2017 GEORGE M. WILKENING AWARD.

PLENARY SPEAKER DR. JEFFREY LUTTRULL PRESENTS HIS WORK TO THE ILSC 2017 AUDIENCE.

DR. JOHN O'HAGAN IS PRESENTED WITH THE 2017 R. JAMES ROCKWELL JR. AWARD.

ILSC 2017

The ILSC Sponsor Reception is a valuable networking opportunity for attendees and exhibitors alike.

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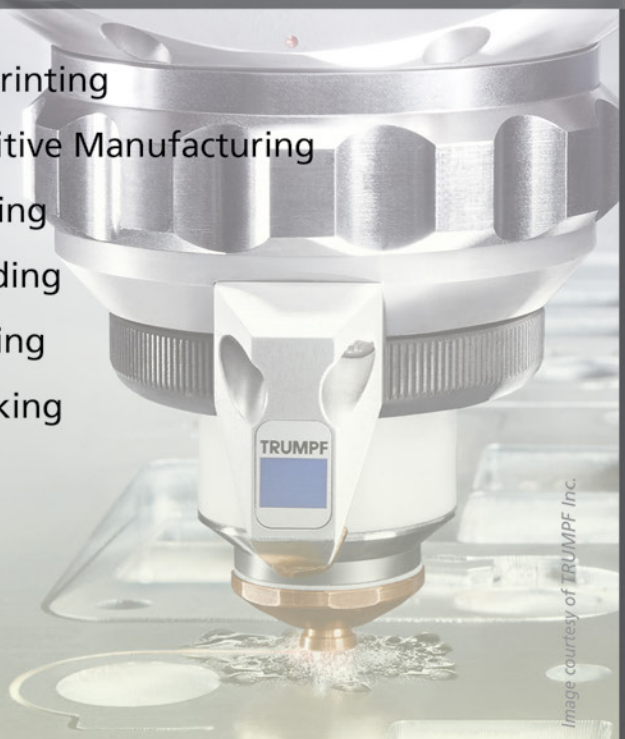

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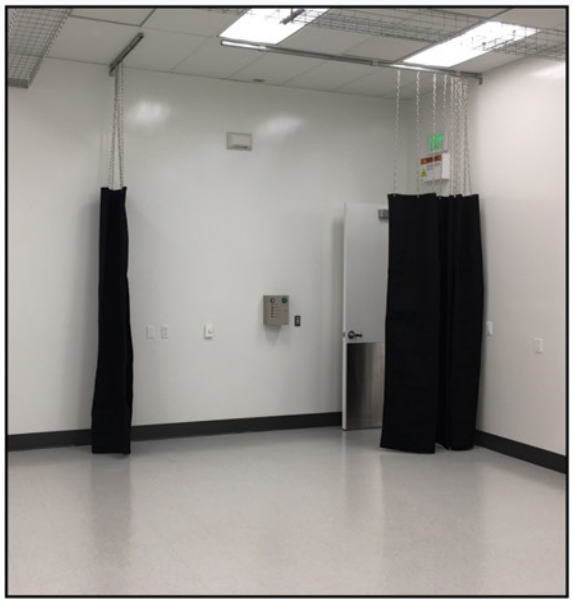

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RAYLASE

A global leader in the industry, RAYLASE continues to be known for its development of high-precision laser beam deflection and modulation components. This includes top-quality optical elements, deflection scanning units, and control electronics with built-in software interfaces. RAYLASE has a worldwide market and supports its customers through professional consulting and customized solutions in the packaging, textile, electronics, and automotive industries.

Located near Munich, Germany, RAYLASE AG was founded in 1999 and now has two subsidiaries. After entering into the Chinese market in 2003, the first subsidiary was founded: RAYLASE Laser Technology (Shenzhen) Co., Ltd, based in Shenzhen, China. In August 2016, Dr. Philipp Schön took over as the new CEO and has been working to align the company toward growth and new markets. As a result, Steven Krusemark recently opened the U.S. office in November 2016. Located near Boston, MA, Krusemark is the president and CEO of RAYLASE Laser Technology Inc., the company's second subsidiary.

Customers worldwide have come to rely on the unique performance and reliability of the company's scanning units. The high-precision components form the cornerstone of industrial laser systems for scanning barcodes, marking textiles and surfaces, and welding metal plates and plastics. They also have the ability to cut semiconductor wafers, as well as other metals, plastics, and glass materials. RAYLASE additionally develops and manufactures a wide range of modules and solutions for integration into devices and machines.

Some standard products offered by RAYLASE include 2-axis scanning units, 3-axis scanning modules, 4- and 5-axis solutions, control cards, and software for laser-material processing applications. RAYLASE is a worldwide leader with its innovative 3-axis scanning modules for a variance of working fields and the best spot sizes in the market. The 3-, 4-, and 5-axis technology meets many customer requirements for large processing fields with smaller spot sizes; it allows the user to change the field, the spot size, and the working distance all with the same scanning unit.

RAYLASE also offers solutions for Machine Vision Control (MVC) in conjunction with its deflection units and scanning modules. A growing trend in the laser community, it features the automatic localization of workpieces, the adaptation of the laser process, and an immediate quality inspection. To glimpse into the company's history, the first product manufactured was the TURBOSCAN 10 for 1064 nm and the TURBOSCAN 15 for 10600 nm.

In the last five years, RAYLASE has been a part of the substantial growth of "additive manufacturing" (AM), also known as "rapid prototyping" or "3D printing." As this concept has progressed from the lab machine to the production of individual hip implants to the mass production line in recent years, RAYLASE has been present for the full evolution.

Today, the additive manufacturing of plastic and metal workpieces is no longer only used for conventionally difficult products; it is widely used in the medical world, the automotive industry, and ever increasingly in the aerospace industry. Naturally existing bionic shapes and structures can now be replicated, which results in sturdy components with low mass, thus making it easier to build automobiles and aircraft. Not only does this increase safety, but it massively reduces pollutant emissions. With this idea in place, RAYLASE is paving the way of the industrial future.

With approximately 120 employees worldwide, RAYLASE demonstrates extremely high standards of quality and accuracy to ensure the most effective performance measures. Most recently, RAYLASE has launched the new control card SP-ICE-3 and soon will expand its digital platform to include a full digital scan head series and a digitalized 3-axis scanning module and MVC. Later in 2017, it will launch its modified AM-MODULE, which is a dedicated solution for the additive-manufacturing market, providing process monitoring and homogeneous power distribution all over the field with the ability to adapt the laser spot size during processing. ■

RAYLASE joined the Laser Institute of America (LIA) in 2016. As a newer member, the company appreciates the ability of the LIA community to offer a high-quality network of companies in the laser-processing industry and the opportunity to attend annual growth and networking events.

For more information about RAYLASE, visit ***www.raylase.com****.*

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Published by: Laser Institute of America
Laser Applications and Safety

Laser Safety Officer Training

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Member Innovations

SCANLAB Oscillating Laser Beam Boosts Cutting Accuracy
SCANLAB GmbH has developed a scan system for oscillating-laser-beam cutting and welding. The new wel*DYNA* scan head unites the advantages of higher laser powers and maximum dynamics. Considerable process benefits are gained by welding and cutting with high-frequency beam oscillation, particularly in macro material processing of larger components. For example, thick metal sheets and fiber-reinforced plastics can be cut more quickly and cleanly. Diverse materials of poor weldability can also be robustly bonded.

The new scan head is designed for multi-kW lasers of high beam quality and features digital servo control, an integrated sensor system for real-time monitoring, and water and air cooling in a robust, industrially-suitable housing.

For more information, visit: **www.scanlab.de/en**.

SPI Lasers Launches PRISM & QUBE Fiber Lasers in Germany
Industrial fiber laser manufacturer SPI Lasers, known for their innovative, high quality products, will showcase their latest range of Multi kW CW fiber lasers at the Laser World of Photonics exhibition in Munich.

Customers will have their first opportunity to get up close to these redPOWER PRISM & QUBE CW (300W – 6kW) products for the first time in the European market; a fantastic opportunity for prospective customers to speak to their experts and identify just how these Fiber Lasers can improve industrial manufacturing processes by maximizing efficiency, reducing production times and costs.

Dr. Steve Kidd, VP of CW Business line for SPI Lasers stated: "This is the first time we have showcased this latest generation of multi kW CW products to a wide European audience and the response has been fantastic; the power and level of control we are offering when combined with our after sales support is something our customers have been crying out for and I believe we will be helping many companies release their full manufacturing potential in the coming months."

The show is open from June 26-29, 2017. Visit SPI Lasers in Hall A3, Stand 403 to view their full product range and receive the opportunity to view numerous videos and samples that demonstrate the versatility of their fiber lasers.

For more information, visit **www.spilasers.com**.

Members In Motion

Buffalo Filter Relaunches Clear the Air Program™ With New Logo
Buffalo Filter is pleased to announce a new logo for our Clear the Air™ program. The Clear the Air™ program was developed several years ago to provide facilities with the tools and support necessary to analyze gaps in practice, develop policies and provide education needed to establish, guide and maintain a surgical smoke-free environment for perioperative teams and patients.

For more information, visit **www.buffalofilter.com**.

Jenoptik Opens New Technology Campus in Michigan
Jenoptik is opening a modern technology campus for metrology and laser machines in Rochester Hills, MI. An internal opening ceremony with the company's executive board, local management, and staff is planned for mid-June 2017.

The new building covers 100,000 sq. ft. on a 16-acre campus, almost twice as large as its current facility. The new facility meets the latest standards in a production environment for both employees and customers, with modern and flexible application areas that can be used simultaneously for training and meeting rooms.

"In our expanded laser application center, we will be able to demonstrate and perform feasibility studies, application-specific competencies, as well as cutting and welding services directly onsite," says Andreas Blind, VP of sales, services, and marketing.

In this expansion phase, the new facility will devote approximately 50 percent of its total square footage to production. It will also provide areas and flexible expansion options, in the medium term, for other company activities and future planned growth in the US.

For more information, please visit **www.jenoptik.com**.

Annual Meeting Overview

On March 19, 2017, Accredited Standards Committee (ASC) Z136 held its annual meeting at the Sheraton Atlanta Airport, Atlanta, GA. Just preceding the International Laser Safety Conference (ILSC®), this year's meeting boasted the highest number of attendees in recollection, with 47 members and 22 observers participating.

Opening the meeting, Barbara Sams, LIA Director of Standards Development announced the appointment of Edward "Ted" Early as ASC Z136 Secretary, and the reappointments of Robert Thomas and Sheldon Zimmerman as Chair and Vice-Chair, respectively. Following approval of the agenda and previous year's minutes, Dr. Thomas presented the report of the Administrative Committee (ADCOM), which included the yearly activities of ASC Z136 consensus body balloting, announcement of subcommittee chairs and membership transitions.

Notable changes:

- The addition of two new subcommittee chairs; Ted Early will be replacing Jeff Pfoutz as standards subcommittee 4 (SSC-4) chair and Jennifer Hunter will be replacing Bruce Stuck as technical subcommittee 1 (TSC-1) chair. SSC-4 is responsible for the maintenance and further development of the Z136.4 *Recommended Practice for Laser Safety Measurements for Hazard Evaluation*, while TSC-1 is the technical subcommittee that addresses bioeffects and medical surveillance across all standards.
- Patti Owens, formerly alternate representative for the American Society for Laser Medicine & Surgery, stepped down to assume the primary representative role to the committee for the Association of periOperative Registered Nurses. Taking her place as alternate ASLMS representative, we welcome David McDaniel.
- Vangie Dennis, former primary representative for AORN is now primary representative of new organizational member Emory Healthcare.
- Joe Greco and Dan Palmerton, previously representing organizational members were approved as individual members, and join new individual member Daniel Seaman.
- Finally, we welcome new organizational member Department of Veterans Affairs Medical Center with Damien Luviano as its representative.

Also discussed during ADCOM reporting was the number of votes one member could hold, recognition and adoption of ANSI Code of Ethics, orderly meeting conduct and LIA business inquiries. Following the ADCOM portion of the meeting, an overview of each subcommittee's activities was presented by its chair.

Following lunch, the committee heard from Mike Woods on the National Fire Protection Association's 70E *Standard for Electrical Safety in the Workplace, Article 330, Safety-related Work Practices: Lasers*, revisited risk management, and discussed progress made with respect to last year's addition of the Graphic Design Group. New Business explored expanding the standard's table of contents listing level, whether control measures should appear in the horizontal Z136.1 or the vertical standards and concluded with some final committee housekeeping topics, e.g., maintaining one's account, nominating individuals for LIA awards, and suggestions for upcoming meeting sites.

For questions regarding the work of the committee, or to participate on ASC Z136 or any of its subcommittees, please contact Barbara Sams at **+1.407.380.1553** or email **bsams@lia.org**.

The Board of Laser Safety (BLS) is proud to announce the first recipient of the BLS Illumination Award, Mount Sinai Health System. The award was presented during the BLS CLSO & CMLSO Appreciation Reception at the 2017 International Laser Safety Conference on March 20 at the Sheraton Atlanta Airport in Atlanta, GA.

The BLS Illumination Award has been created to recognize an institution, company or organization that directly employs a certified laser safety officer, and provides encouragement and support for employee participation within the laser safety community and/or has made outstanding contributions to the field of laser safety.

Jacob Kamen, who received the award at ILSC 2017 on behalf of his employer, Mount Sinai Health System, said it validates all the effort and energy Mount Sinai has put into its Laser Safety Program over the past seven years.

Partnering with Laser Institute of America to host New York City's first-ever LIA MLSO course in 2015, Mount Sinai Health System has advanced its education goal further. Mount Sinai was also the first institution to sponsor the BLS certified medical laser safety officer (CMLSO) examination in New York City. Presently, Mount Sinai boasts three CMLSOs on staff. Its Laser Safety Program has recently expanded to the eight hospitals that incorporate the Mount Sinai Health System.

Additionally, Mount Sinai has supplemented to their online training by creating multiple laser safety training courses covering a variety of clinical and research areas. These courses have been used by more than 5,000 staff members throughout the entire Mount Sinai Health System.

"Mount Sinai hopes that this award will provide encouragement for other hospitals to follow their path and create a safe laser environment for employees and patients," stated Kamen.

Barbara Sams, Executive Director of BLS, said, "We were honored to be able to present the inaugural BLS Illumination Award to Mount Sinai at ILSC 2017. We feel it is important to recognize the employer who has the vision to see the significance of investing in its personnel and challenges its staff to seek knowledge through various channels of continuing education."

If you are a CLSO or CMLSO who would like to nominate your company/employer for the next Illumination Award, please contact the BLS at **bls@lasersafety.org** or call **+1.407.985.3810**.

LIA is committed to keeping the workplace safe from hazards associated with lasers. LIA formed an Alliance with the Occupational Safety and Health Administration (OSHA) to help achieve these goals. Learn more at **www.lia.org/oshaalliance**.

OSHA to Delay Enforcing Crystalline Silica Standard

The U.S. Department of Labor's Occupational Safety and Health Administration today announced a delay in enforcement of the crystalline silica standard that applies to the construction industry to conduct additional outreach and provide educational materials and guidance for employers.

The agency has determined that additional guidance is necessary due to the unique nature of the requirements in the construction standard. Originally scheduled to begin June 23, 2017, enforcement will now begin Sept. 23, 2017.

OSHA expects employers in the construction industry to continue to take steps either to come into compliance with the new permissible exposure limit, or to implement specific dust controls for certain operations as provided in Table 1 of the standard. Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to ensure these conditions for America's working men and women by setting and enforcing standards, and providing training, education and assistance.

For more information, visit **www.osha.gov**.

JLA Journal of Laser Applications

Advantages of Laser Beam Oscillation for Remote Welding of Aluminum Closely Above the Deep-penetration Welding Threshold

BY MARTIN SOMMER, JAN-PHILIPP WEBERPALS, STEFFEN MÜLLER, PETER BERGER, AND THOMAS GRAF

Laser beam welding of aluminum has been developed into a widely used process in modern car body manufacturing. Following the trend of recent lightweight designs and the use of high strength materials, the application of thinner aluminum sheets is increasing. Due to the stepwise increase of the welding depth at the transition from heat-conduction welding to keyhole welding, the usability of the laser beam as a tool has some limitations. This work has investigated the penetration depth when keyhole welding close to the deep-penetration welding threshold can be reduced in a controlled manner by means of laser beam oscillation.

LIA Launches New Website Design & Features
The Laser Institute of America (LIA), the professional society for laser applications and safety is proud to announce its new website – designed to include many convenient features for members and non-members alike.

The new LIA website continues to be the go-to source for laser information. Any laser professional, from beginner to advanced looking to educate themselves or their employees on the latest information, will see improvement with an updated search function. Laser enthusiasts are able to easily register for our industry leading events, purchase industry publications and find the most current technical information available.

"We invite LIA members and visitors to explore the user-friendly site with improved features, innovative design and layout," says LIA's IT Manager Shaun Oleson. Since streamlining this process, LIA hopes to further their mission to promote laser technology and its safe use through education, training and symposia. Visit **www.lia.org** to learn more about LIA's new website features.

LIA Guide to High Power Laser Cutting Now Available
Laser Institute of America (LIA), the professional society for laser applications and safety, announces its release of the LIA Guide to High Power Laser Cutting. In the guide, students, engineers, and scientists alike will gain a more in-depth understanding of the science behind laser cutting. Written by a team of specialists led by industry experts Dr. John Powell and Dr. Dirk Petring, this 136-page guide is a comprehensive resource that touches on all features of laser cutting machines and materials.

The cost of the guide is $60.00 for LIA members and $70.00 for non-members. The newest version of the guide can be purchased by visiting **https://www.lia.org/store/product/125**.

LIA Announces Session on North American Additive Manufacturing
LIA will organize for the first time a 1.5 hour Additive Manufacturing (AM) session called AM: Trends in North America as part of the World of Photonics Congress LiM 2017 event. Held on Wednesday, June 28, 2017, from 2:00-3:30 PM local time at the International Congress Center in Munich, Germany, the event runs as a session of a subconference of the larger LiM event from June 26-29, 2017.

The unprecedented AM session offered by LIA is intended to provide updates on the most current laser additive manufacturing applications and offer a helpful perspective regarding how American and Canadian companies are successfully using AM technology to reduce cost and increase efficiency.

For more information on this event, including sponsorship information, please contact **marketing@lia.org** or call **+1.407.380.1553**.

LASER World of PHOTONICS

LASER World of PHOTONICS Held from June 26-29 in Munich
LASER World of Photonics, the world's leading trade show for Photonics Components, Systems and Applications, will be held in Munich, Germany from June 26-29, 2017. The show will set new records, with more than 1,250 applied exhibitors occupying almost 600,000 square feet of exhibition space to showcase their ideas of optical technologies for the future to visitors. During the show, the pioneering spirit will be represented in the Start-up World and highlighted with the Photonics Award. Numerous domestic and foreign companies will participate at the Start-Up World in Hall B3 to show their marketable products. More than 100 American companies will travel to Munich to exhibit at this biennial industry highlight. For the first time, two USA Pavilions in Hall B2 and B3 offer medium-sized American companies a platform to stand out, get noticed, and leave a lasting impression. An extensive program of related events, current focus topics, and the World of Photonics Congress – the leading European scientific congress being held in conjunction with the show – and the international Laser Marketplace, create a unique combination of research, innovative technology and industrial application sectors as well as provide insight into the global market of laser materials processing.

Dates & Location for LAM® & LME® Announced

10 YEARS LAM® LASER ADDITIVE MANUFACTURING CONFERENCE

LME® 2018 LASERS FOR MANUFACTURING EVENT®

Mark your calendars for the 2018 Laser Additive Manufacturing Conference (LAM®) and the Lasers for Manufacturing Event (LME®), taking place from March 27–29, 2018 at the Schaumburg Convention Center in Schaumburg, IL, USA.

Laser Additive Manufacturing Conference (LAM®), devoted to advancing additive with lasers, is celebrating its 10th anniversary and will be held from March 27–28. The Lasers for Manufacturing Event (LME®), focused on maximizing profits with lasers, is held from March 28–29.

For more information about LAM®, please visit **www.lia.org/lam**. To learn more about LME®, please visit **www.laserevent.org**.

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