Check out the latest industry articles that were rated the highest by LIA's social media followers.

**TRENDING IN THE NEWS:**

**LIA'S TOP 4 ARTICLE PICKS**

**Lasers in Architecture:**

**LIA TODAY** is published bimonthly to educate and inform students and professionals of challenges and innovations in the field of photonic materials processing. ISSN 2690-5981

---

**LIA TODAY**

**THE OFFICIAL NEWSLETTER OF LIA**

**FEATURES**

- Upcoming LIA Training
- President & Executive Director’s Message
- OSHA News Release
- Trending in the News
- Laser-based Security Systems: Protecting Homes and Businesses
- Empowering Laser Safety: Join the Z136.1 American National Standard Revision
- Student Spotlight

**ADVERTISERS**

- Photonics Media

---

**EMPOWERING LASER SAFETY: JOIN THE Z136.1 AMERICAN NATIONAL STANDARD REVISION**

By, Dr. Robert Thomas.

The Z136.1 American National Standard revision is underway! Throughout its history, The Laser Institute has been at the forefront of laser safety, serving as Accredited Standards Developer and publisher of the ANSI Z136 series of standards and Secretariat to the ASC Z136.

---

**Laser-based Security Systems: Protecting Homes and Businesses**

By, Cort Hurley

Utilizing the precision and speed of light, laser-based security systems offer a futuristic yet practical approach to home and business security. They work by using lasers to create a virtual fence that signals an intrusion when broken. They also serve as effective deterrents to ward off criminals from targeting your home or business.

---

**EMPOWERING LASER SAFETY: JOIN THE Z136.1 AMERICAN NATIONAL STANDARD REVISION**

By, Dr. Robert Thomas.

The Z136.1 American National Standard revision is underway! Throughout its history, The Laser Institute has been at the forefront of laser safety, serving as Accredited Standards Developer and publisher of the ANSI Z136 series of standards and Secretariat to the ASC Z136.

---

**Managing Editor:** Jana Langhans - jlanghans@lia.org

---

Catch up on all past issues!

https://www.lia.org/subscriptions/lia-today

---

If you are interested in advertising space in this newsletter, call +1.407.380.1553/1.800.34.LASER or email marketing@lia.org.
**LIA Laser Safety Trainings**

**Laser Safety Officer Training**
- Orlando, FL  Feb. 19 - 21, 2024
- Orlando, FL  Apr. 8 - 12, 2024
- Orlando, FL  Sep. 16 - 20, 2024
- Orlando, FL  Nov. 18 - 22, 2024

**Laser Safety Officer with Hazard Analysis**
- Orlando, FL  Feb. 19 - 23, 2024
- Virtual, Zoom  July 15, 2023
- Virtual, Zoom  Oct. 21, 2023

**Medical Laser Safety Officer Training**
- Minneapolis, MN  May 6 - 7, 2023
- Denver, CO  Aug. 18 - 19, 2023
- Orlando, FL  Nov. 11 - 12, 2023

**IndustriAL Laser Safety Officer Training**
- Novi, MI  Feb. 14 - 15, 2024
- Novi, MI  May 15 - 16, 2024
- Novi, MI  Aug. 14 - 15, 2024
- Novi, MI  Nov. 13 - 14, 2024

**Course Highlight**

**Laser Safety Officer Training**
**Orlando, FL - February 19 - 21, 2024**

Developing and implementing a successful laser safety program is a top priority for you and your organization. Whether you are new to laser safety, or more experienced, your goal is to uphold the highest standard of laser safety. At LIA, our goal is to help you achieve that by offering the most comprehensive laser safety training program for LSOs. Developed and taught by LIA experts - the industry leader in laser safety education - the LSO course was designed for all levels of experience involved in industrial, military, educational, or research applications of lasers. It is tailored to fit the needs of safety professionals, engineers, laser operators, technicians, and other professionals assigned the duties of Laser Safety Officer who are not required to perform hazard analysis calculations. This course meets all LSO training requirements outlined by the ANSI Z136.1 Safe Use of Lasers standard, OSHA and ACGIH and is worth 24 CECs by AAHP, 3.0 BLS CM Points by the Board of Laser Safety, and is eligible for ABIH CM Points.

**Executive Director's Message**

During this season, I imagine everyone being busy finishing up year end projects and getting ready for the upcoming holidays. At the LIA it is very busy as well. Beside business as usual, we are well into the process of evaluating profit centers, updating the strategic plan and formalizing the new budget for growth in 2024.

Recently the LIA formed an advocacy initiative to connect and form partnerships with educational institutions and photonics clusters. On the educational front we would like to thank everyone who has supported the Laser Institute during this journey. It has been great working with you all.

I wish Arvi and Gil success in leading the organization as I'll take a couple of steps back and hide behind the curtain. The organization is in a good shape and it is in good hands. I am happy to see it thriving and organizing fantastic events like this year's ICALEO in Chicago. There is a wonderful future ahead for the LIA.

I have a great new year and looking forward to seeing you all.

See you next year!

*mic drop*
PROCESS DEVELOPMENT AND PROCESS ADAPTATION GUIDELINES FOR THE DEPOSITION OF THIN-WALLED STRUCTURES WITH IN718 USING EXTREME HIGH-SPEED DIRECTED ENERGY DEPOSITION (EHLA3D)

By: Min-Uh Ko; Zongwei Zhang; Thomas Schopphoven

Abstract: Extreme high-speed directed energy deposition (EHLA) is a modified variant of the laser based directed energy deposition (DED-LB) and is being applied as an efficient coating process for rotational symmetric components. Characteristics of EHLA processes are feed rates of up to 200 m/min, which result in smaller weld bead deposition and thinner layer thicknesses compared to conventional DED-LB. When transferred to additive manufacturing, this characteristic utilizes the potential of depositing thin-walled filigree structures at deposition rates, which are comparable to typical DED-LB processes (EHLA3D). The results of this work were achieved with an EHLA3D machine, which is a modified CNC-type machine capable of operating feed rates with vf = 30 m/min. In this work, process parameters were developed for the deposition of thin-walled filigree structures with the Ni-based superalloy IN718. Single tracks with constant feed rates and a variation in the beam diameter and powder mass flow were deposited and analyzed regarding the resulting weld bead dimension and dilution zone. Then, process parameters were selected and transferred to the deposition of thin walls, and guidelines of the parameter adaption toward thin-walled deposition were defined. Two parameter sets were developed to assess the feasible wall-thicknesses deposited by EHLA3D. Depending on the developed parameter sets, wall thicknesses between 300 and 500 μm are achieved. To characterize the resulting thin-walls, surface roughness measurements and metallographic cross sections were conducted.

Journal of Laser Applications 35, 042059 (2023); https://doi.org/10.2351/7.0001140

Free to LIA Members! Visit JLA Online: https://lia.scitation.org/journal/jla

TRENDING IN THE NEWS:
LIA’S TOP 4 ARTICLE PICKS

1. **DO THE BUMP: SCIENTISTS PERFECT MINIATURIZED TECHNIQUE TO GENERATE PRECISE WAVELENGTHS OF VISIBLE LASER LIGHT**
   By creating tiny, periodic bumps in a miniature racetrack for light, researchers have converted near-infrared laser light into specific desired wavelengths of visible light with high accuracy and efficiency.  
   Read more

2. **SOUND WAVES IN AIR DEFLECT INTENSE LASER PULSES**
   Ultrasound waves in air have been used to manipulate powerful laser beams – in a first claimed by researchers in Germany. The team’s acousto-optic Bragg grating could lead to new and useful ways to manipulate light.  
   Read more

3. **SCIENTISTS FIGURE OUT HOW TO MAKE LASERS NINE-TIMES MORE POWERFUL**
   Scientists have discovered a method to scale up the power of lasers by up to nine times without reducing the beam quality.  
   Read more

4. **AN ANOMALOUS RELATIVISTIC EMISSION ARISING FROM THE INTENSE INTERACTION OF LASERS WITH PLASMA MIRRORS**
   Researchers recently uncovered a surprising transition that takes place during interactions between intense laser pulses and plasma mirrors.  
   Read more
Utilizing the precision and speed of light, laser-based security systems offer a futuristic yet practical approach to home and business security. They work by using lasers to create a virtual fence that signals an intrusion when broken. They also serve as effective deterrents to ward off criminals from targeting your home or business.

**Laser Security Technology 101**

The primary principle behind laser-based security revolves around detecting interruptions or alterations in a laser beam. These interruptions or alterations signify an unauthorized entry or presence. Most systems either use a break-beam system or a reflective system.

Break-beam systems consist of a laser source and a separate photodetector. When an object crosses the laser’s path, it breaks the beam, causing a reduction in the light reaching the detector, which then triggers an alarm.

Reflective systems use a mirror or retroreflector to reflect a laser beam to its source. It detects an intruder from the intruder obstructing the beam. This obstruction disrupts the reflected light pattern which alerts the security system.

**What Type of Lasers Do Security Systems Use?**

At the center of any laser-based security system is the laser source itself. The type of laser used for a security application influences factors such as range, power requirements, and environmental conditions. In security, we primarily see the use of fiber lasers. Fiber lasers offer high power efficiency and reliability. Their monochromatic and coherent light can be easily focused into tight beams, making them ideal for long-range detection applications.

**Key Components of a Laser-based Security System**

A laser security system consists of several key components, each serving a specific function within the larger system:

- **Lasers:** The selection of the laser type is pivotal and depends on factors like operational distance, beam quality, and system response time. Diode lasers, for instance, are commonly used due to their efficiency, compact size, and longevity.
- **Photodetectors:** These are the ‘ears’ of the system, tuned to detect the specific wavelength emitted by the laser. They must be highly sensitive and capable of discriminating between the laser light and ambient light conditions to avoid false detections.
- **Controller:** Serving as the ‘brain’ of the system, controllers process the input from photodetectors to ascertain whether the beam pattern has been disturbed by an intruder. Modern controllers can be programmed with complex algorithms that factor in variables such as the duration of the interruption and the time of day.
- **Ancillary Equipment:** This includes power supply units that often include battery backups to ensure system integrity in case of power outages. Protective enclosures are also essential for safeguarding the electronic components from the elements and potential tampering.

**3 Recent Advancements in Laser Security Technology**

As security threats continue to evolve every year, laser-based security systems need to keep up. Three key developments in laser technology and the application of laser technology for security include.

1. **Quantum Cascade Lasers**

   Although they offer a few other advancements as well such as a higher sensitivity and operability at room temperature, the main way quantum cascade lasers (QCLs) improve security systems is through their tunable wavelengths.

   With tunable wavelengths, operators can set the laser wavelength to correspond with the absorption characteristics of a particular substance the operator wants to detect. This is especially useful in environments where the detection of chemical agents or other specific compounds is required.

   In the same way that tunable wavelengths allow for the detection of specific substances, they also allow systems to bypass common causes of interference such as fog, dust, or other aerosols.
2. Solid-state Laser Technology

Originally invented in the 1960s, solid-state lasers have seen some recent developments that improve their capabilities in security systems. A few key improvements include:

- **Enhanced Durability**: Modern solid-state lasers are built to withstand harsh environments, making them suitable for a wide range of security applications, from border surveillance to asset protection.
- **Greater Output Power**: With advancements in diode and crystal technology, these lasers now offer higher output power, which translates to extended range and better performance in detecting intrusions.
- **Reduced Size and Cost**: Ongoing research has led to the miniaturization of solid-state laser components, which in turn has made these systems more affordable and accessible for a wider variety of security needs.

3. Adaptive Laser Systems

With a focus on creating systems that can adjust to changing conditions in real-time, adaptive laser systems stand at the forefront of laser security technology. These systems can automatically adjust their operational parameters in response to environmental changes. This ensures consistent detection capabilities under all conditions. They can also self-calibrate minimizing maintenance costs while maintaining optimal accuracy levels.

Current Limitations in Laser-based Security Systems

Laser security systems are at the cutting edge of surveillance technology. But, even cutting-edge systems come with a few limitations. Here are three limitations current laser-based security systems still struggle to overcome:

- **Environmental Sensitivity**: Performance can be significantly affected by adverse weather conditions such as fog, rain, or snow, which can obscure laser function. Wildlife and fluctuating environmental elements, like the swaying of trees in the wind, can also trigger false alarms which complicate the differentiation between true threats and natural movements.
- **Security Vulnerabilities**: Intruders may utilize reflective materials or other sophisticated methods to bypass laser detection without breaking the beam. Some systems are also vulnerable to high-tech attacks that involve creating a replica of the laser beam to fool the system into thinking the perimeter is intact.
- **Cybersecurity**: Modern laser-based security systems use IoT devices to create more effective alert systems such as notifying authorities or locking doors. However, this interconnectedness also opens up the system to potential cybersecurity risks. Network-based attacks can disable or manipulate security measures. To minimize these risks, security systems need strong network security protocols.

Conclusion

Laser-based security systems have carved out a niche that extends far beyond gimmickry into the realm of essential, reliable protection. The development of these systems reflects a broader trend toward the harmonization of high-tech solutions with everyday needs. As we look ahead, the potential for laser-based security is boundless. We are on the cusp of a world where the invisible lines drawn by lasers not only define the boundaries of our properties but also the cutting edge of a secure, technologically advanced society.
Empowering Laser Safety: Join the Z136.1 American National Standard Revision

The Z136.1 American National Standard revision is underway! Please consider contributing as an LIA member.

Throughout its history, The Laser Institute has been at the forefront of laser safety, serving as Accredited Standards Developer and publisher of the ANSI Z136 series of standards and Secretariat to the ASC Z136. The LIA now shepherds ten distinct standards documents with application to medical, research and development, educational, and industrial practices.

ANSI Z136.1, the American National Standard for Safe Use of Lasers, most recently approved in August 2022 is the flagship standard of the Z136 series of documents and serves as the primary reference for laser safety in the United States, with adoption by others around the world.

With the most recent publication of the ANSI Z136.1, a new cycle of development begins. The development process may lead to a revision of the exposure limits and may also change requirements for engineering and administrative controls. The scope of this project includes clarification of methodologies for assessing hazards. Changes are proposed from technical subcommittees, ranging from those reviewing the latest scientific literature on bioeffects, to a review of best practices from experienced laser safety professionals, many of which are addressing the latest in laser technology and applications. These updates provide the community with a continued improvement of guidance to keep laser users and their colleagues safe.

The window for contributing to the revision of the Z136.1 standard will span about two more years. The overall 5-year revision cycle includes extensive review, balloting, and reconciliation of comments after a revision draft is submitted to the committee. Building broad consensus in the document is the group imperative. The subcommittee charged with drafting the revised standard, the SSC-1, will hold regular meetings, mostly through virtual means throughout that time period. Agendas providing a forum for specific topics within the revision’s “content agenda” will be addressed throughout the time period.

Those wishing to make contributions to the revision should reach out and ask to join the standard subcommittee by going to z136 lia.org. From there, you can request to join the SSC-1 and other technical subcommittees depending on your area of expertise, or as an affected party. You may be asked to submit a resume as part of the request to join the group.

Please consider adding your expertise to the group and make this next revision of our primary laser safety standard even better!

Please mark your calendar for Wednesday, February 28 for the 2024 Z136 Annual Meeting, to be held virtually via Zoom video conference. This meeting is open to observers (non-members). If you are not a member of the Z136 Standards Committee and would like to attend as an observer, please email John McCormack (jmccormack@lia.org) to be placed on the email list to receive the registration link. The registration link for Zoom will be emailed in January 2024.

Event: Z136 Annual Meeting
Location: Online/ Zoom video conference
Date: Wednesday, February 28, 2024
Start Time: 8:00 AM PST/ 11:00 AM EST
End Time: 1:00 PM PST/ 4:00 PM EST
Registration: FREE

When were you first introduced to photonics/electro-optics?

My hands-on experience with optics and photonics was during my undergraduate studies in electrical engineering. I actively assisted my advisor in setting up a dedicated teaching lab for optics and photonics. This opportunity allowed me to design experiments involving solar cells, optical fibers, and photonic communication modules. The fact that such minute components can have significant impacts on our lives greatly influenced my decision to pursue a path of exploring optics and photonics.

What or who inspired you to choose your line of study?

My current mentor, Dr. Guiying Li, is by all means an entrepreneur. What I have learned in the past few years is to look at my field of research in the most applicable way to everyday life. My ongoing work in silicon photonics represents the mainstream platform for integrating optics and photonics into commercially available systems, aiming to significantly enhance the quality of life. The silicon photonics market, as one of the important branches of optics and photonics, is projected to grow into a 5-billion-dollar industry within the next five years. This rapid growth underscores the importance of our field of research. Our team is trying to play a role through these developments, and I hope I can also inspire some of my peers to join us in this journey.

Describe your favorite course you have taken so far.

I find it hard to single out one course as my favorite because each course has provided me with an expanded view in its unique way. To name one, I liked the optical fiber communication course since we were dealing with real-world applications through this class. The course materials were designed to help us comprehend the challenges of providing internet access to every corner of the world and the solutions that have evolved over the past decades. I find the industrial perspective fascinating, as optical communications are currently operating very robustly and experiencing rapid growth, something that most people probably couldn’t have believed 25 years ago.

Are you researching anything at the moment? Can you tell us about it?

We are in the revolutionary era of artificial intelligence (AI). Unprecedented computational power demands of AI models lead to an energy crisis and excessive global warming in the coming years. My research focuses on novel methods to perform computations on optical and photonic frameworks. Leading a team, I am at the forefront of designing a groundbreaking integrated photonic chip capable of performing matrix and tensor calculations at the terahertz speed (an order of magnitude faster than any electronic computer) while achieving significantly higher power efficiency. The substantial funding of several million dollars and the industry attention received over the past few years illustrate the importance of our research within the technology world. The success of our project can lead to a significant push for AI technology to move forward with its numerous applications.

What would you like to do in the future with your studies?

My interests are very well-aligned with the optics and photonics industry, while I may not have the required experience to start my own business at the time, my final goal is to run a startup company where I lead a research team dedicated to developing solutions for challenges that people are dealing with around the world.
WANT TO SHARE YOUR IDEAS WITH THE LASER COMMUNITY THROUGH LIA TODAY?

Check out the guest article guidelines below and get in touch with an editor today!

BEFORE YOU SUBMIT:

**Content:** We are always looking for great newsworthy content that covers challenges and innovations in the field of photonic materials processing, laser safety, and laser market trends. This is not a paid opportunity, but does carry the benefit of publishing your work on a platform that is read by thousands of your peers. All article topics should be confirmed with an LIA TODAY editor before writing your article. Please email your article ideas to liatoday@lia.org and an editor will be in touch with you.

**Potential Categories:** Safety, medical applications, research and development, laser applications fundamentals, history, business, and other categories.

**Potential Industries:** Energy storage, aerospace, DoD non-aerospace, automotive, medical devices and biotechnology, microelectronics and IC fabrication, Internet of Things, research and development, and other industries.

SUBMISSION GUIDELINES:

**Style:** The tone should be editorial and informative; it should not sound like a sales pitch. It should be comprehensible by a broad audience of readers with low to expert experience with the topic, so it is important to include examples and simple explanations alongside any technical language.

**Length:** 600 - 1500 words

**Text:** Please use standard fonts such as Arial, Calibri, or Times New Roman. Fonts, font sizes, and line spacing will be reformatted by LIA for the final piece. Grammar and mechanics will be edited to the LIA style guide by LIA, but please be mindful of spelling and grammar as you are writing so that your message is clear.

**Headline:** Please include two newsworthy headlines suggestions for your article using action verbs.

**Images & Figures:** Please include images to be used with the article. Submit as an email attachment (PNG, GIF, JPG, JPEG) (min. 1000px in width or height). Images should also be placed in the body of the text where the author would like them to appear in the final article. All figures or images should include captions.

**Deadlines:** All material is due no later than two weeks prior to the scheduled publishing date. Check with an editor for your deadline.

Note: LIA reserves the right to abstain from publishing a submitted article for any reason.

SUBMISSION CHECK LIST:

- Full text as a Word Document
  - Abstract: A 50 – 100 word summary in plain language
  - Two (2) headline suggestions using an action verb
  - Article 600 – 1500 Words
  - Images with captions placed in the body of the article
  - Article references when applicable
  - Short author bio (full title, company, 50 words)
  - (optional) Professional headshot of author
- Images attached in one of the accepted file types (.png, .tiff, .jpeg, .jpg) (min. 1000px width or height).

VIEW SUBMISSION FORM