

LIA TODAY

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TRENDING IN THE NEWS

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LASER COMMUNICATION:
THE FUTURE OF
HIGH-SPEED DATA
TRANSMISSION

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SPOTLIGHT

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LIA TODAY

THE OFFICIAL NEWSLETTER OF LIA

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

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

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Managing Editor: Jana Langhans - jlangeans@lia.org



LASER COMMUNICATION: THE FUTURE OF HIGH-SPEED DATA TRANSMISSION

In today's ever-changing digital landscape, the need for super-fast data transmission is more important than ever. That's where laser communication comes in—a new technology that has the potential to revolutionize data transmission as we know it.



STUDENT SPOTLIGHT

Meet Alireza Fardoost, this issue's Student Spotlight from the University of Central Florida's CREOL, The College of Optics and Photonics!

The acceptance and publication of manuscripts and other types of articles in LIA TODAY does not imply that the reviewers, editors, or publisher accept, approve, or endorse the data, opinions, and conclusions of the authors.

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LIA Laser Safety Trainings

LASER SAFETY OFFICER TRAINING

Orlando, FL	Feb. 22 - 24, 2023
New Orleans, LA	Apr. 19 - 21, 2023
Denver, CO	Aug. 15 - 17, 2023
Orlando, FL	Nov. 8 - 10, 2023

LASER SAFETY OFFICER WITH HAZARD ANALYSIS

Orlando, FL	Feb. 27 - Mar 3, 2023
New Orleans, LA	Apr. 24 - 28, 2023
Denver, CO	Aug. 21 - 25, 2023
Niagara Falls, NY	Sep. 25 - 29, 2023
Orlando, FL	Nov. 13 - 17, 2023

MEDICAL LASER SAFETY OFFICER TRAINING

Orlando, FL	Feb. 25- 26, 2023
Minneapolis, MN	May 6 - 7, 2023
Virtual, Zoom	July 15, 2023
Denver, CO	Aug. 18 - 19, 2023
Virtual, Zoom	Oct. 21, 2023
Orlando, FL	Nov. 11 - 12, 2023

INDUSTRIAL LASER SAFETY OFFICER TRAINING

Novi, MI	Feb. 15 - 16, 2023
Novi, MI	May 17 - 18, 2023
Novi, MI	Aug. 9 - 10, 2023
Novi, MI	Nov. 1 - 2, 2023

Course Highlight

MEDICAL LASER SAFETY OFFICER TRAINING
DENVER, CO - AUGUST 18-19, 2023

Are you an RN, OR supervisor, surgical tech or training coordinator who has been assigned the critical responsibility of LSO in a medical facility? Designed to meet the special needs of medical professionals, LIA's Medical Laser Safety Course will provide the training you need to build and maintain a successful laser safety program.

As an LSO at a medical facility, you have a unique set of responsibilities. Not only is laser safety a top priority to protect your staff, but it is critical to protecting your patients. Our MLSO training program addresses the specific laser safety protocols as they relate to medical and healthcare environments.

This course meets all LSO training requirements as outlined by the ANSI Z136.3 Safe Use of Lasers in Health Care standard, OSHA, and The Joint Commission.

In addition to the working knowledge you will gain, you will earn 12 Contact Hours, 2.0 BLS CM Points by the Board of Laser Safety, 4 CECs by the AAHP and eligible for ABIH CM points.



Henrikki Pantsar
LIA President 2023

PRESIDENT'S MESSAGE

The summer is here and I hope everyone gets to work with lasers in a nice weather. The LIA is keeping things moving with Gil Haas as the interim Executive Director working closely with the LIA office to provide high quality trainings and preparing for the ICALEO conference in October. We have also started planning for ICALEO 2024 already. I would like to express my gratitude to the team LIA, where everyone has stepped up to take on extra work during this transition time.

The search for the next Executive Director continues and if you have anyone in your circle of friends and colleagues who would be a good fit for the role and would enjoy the pleasant climate of Orlando, FL, please let us know and we will get the interviews started.

It's only three months until many of us will meet for ICALEO in Chicago. I am really excited about us being back in the Mid-West after 23 years, when ICALEO was in Detroit. The growth of the battery industry and artificial intelligence will be the hot topics and Chicago is the right place to come together to learn more.

I hope everyone gets to also enjoy the summer and relax a bit, and enjoy the photons not only coming from lasers, but also from the sun!

Be well and stay safe!



Gilbert Haas
Interim Executive Director

EXECUTIVE DIRECTOR'S MESSAGE

During this transition period as the acting interim Executive Director, we have been busy searching for a new incumbent. We have interviewed several candidates and should be convening on our decision over the next couple months. We are looking forward to this transition to move forward and secure the future of the LIA.

In the same time, ICALEO 2023 is on-track and moving forward. In addition, we are looking to formalize the location/venue for ICALEO 2024 very shortly.

A Look Ahead at Upcoming Laser Industry Conferences!

- 1. Photonics West - Jan 28-Feb 2, 2023 (San Francisco, CA, USA)
- 2. MD&M West - Feb 7-9, 2023 (Anaheim, CA, USA)
- 3. ILSC - Feb 27-Mar 2, 2023 (Portland, OR, USA)
- 4. AORN - April 4-5, 2023 (San Antonio, TX, USA)
- 5. RAPID + TCT - May 2-4, 2023 (Chicago, IL, USA)
- 6. ETOP - May 15-18, 2023 (Cocoa Beach, FL, USA)
- 7. FABTECH Mexico - May 16-18, 2023 (Mexico City, Mexico)
- 8. FABTECH Canada - June 11-13, 2023 (Toronto, OT, Canada)
- 9. ALAW - June 13-15, 2023 (Plymouth, MI, USA)
- 10. Laser World of Photonics - June 27-30, 2023 (Munich, Germany)
- 11. FABTECH - Sept 11-14, 2023 (Chicago, IL, USA)
- 12. ICALEO, Oct. 16-19, 2023 (Orlando, FL, USA)

Cooperating Conferences



LIA is proud to be the on site Laser Safety Officer for the 3 international Fabtech conferences again this year.



CHICAGO, IL
OCTOBER 16-19, 2023

Presented by:
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See you in Chicago, IL!

The International Congress on Applications of Lasers & Electro-Optics (ICALEO), brings together the leaders and experts in the field of laser material interaction, providing the world's premier platform for sharing new ideas and discovering solutions. We are excited to welcome you back to Chicago, Illinois for 2023!

Chicago is bursting with world-class, big city culture. But at its heart, it's a Midwestern city — which means a warm welcome and genuine hospitality. No matter who you are or what you love, you'll fit right in exploring famed restaurants, world-renowned museums, a jaw-dropping waterfront, groundbreaking music, Tony Award-winning theatres, iconic architecture designed by legendary architects, and over 300 parks and green spaces.



The Palmer House Hilton

We hope to see you at this year's in-person event at the beautiful Palmer House Hilton Hotel. A timeless Chicago hotel, Palmer House offers historic charm with hip conveniences, comprehensive amenities, award-winning dining, and gracious service.

Located in the downtown area, the historic Palmer House hotel gives attendees plenty to explore and experience both within the hotel and within walking distance right outside the door. When you book through ICALEO your guest room internet access is included at no additional charge. Additionally, staying onsite provides you with easy access to network with your LIA friends and fellow conference attendees.



Sunday, Oct 15

Welcome Reception

Monday, Oct 16

Running Club
Opening Plenaries
Technical Sessions
President's Reception

Tuesday, Oct 17

Running Club
Technical Sessions
Business Session
Poster Gallery
Exhibitor Reception

Wednesday, Oct 18

Running Club
Technical Sessions
Awards Luncheon
Closing Plenaries
Ice Cream Social

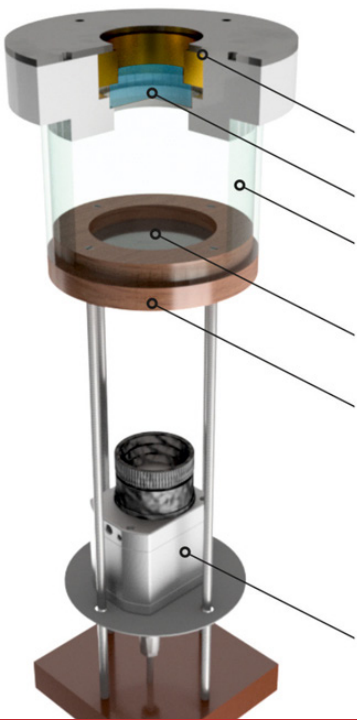
Thursday, Oct 19

Factory Tours
After 3 days of sessions, it's time to explore the fascinating world of manufacturing by visiting 3 local factories on Thursday. This extraordinary opportunity to go behind the scenes of manufacturing includes stops at the TRUMPF Smart Factory, DMG Mori, and Bystronic! Get a chance to witness cutting-edge technologies, gain new perspectives, and engage with industry experts as you visit each of these facilities.

Agenda is subject to change.

ICALEO@LIA.ORG

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Protection glass holder
Protection glass
Shielding gas chamber
Sample holder (thermally isolated)
thermal imaging camera

Figure 1. Experimental setup for the melting experiments with shielding gas chamber, sample holder, and thermal imaging camera. The probes were coaxially irradiated by the incident laser beam.

INVESTIGATIONS ON DROSS FORMATION SUSCEPTIBILITY IN LASER FUSION CUTTING OF DIFFERENT STAINLESS STEEL COMPOSITIONS WITH EMPHASIS ON MINOR ELEMENT EFFECTS

By: A. Mahrle; T. Wanski; A. T. Zeuner; P. Herwig; M. Zimmermann

Abstract: The problem of variable susceptibility to dross formation or cast-to-cast variations in the performance of solid-state laser fusion cutting of 2 mm stainless steel sheets is investigated. The conducted study considered five different steel batches that each fully meets the material specifications of AISI 304 steel but show variations in minor element concentrations, particularly with respect to the sulfur content. Based on the hypothesis that the dross formation phenomenon correlates with surface tension and viscosity of the melt, the general melt flow behavior of the batches was first characterized by complementary experimental and simulative investigations. This combined approach allowed for a qualitative distinction of batches with a primary negative or positive temperature coefficient (NTC/PTC) of surface tension. Subsequent cutting experiments on qualitatively different batches with variations in cutting speed and gas

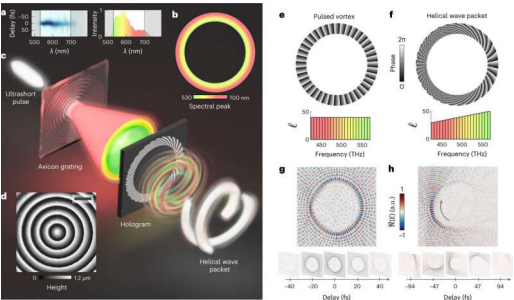
pressure give evidence that an experienced wider processing window for dross-free cuts relates to PTC batches. However, these batches showed more irregular cut edge topography with slightly increased roughness values. It is consequently concluded that proper quality management in laser cutting of different batches of a material needs to consider the real composition of the materials being cut.

Journal of Laser Applications 35, 032001 (2023); <https://doi.org/10.2351/7.0001015>
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1

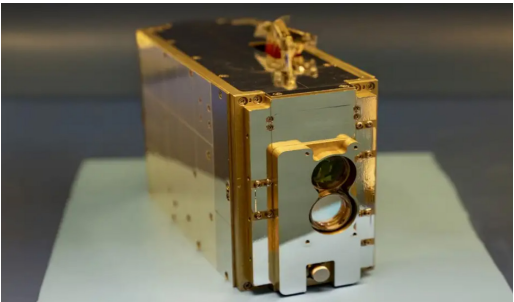
TRENDING IN THE NEWS: LIA'S TOP 4 ARTICLE PICKS



ULTRASHORT LIGHT PULSES SHAPED LIKE A SPRING TOY BRING A NEW TWIST TO PHOTONICS
An international team of researchers has harnessed ultrafast optics and structured light to synthesize in the laboratory a new family of spatiotemporal light beams, known as light springs.

[Read more](#)

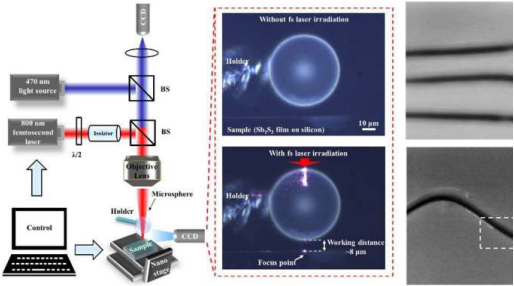
2



NASA, MIT'S LASER LINK ACHIEVES A GROUNDBREAKING 200 GBPS SPEED
Researchers from NASA, MIT, and other institutions have achieved the fastest space-to-ground laser-communication link yet — 200 gigabits per second — between a satellite in orbit and Earth, the highest data rate ever achieved by optical communications technology.

[Read more](#)

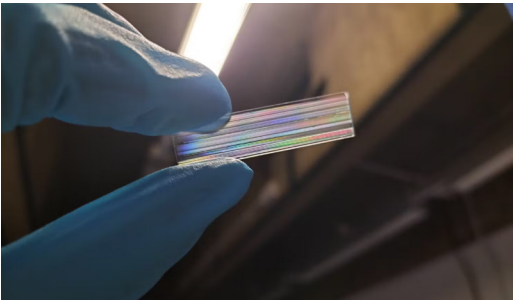
3



NON-CONTACT MICROSPHERE ULTRAFAST LASER NANOPATTERNING TECHNOLOGY
Researchers reported an ultrafast laser processing technology based on non-contact microspheres, realizing <50 nm functional nano-patternings on the surface of phase change materials.

[Read more](#)

4



ABILITY TO WRITE WAVEGUIDES IN SAPPHIRE OPENS DOOR TO SAPPHIRE PHOTONIC CHIPS
University of Oxford researchers show integrated sapphire photonic chips are a realistic prospect, thanks to the ability to write hundreds of waveguides in sapphire.

[Read more](#)

Laser Communication: The Future of High-Speed Data Transmission

By, Cort Honey

In today's ever-changing digital landscape, the need for super-fast data transmission is more important than ever. Whether it's streaming high-quality videos or sending large files, we're always searching for quicker and more efficient ways to move information. That's where laser communication comes in—a new technology that has the potential to revolutionize data transmission as we know it.

What is Laser Communication?

At its core, laser communication harnesses the power of laser beams for data transmission, setting it apart from traditional methods like radio waves or fiber optics. Rather than relying on different mediums to carry signals, laser communication utilizes concentrated light beams to encode and transmit data.

Laser beams are produced by amplifying light through a process called stimulated emission. This results in a coherent and focused beam of light with high intensity. These laser beams are then modulated to carry data by varying their properties, such as intensity or phase.

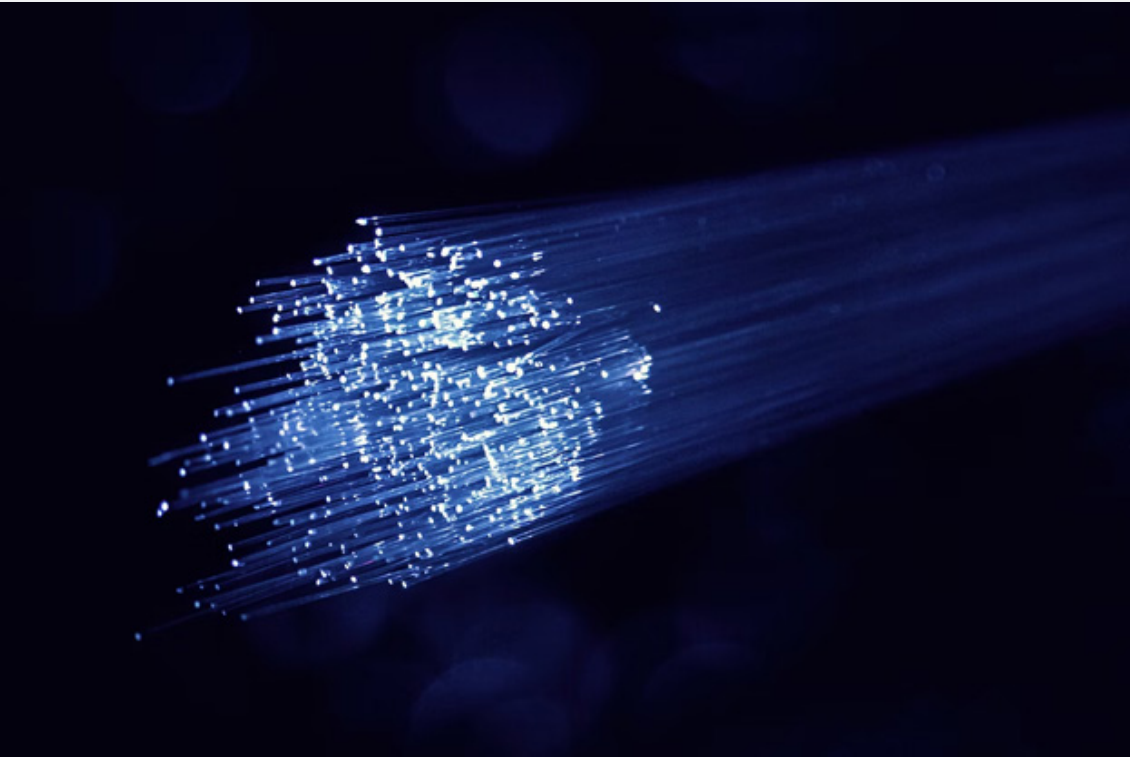
Once the data is encoded onto the laser beam, it can be transmitted through the air or even across vast distances in space. This is achieved by directing the laser beam toward a receiver, which captures the light and decodes the encoded data. The receiver can be equipped with specialized detectors designed to accurately detect and interpret the modulated laser signal.

3 Key Benefits of Laser Communication for Data Transmission

By harnessing the power of laser beams, we can transform the way we connect, communicate, and share data. Here are a few key ways laser communication enhances data transmission:

- **Super-Fast Data Transfer:** Communication using focused light beams offers incredible speed, surpassing traditional methods. This means data can travel at lightning-fast speeds, ensuring quick downloads, smooth streaming of high-quality content, and instant real-time communication.
- **Enhanced Security:** With a more focused and directed signal, laser communication improves security. It reduces the risk of unauthorized access or data breaches as intercepting laser communication requires a receiver that can understand the method of communication.

- **Clearer Signal:** The use of focused light beams results in a clear and robust signal. This ensures data integrity over long distances and in challenging environments, minimizing the impact of signal degradation or interference commonly encountered with other transmission methods.



Laser communication systems use the properties of lasers to encode data for high-speed transmission

Applications of Laser Communication

Laser communication showcases its versatility and transformative potential through practical applications in various domains.

Space Exploration

Enabling high-speed and efficient data transmission between a spacecraft and Earth, laser communication facilitates the exchange of vast amounts of scientific information. Laser communication proves particularly invaluable in unmanned space exploration missions. It allows for faster transmission of scientific discoveries, real-time monitoring of mission status, and more efficient operational control of unmanned space vehicles.

Currently, the International Space Station uses laser communication technology to communicate with one of the telescopes from Japan's [National Institute of Information and Communications Technology](#). The [Psyche mission to 16 Psyche](#), the main-belt asteroid, also uses laser technology with Deep Space Optical Communications.

By leveraging this technology, space agencies can accelerate the pace of discovery, enhance our understanding of the universe, and lay the groundwork for future missions. Laser communication enables real-time communication with astronauts, enhances remote spacecraft operations, and facilitates interplanetary communication for future human missions beyond Earth's orbit.

Telecommunications

In remote areas, where laying traditional cables or deploying extensive cellular networks is challenging, laser communication systems provide a wireless alternative. These systems establish high-speed connections using beams of light. As a result, they can enable voice and data transmission, internet access, and other telecommunication services from satellite systems.

Fiber optic telecommunication systems already use lasers for transmitting data. They use [semiconductor](#)

[lasers](#) to transmit data through a fiber-optic line. This method of transmitting data currently leads the telecommunications industry in cost-effective high-speed connections.

By rapidly deploying laser communication links, telecommunications companies, NGOs, and governments can extend connectivity to previously isolated regions. This empowers communities with access to education, healthcare information, e-commerce opportunities, and global communication networks.

Disaster Response & Emergency Communications

During disasters and emergency situations, communication infrastructure often gets disrupted, impeding rescue and relief efforts. Laser communication systems can help re-establish communication lines with fast-deploying temporary communication links. These systems provide reliable and high-speed connections, enabling emergency responders to coordinate their efforts, share real-time information, and make timely decisions.

Wireless laser communication can transmit high-definition information without requiring extensive infrastructure. This makes it a highly effective method for disaster communications. The International Conference on Robots & Intelligent Systems published a [proposed structure for laser-based disaster communications](#).

With its focused and directed nature, laser communication is less vulnerable to interference and signal degradation, ensuring communication reliability even in challenging environments. This resilience enables emergency personnel to maintain essential communication links. It can facilitate search and rescue operations, medical assistance, and logistical support during critical times.

High-Frequency Trading

In the realm of high-frequency trading, where split-second transactions can yield significant financial gains, laser communication plays a pivotal role. It enables ultra-fast and reliable data transmission between trading centers, reducing latency and facilitating real-time trades.

Dedicated laser communication systems provide low-latency communication channels that significantly reduce the time required to transmit trade orders, market data, and other critical information. This allows traders to react swiftly to market fluctuations, execute orders in milliseconds, and capitalize on market trends before competitors. It also enables algorithmic trading strategies that require real-time and accurate data.

“Laser communication is leading the way in high-speed data transmission, bringing us closer to a future where connectivity is seamless and communication knows no bounds.”

Challenges with Laser Communication

While laser communication brings impressive benefits, it also faces several challenges that can make traditional communication methods more effective in some circumstances. A few key challenges facing laser communication include:

- **Atmospheric interference:** Laser beams can be affected by fog, rain, dust, and turbulence, leading to weaker signals or loss. Overcoming this requires minimizing atmospheric interference.
- **Alignment and pointing:** Precise alignment is crucial, and even slight misalignments can disrupt communication. Sophisticated tracking mechanisms are needed for accurate pointing.
- **Earth’s rotation and orbital dynamics:** The Earth’s rotation and spacecraft orbits introduce complexities. Continuous adjustments are needed to maintain communication links, especially in interplanetary missions.

- **Security and interference:** Laser communication is susceptible to interception and interference, requiring robust encryption and countermeasures to protect against unauthorized access.
- **Cost and infrastructure:** Implementing laser communication systems can be costly. Deployment of ground stations, satellite systems, and infrastructure requires substantial investments.

Current Developments and Future Outlook

The world of laser communication is constantly evolving, with new advancements and possibilities on the horizon. Recent developments and ongoing research has focused on three main areas:

1. Faster Data Rates

Researchers are working to make laser communication even faster. They are using clever techniques and better technology to increase the speed at which data can be transmitted. Just last year, scientists reached the [fastest data transmission](#) speeds ever with just one laser and an optical chip.

2. Satellite Networks

Satellites are being used in groups, called constellations, to provide global connectivity. Laser communication plays a crucial role in these networks, allowing fast and efficient communication between satellites and the ground. NASA began testing the capabilities of laser communication systems in satellites with the launch of the [Laser Communications Relay Demonstration](#) at the end of 2021.

3. Stronger Security

Researchers are exploring the combination of laser communication with quantum key distribution (QKD) to better encrypt laser data. QKD uses the principles of quantum physics to create highly secure encryption keys.

The latest research in QKD revolves around [device-independent quantum key distribution protocols](#) and [expanding the range of these protocols](#). With a high enough range, laser communication systems can start using quantum key distribution encryption protocols to significantly enhance security.

Laser communication is leading the way in high-speed data transmission, bringing us closer to a future where connectivity is seamless and communication knows no bounds. As technology advances, we can expect even faster data rates, better optical systems, and more diverse applications. With each step forward, we move closer to a future where information exchange knows no limits and becomes an integral part of our daily lives.



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Canadian Department of National Defense
HPS Laser
Winbro Group Technologies LLC
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STUDENT SPOTLIGHT

Name: Alireza Fardoost
Hometown/State: Orlando, FL
Year in School: 5th year Ph.D. student
Area of Study/Major: Optics and Photonics

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

“I was a double major student through my undergraduate studies and have received two BSc degrees in Physics and Electrical Engineering (EE). I’m so passionate about optics and photonics because I find it to be where EE and Physics meet.”

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

“Throughout high school, I always enjoyed physics and loved playing in the lab. I have witnessed the rapid growth of technology including the internet, TV screens, and cell phones. I found this path so astonishing and always loved to play my part in their future developments.”

Describe your favorite course you have taken so far.

“I have enjoyed almost all the courses I’ve had so far in CREOL, the College of Optics and Photonics. More specifically, I like the ones with very robust theoretical descriptions and extended practical applications such as optical fiber communications. In this course, you can see how physical phenomena can be engineered to perform one of the most important applications of optics and photonics.”

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

“My main research is currently on the design and demonstration of photonic computational units. We are basically working on an optical computer. We have demonstrated a tensor processing unit in our lab working with the same computational power as Google Edge TPU (tensor processing unit). We have also proposed more powerful optical units currently under design and fabrication that can have major effects on the future of artificial intelligence by significantly increasing the speed and energy efficiency of state-of-the-art electronic processors.”

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

“My qualifications fit well into an engineering job in the industry where we can design, simulate, and experimentally characterize advanced optical and photonic devices. Meanwhile, my long-term plan is to start my own company and run the whole business.”

WANT TO SHARE YOUR IDEAS WITH THE LASER COMMUNITY THROUGH *LIA TODAY*?

LIATODAY

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).

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