The Certification Renewal deadline is coming up again on December 31, 2021. If you were unable to acquire enough Certification Maintenance points this year, you may qualify to apply for an Extension Year. Learn more about this process in the BLS section of this newsletter.

BLS: EXTENSION YEAR REMINDER

On Friday, December 17, the U.S. Court of Appeals for the Sixth Circuit dissolved the Fifth Circuit’s stay of the COVID-19 Vaccination and Testing Emergency Temporary Standard (COVID-19 Vaccination and Testing ETS). OSHA can now once again implement this vital workplace health standard, which will protect the health of workers by mitigating the spread of the unprecedented virus in the workplace.

STAY LIFTED ON OSHA COVID-19 VACCINATION AND TESTING EMERGENCY STANDARD

CUTTING CREATIVELY: LASER CUTTING FOR SMALL BUSINESS

Laser cutting is a huge part of the laser materials processing industry and continues to be used in many capacities. Specifically, it has become an appealing option for people who want to get started with their own small business. Learn about the process and hear a personal account from small business owner Rachel Kleser of Home Fires Engravings.

Cutting Creatively: Laser Cutting for Small Business

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.
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.

**Course Highlight**

**MEDICAL LASER SAFETY OFFICER TRAINING**

**ORLANDO, FL - FEB 19-20, 2022**

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.

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**LIA Laser Safety Trainings**

**LASER SAFETY OFFICER TRAINING**

- **Orlando, FL**  
  Dec. 1 - 3, 2021
- **Orlando, FL**  
  Feb. 16 - 18, 2022

**LASER SAFETY OFFICER WITH HAZARD ANALYSIS**

- **Orlando, FL**  
  Dec. 6 - 10, 2021
- **Orlando, FL**  
  Feb. 22 - 25, 2022

**MEDICAL LASER SAFETY OFFICER TRAINING**

- **Orlando, FL**  
  Dec. 4 - 5, 2021
- **Orlando, FL**  
  Feb. 19 - 20, 2022

**INDUSTRIAL LASER SAFETY OFFICER TRAINING**

- **Novi, MI**  
  Nov. 10 - 11, 2021

Visit [www.lia.org](http://www.lia.org) for all course and event listings.

**President's Message**

As we approach the end of 2021, I reach the end of my extended (2) year term as President of the LIA. I will be remaining on the Board of Trustees in the role of Past President in 2022. I would like to thank the membership, trustees and specifically Nathanial Quick along with the entire LIA staff for your support and hard work especially through these challenging COVID times.

During the past two years, the organization has evolved and achieved the milestones and goals set for its restructuring. In addition, virtual platforms are all now configured for future communication, conferences, presentations and training internationally. The new organization is now stronger and positioned for beneficial growth as it moves forward.

The board of Trustees, the entire LIA team and I wish you a Happy, Safe and Prosperous Holiday Season!

**Executive Director’s Message**

The year is coming to a close, and with 2021 nearly behind us, we look ahead and move forward with our experiences from the past year providing important guidance. We would like to thank your continued support and are excited for things to come.

In this issue you will find an article about laser cutting and its adoption into the small business world. This piece will give you an insight into how the technology is being used, particularly with more people working from home. In reading this article, you will get a personal insight into this process from an interview with a woman who recently launched her own laser engraving and cutting business.

Also included is another publishing of the Student Spotlight segment. We are excited to highlight some of our local students and their passion to learn and use their knowledge to grow this field. In this segment we are recognizing UCF CREOL student Ricardo Bustos Ramirez, who received his PhD in Optics and Photonics.

With a new year ahead of us, the LIA family is excited for what is to come and how we can continue to improve how we serve the laser community.

Wishing you all happy holidays and a bright New Year!

Stay safe and keep others safe.
A Look Ahead at Upcoming Laser Industry Conferences!

1. SPIE Photonics West - 22 - 27 January 2022 (San Francisco, CA, USA)
2. AORN - Mar 19-23, 2022 (New Orleans, LA, USA)
3. MD&M West - April 12-14, 2022 (Anaheim, CA, USA)
4. COLA - April 24-29, 2022 (Matsue, Japan)
5. Laser World of Photonics - April 26-29, 2022 (Munich, Germany)
6. Fabtech - May 3-5, 2022 (Mexico)
7. AKL - May 4–6, 2022 (Aachen, Germany)
8. RAPID + TCT - May 17 - 19, 2022 (Detroit, MI, USA)
9. ALAW - June 7-9, 2022 (Plymouth, MI, USA)
10. IMTS - Sept 12-17, 2022 (Chicago, IL, USA)
11. ICAL E O, Oct. 17-20, 2022 (Orlando, FL, USA)
12. Fabtech - November 8-10, 2022 (Atlanta, GA, USA)

TRENDING IN THE NEWS:

1. A SINGLE LASER FIRED THROUGH A KEYHOLE CAN EXPOSE EVERYTHING INSIDE A ROOM
   Researchers at the Stanford Computational Imaging Lab have expanded on a technique called non-line-of-sight imaging so that just a single point of laser light entering a room can be used to see what physical objects might be inside.
   Read more

2. RESEARCHERS AT THE BRINK OF FUSION IGNITION AT NATIONAL IGNITION FACILITY
   Lawrence Livermore National Laboratory’s (LLNL) National Ignition Facility (NIF) in California has turned up a whopping 1.3 megajoules of energy, or about three percent of the energy contained in one kilogram of crude oil.
   Read more

3. NEW LASER CAPTURES ENERGY LIKE NOISE-CANCELLING HEADPHONES
   Physicists at The Australian National University (ANU) have developed extremely powerful microscopic lasers that are even smaller than the wavelength of the light they produce.
   Read more

4. ADVANCES IN GREEN LASER PROCESSING
   Green-wavelength lasers have found distinctive materials processing applications, with the latest being 3D printing using copper powder.
   Read more
EXPERIMENTAL OBSERVATION OF THE EFFECT OF PULSE DURATION ON OPTICAL PROPERTIES IN ULTRAFAST LASER MICRO-PROCESSING OF POLYMERS

By: Arifur Rahaman, Xinpeng Du, Aravinda Kar, and Xiaoming Yu

Abstract: Polymers are important materials for both industrial and scientific applications. However, it is challenging to efficiently process polymers with an ultrafast laser due to their low melting point, high bandgap, and different absorption mechanics with different laser parameters. It is common practice in industries to use different kinds of lasers and, therefore, different laser parameters, such as pulse duration, wavelength, pulse energy, etc. In particular, the effect of pulse duration during ultrafast laser interaction with polymers is significant as the absorption mechanism can be different with different pulse durations. In this study, the effect of pulse duration is investigated during the ultrafast laser interaction with transparent polypropylene (TPP), which is an important polymeric material widely used in many industrial applications. This study is based on the experimental measurement of the optical properties of TPP during ultrafast interaction, where optical properties, i.e., reflectance, transmittance, and absorptance, are determined by performing time-resolved measurements in single-pulse configurations. This experiment is carried out by collecting in situ data of the reflection and transmission of each laser pulse in an ellipsoidal reflector-based experimental setup, which enables the collection of both specular and diffusive reflection with nearly full coverage, and absorption is calculated from the experimental results. It is found that TPP undergoes a dramatic morphological change with different pulse durations ranging from 167 fs to 1 ps, which is correlated with the change of optical properties during the ultrafast laser interaction with TPP for different pulse durations. This result will be useful for controlling the processing of polymers with ultrafast lasers for industrial applications.

Journal of Laser Applications 33, 042003 (2021); https://doi.org/10.2351/7.0000462

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

When were you first introduced to photonics/electro-optics?
I was introduced by a friend from college who was doing a MSc in Optics. We were both trying to figure out what to do for our PhDs and he recommended Photonics/Electro-Optics as a career.

What or who inspired you to choose your line of study?
Several things; after my friend introduced me to optics I started doing my own research about it and I found out that photonics is now everywhere in science and even in technology we use everyday. It is in the telescopes, and most of the technology that we use to study the universe, but it is also in things that we all use, for example, it provides the infrastructure for high-speed internet.

Describe your favorite course you have taken so far.
My favorite course so far was Ultrafast Optics. It was taught by Prof. Peter Delfyett. I liked it a lot because it had a good mix of nonlinear optics and systems engineering, which I both like. It also helps that ultrafast optics is the main topic of my PhD.

Are you researching anything at the moment? Can you tell us about it?
During my PhD I was working on linking two different types of chip-scale frequency combs, namely microcombs and semiconductor mode-locked laser. In the future this could have applications in the generation of ultra-low phase noise signals and in chip-scale optical atomic clocks.

Right now I work at a company that designs and manufactures optical networking equipment based on photonic integrated circuits.

What would you like to do in the future with your studies?
I would like to work in industry in an R&D environment for a company that does research in telecommunications, microwave photonics, or ultrafast photonics. Another place I would like to work at is at a National Lab.
Freeform Future Corp
Freeform is a stealth-mode metal 3D printing startup backed by Silicon Valley’s top venture capital firms. Founded by experienced entrepreneurs from several of the world’s most innovative companies, we believe that transforming the way things are made is essential to making the world a better place. Our advanced technology stack lies at the intersection of hardware, software, and data science, creating the foundation for the world’s first fully autonomous manufacturing factory.

https://www.freeformfuture.com/

Zap Energy was founded in 2017. Our breakthrough plasma confinement technology is an extension of work originally pioneered by the FuZE team at the University of Washington and Lawrence Livermore National Laboratory, funded by the US Department of Energy since 1998. By stabilizing the plasma with a sheared flow the high-temperature, high-density reactive medium can be confined long enough for the fusion reactions to occur.

We think our reactor is the least expensive, most compact, most scalable solution with the shortest path to commercially viable fusion. Based on our progress to this point, we are on track to reach Q=1 energy breakeven plasma conditions.

https://www.zapenergyinc.com/

WASHINGTON, DC – As you may be aware, on Friday, December 17, the U.S. Court of Appeals for the Sixth Circuit dissolved the Fifth Circuit’s stay of the COVID-19 Vaccination and Testing Emergency Temporary Standard (COVID-19 Vaccination and Testing ETS). OSHA can now once again implement this vital workplace health standard, which will protect the health of workers by mitigating the spread of the unprecedented virus in the workplace.

To account for any uncertainty created by the stay, OSHA is exercising enforcement discretion with respect to the compliance dates of the ETS. To provide employers with sufficient time to come into compliance, OSHA will not issue citations for noncompliance with any requirements of the ETS before January 10 and will not issue citations for noncompliance with the standard’s testing requirements before February 9, so long as an employer is exercising reasonable, good faith efforts to come into compliance with the standard. OSHA will work closely with the regulated community to provide compliance assistance.

For more information, please refer to OSHA’s COVID-19 Vaccination and Testing ETS webpage, which provides access to the regulatory text, fact sheets, a pre-recorded webinar, sample policies, frequently asked questions, and links to related Department of Labor (DOL) and Centers for Disease Control and Prevention (CDC) resources.

- Doug Kalinowski
Directorate of Cooperative and State Programs
Laser Cutting is a huge part of the laser materials processing industry and continues to be used in many capacities. Laser cutting is the process of using a focused beam of light to burn, melt, or vaporize material, typically in a custom pattern, to create a clean cut on a variety of materials. It is used in many industries, such as making sheet metal parts, one of its main industries it is likely to dominate over time. Laser cutting rivals other cutting processes, such as waterjet cutting, in efficiency for these types of projects.

There are three types of lasers used for cutting: fiber, CO2, and crystal lasers. When the laser was first created by Theodore Maiman in 1960, he used a ruby laser. A few years later, Kumar Patel created the CO2 laser which replaced ruby laser cutting because it was more efficient. Since then, the fiber laser has also been invented and taken the industry by storm due to its flexibility, efficiency, and affordability.

Affordability for Small Businesses

This past year and a half has been a difficult time for many, but for some people, it also became a time to grow creatively. Many people had nothing else to do during the pandemic except trying new hobbies or reviving old ones. A few were even able to turn those hobbies into a way to earn money and start a business. Laser cutting, specifically, has become an appealing option for people who want to get started with their own small business.

Laser cutting can be a good option for people who want to design and create quality products out of different materials. Many laser cutting machines are capable of more than just actual cutting, they can also etch and engrave materials. This makes lasers even more useful and versatile for people who use them to start a business from home. A person is not confined to one type of work so they can make a variety of different products, including jewelry, cut out signs, or engraved cups or tumblers.

The startup cost can vary depending on which machine a person chooses to invest in, but it generally has a relatively low cost compared to other options out there, making it all the more appealing. Once you have purchased a machine, there is not much added expense to keep up with as it does not use any materials other than the material to be cut or engraved. The only costs would be repairs or upkeep on parts for the machine, for example, occasionally replacing the CO2 cartridge in a CO2 machine.

The process of starting a laser cutting project from start to finish can seem simple, but in reality, it can require some time and dedication. You start with a computer-aided design (CAD) or computer-aided manufacturing (CAM) program to design and customize what you want to cut. Just be prepared to take some time to learn and become familiar with these programs if you have never used them, or you could look for presets that are available. Once you have finished creating the project in the software and adjusted the design to how your specifications, you can program it into the machine. The machine will then cut your material of choice into the provided design. Once you have a cut, you can inspect the result and make adjustments as needed.

Laser Cutting Small Business in Practice

To get a deeper and personal insight into laser engraving small business, I reached out to Rachel Kleser, who just started her work-from-home laser cutting and engraving business, Home Fires Engraving, LLC. (www.homefiresengraving.com). To her, starting her own business gave her a focus and way to fill her days after moving across the country to deal with a family emergency. Although she has always had a passion for learning and creating, her interests were specifically led to laser systems by watching YouTube videos. “They captured my interest because I saw a tool I could use to not only build a business around, but also fueled my passion for learning and creating” she said.

Rachel found an Epilog 60watt CO2 laser that seemed right for her and started creating personalized gifts for friends and family late in 2020. After receiving positive feedback and encouragement, she decided to start constructing her business. Here is a list of skills she said she had to acquire in the process:

- Learning how to use a design program (I use Adobe Illustrator, but it seems people also choose to use Corel Draw or LightBurn depending on their machine and/ or their comfort zone.)
- Learning how to use the laser and how to find the right settings according to the material and desired effect
- Finding material and product suppliers
- Website creation - for this I started with a WordPress site, but switched to Shopify, which offers tutorials and ways to
connect with experts that one can hire for when a site needs something more technical than might be prudent to try to accomplish on one’s own.

**Marketing**

Another thing Rachel had to consider was which materials she could best work with. By now, she has tested out many different materials so she has some insight on what works best for her and her machine. “So far, the easiest for me is engraving powder-coated drinkware. The results are always the same. However, I really enjoy creating products (ornaments, coasters, signs, etc) from raw materials because the work is satisfying. I love working with wood because it is versatile, beautiful, natural, and somehow comforting. I use primarily solid cherry, maple and walnut on most of my products, but Baltic Birch plywood also has its place in my shop.” She has also worked with plywood, acrylic, and leather, but says that the more you work with any material that agrees with your machine, the easier it will get.

“If someone is considering getting a laser cutter/engraver either as an add-on to an existing business, or as the focal point of a new business, here are some suggestions to consider:

- **Learn as much as you can.** There are many resources available online (YouTube and Facebook groups, for example, or manufacturer websites) that a person can take advantage of.
- **Find a laser you can play with.** Some libraries have “maker spaces” that are equipped with lasers that the public can use.
- **Reach out to manufacturers to learn about any machine you are considering and about support after the sale.** (The last thing you want to do is to have to struggle with a machine that isn’t cooperating, and not have access to technical support.)
- **Determine what you want to do with your laser before you buy.** There are a lot of factors to consider (size, speed, power, ability to engrave curved surfaces, ability to engrave or cut metal, etc).

Once you get a machine, play with it — a lot, and don’t be afraid to wreck some things! Finally, if you are like me, you may have to remind yourself to be patient in the process. Although it feels like the road has been a long one, each experience or misstep has taught me something valuable.” For people like Rachel, lasers can be used to create at a time when it is needed most: “I realized I could use my laser engraving business to help spread joy in a stressed out world. I wanted to be able to do something that caused people to smile, to connect with others, and to somehow shine a light into the darkness. That’s a tall order for a small business, but I don’t have to be big - I just have to be good. I’d found my purpose.”

When most people in the laser industry talk about or think of laser cutting, it is pictured as being used commercially in industries such as manufacturing for automobiles, aerospace engineering, and more. Although it is a huge part of those industries, the technology can reach individuals as well. The laser has come so far in its short history, and we have seen its prominent impact in almost all aspects of life. It makes sense then, to also see it encourage and enable people’s independence and creativity.

Sources for reference

- https://www.3erp.com/blog/three-main-types-of-lasers-for-cutting/
NEWSLETTER

Volume 2 • Issue 4

Certification Renewal Deadline

The certification renewal deadline is December 31, 2021. Please be sure to have all forms and applicable payments submitted/postmarked by that date. For updates on renewal policies, please review the certification maintenance tab on our website or view the quick guide on certification maintenance found here: https://www.laser-safety.org/store/product/safe-use-lasers-draft-4-public-review

New Option for Certification Exams

Certification exams will now be available through remote proctoring! Details to this process will be added to the BLS website soon.

For more certification exam information, visit www.lasersafety.org, or contact us at bls@lasersafety.org.

ANSI Z136.1 Public Review Period 4 Open

The 4th public review for the ANSI Z136.1 Safe Use of Lasers is now open! Make sure to submit your comments before the January 10, 2022 deadline.

For more information and to purchase a copy of the draft, visit https://www.lia.org/store/product/bsrz1361202x-safe-use-lasers-draft-4-public-review.

Find this standard, as well as the rest, on our website at lia.org/store/laser-safety-standards.

International Laser Safety Conference (ILSC) 2023 Dates and Location

The International Laser Safety Conference will now take place in Portland, Oregon from February 27 - March 2, 2023.

Find out more about the conference at lisconference.org.

Write for BLS!

Looking for a way to earn BLS CM points for free? BLS has restarted it’s newsletter and is inviting CLSOs and CMLSOs to share laser safety knowledge with the laser community! Published article submissions are worth 0.5 BLS Certification Maintenance (CM) points in Category 3. For more information on guidelines and regulations, email us at bls@lasersafety.org. Check out one of our submissions on the next page!

About BLS

The mission of the Board of Laser Safety (BLS) is to provide a means for the recognition of laser safety professionals through certification and to promote competency in the field of laser safety. BLS certification will enhance the credibility of a designated Laser Safety Officer, and demonstrate that individuals serving in the field have agreed to adhere to high standards of safety and professional practice. For the employer, having a CLSO or CMLSO on staff demonstrates due-diligence and helps to ensure legitimacy and adequacy of the laser safety program, validating the company’s dedication to a safe working environment for all employees.

Not enough CM Points? Apply for an Extension Year

After an individual has passed the certification examination, he/she will be required to maintain that certification through approved professional development activities over the 3-year certification period. As the industry changes and technology grows, so too must the knowledge of the CLSO and CMLSO. The BLS only recognizes BLS Certification Maintenance (CM) points and may award these points for eligible laser-related activities.

Last year, the Board of Laser Safety introduced the option of the Extension Year. If you are a CLSO or CMLSO and you were unable to finish earning the 10 Certification Maintenance points that are required in the 3-year maintenance cycle, this is an option for you. The extension year option gives you an additional year after your December 31 deadline to earn those CM points that you were missing. There are, of course, some limitations to this.

First, an extension year must be applied for. The request and payment of the extension year fee must be submitted no later than December 31 of the original 3-year cycle, i.e., the original certification expiration date. The renewal fee must also be paid by that deadline.

If a CLSO or CMLSO chooses to use the extension year, they can only renew by Certification Maintenance points. They also cannot earn more points in the same categories if they have reached the maximum, just because it is a new year. Only new points in categories not fulfilled will be accepted.

Lastly, the extension year can only be requested once every other certification cycle and there is no “grace period” allotted to the fourth year, since the extension year serves as its own type of grace period. They also may not extend two cycles in a row, meaning if you applied last year, you are unable to apply again this year. If the situation is not resolved by December 31st of the extension year, the CLSO/CMLSO will go to Inactive Status.

Here is an example of what an extension year might look like: “Mr. Laser is a CLSO and his certification cycle ends December 31 of this year. He realizes he does not have the required 10 CM points and due to a number of factors cannot earn the points by the end of his cycle. He chooses to apply for an Extension Year and submits his application prior to December 31. Since he did not use an extension year during his previous cycle, he is eligible for one in his current cycle, so he is approved. When he receives notification from BLS that he is approved for an Extension Year, he may begin earning CM points to reach the 10 CM points required for renewal. Mr. Laser already earned the maximum number of points for his job (3 CM) and for attending conferences (4 CM), so he must earn 3 CM points in the remaining categories. He chooses to apply for a one-year membership at a BLS-approved organization for 1 CM point and then chooses to read laser-related journal articles for 2 CM points. At the end of the Extension Year, Mr. Laser has the 10 CM points needed for renewal and submits his CM worksheet and documentation to BLS by the December 31 deadline. He will not be eligible to apply for another Extension year during the following certification cycle, as the Extension Year may only be used every other cycle. His next cycle will be a three-year cycle.”

You can visit the Board of Laser Safety website at lasersafety.org for more information on certification maintenance and the new extension year or watch the following informative video that was made by the BLS staff for your convenience.
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.

Deadline: 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 Checklist:

• 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