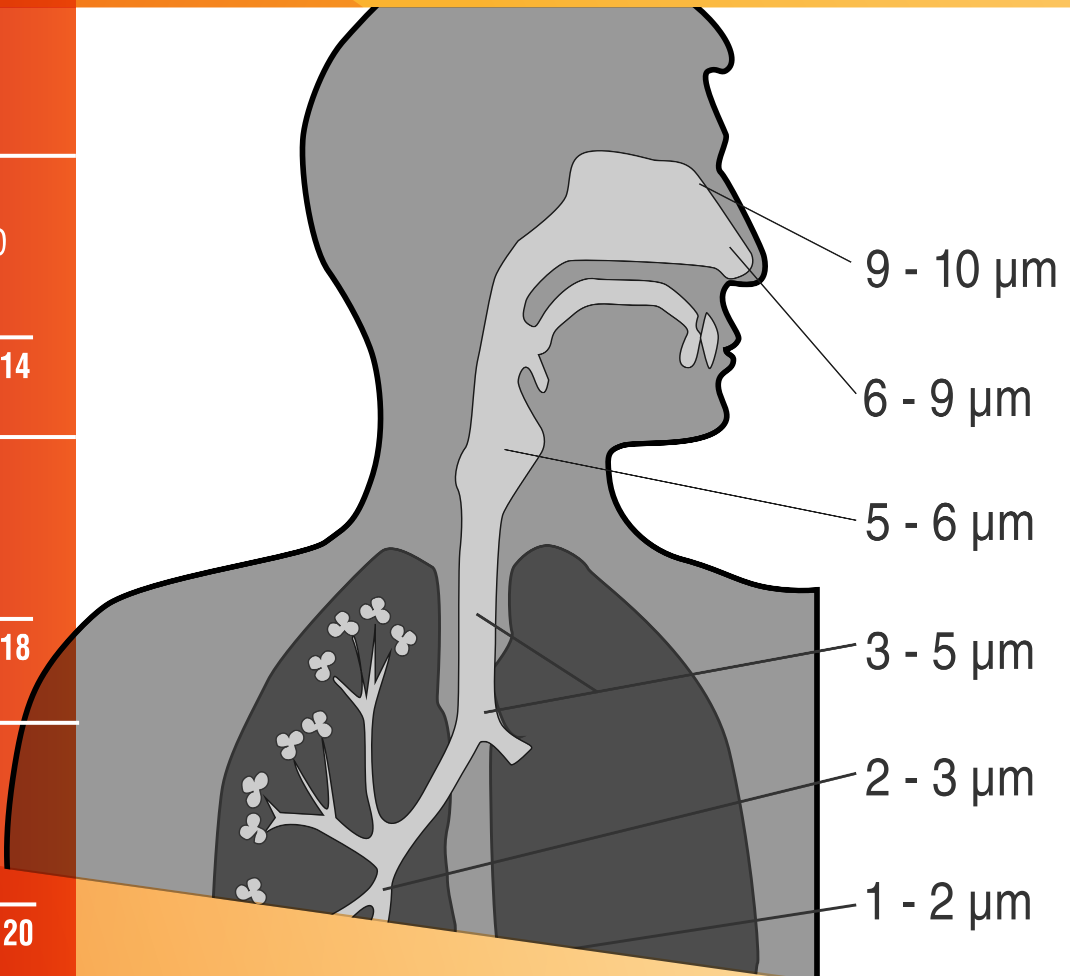
LIA TODAY



Your sneak peek at ILSC inside! Pages 5 - 13

ILSC®
INTERNATIONAL LASER SAFETY CONFERENCE
Embassy Suites® • Kissimmee, FL USA
March 19 - 21, 2019

Presented by:
LIA™ 50 YEARS 1968–2018

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LIA TODAY

THE ILSC 2019 MINI-EDITION

This mini-edition of *LIA TODAY* is your sneak-peak into ILSC, the world's premiere source of laser safety information.

FOLLOW US!

Featured Articles:

As we gear up for ILSC 2019, let's take a look back at some of the amazing presentations from 2017.

14

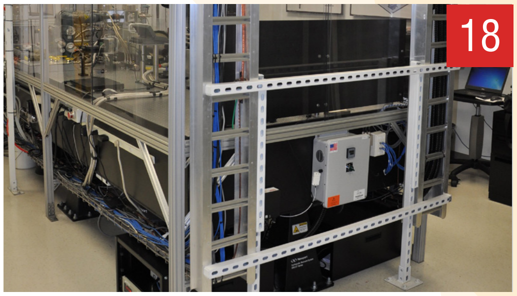
Featured in MPAS 2017

WHERE THERE'S SMOKE...

LASER SURGICAL MASKS AND RESPIRATORY PROTECTION

By Elizabeth Krivonosov and Paul Bozek

During surgery involving lasers, laser generated air contaminants (LGACs) are produced. According to Occupational Safety and Health Administration (OSHA), more than 500,000 workers are exposed to surgical smoke every year. Studies have shown the surgical smoke (plume) contain hazardous particulates and also viable biological pathogens which are capable of causing adverse health effects. READ MORE



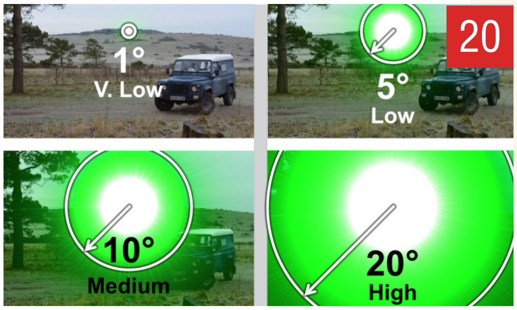
18

Featured in TPAS 2017

SETTING UP A LASER LAB - AVOID THE PITFALLS

By Jamie King

The design of a laser laboratory is not only critical to its overall functionality, but more importantly to the safety of those who work in and around it. The safe planning of a laboratory is no accident. From conception to commissioning of the laser, safety must be involved in every step of the process. READ MORE



20

Featured in LSSS 2017

LASER EYE DAZZLE SAFETY FRAMEWORK

By Craig A. Williamson and Leon N. McLin

A safety framework for laser eye dazzle has been constructed to address the urgent need for dazzle advice within international laser safety standards. Simple calculations are presented to permit dazzle effects to be quantified, based upon the new concepts of Dazzle Level (DL), Maximum Dazzle Exposure (MDE) and Nominal Ocular Dazzle Distance (NODD). READ MORE

2019 CONFERENCE CHAIRS

Conference General Chair

Benjamin Rockwell – U.S. Air Force Research Laboratory

Laser Safety Scientific Sessions

Karl Schulmeister – Seibersdorf Laboratories

SNEAK PEEK AT ILSC 2019 EVENTS Pg. 5

OVERVIEW OF ILSC 2019 SESSIONS Pg. 8

EXCLUSIVE INTERVIEW WITH UL Pg. 22

THE VERY BEGINNINGS OF LIA Pg. 23

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LASERSYSTEMS EUROPE

PHOTONICS MEDIA THE PULSE OF THE INDUSTRY

Technical Practical Applications Seminar

Eddie Ciprazo – University of California, Berkely

Jamie King – Lawrence Livermore National Laboratory

Medical Practical Applications Seminar

Vangie Dennis – WellStar Health System

Patti Owens – AestheticMed Consulting International


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ILSC® 2019 CONFERENCE AGENDA*

Sunday, March 17

9:00am **ASC Z136 Annual Meeting**
1:00pm Registration Desk Open
BLS Exam Opportunity
4:00pm Welcome Reception

Monday, March 18

7:00am Registration Desk Open
7:15am Session Chair Appreciation Breakfast
8:30am **Opening Plenary Session**
9:00am Bookstore Open
10:10am Morning Break
10:40am **LSS Session 1:** Bioeffects I
Medical PAS Session 1
12:00pm Awards Luncheon
2:00pm **LSS Session 2:** Bioeffects II
Medical PAS Session 2
3:20pm Afternoon Break
3:40pm **LSS Session 3:** Bioeffects III
Medical PAS Session 3
5:30pm **BLS Reception**

Tuesday, March 19

8:00am Registration Desk & Bookstore Open
9:00am **LSS Session 4:** Standards
Medical PAS Session 4
10:20am Morning Break
10:40am **LSS Session 5:** IEC 60825-1
Medical PAS Session 5
12:00pm Lunch on own
1:30pm **LSS Session 6:** Regulations
Medical PAS Session 6
2:50pm Afternoon Break
3:00pm **Industry Bussiness Session:** Panel Discussions and Presentations
5:30pm **Industry Business Session:** Sponsor Reception

Wednesday, March 20

8:00am Registration Desk & Bookstore Open
9:00am **LSS Session 8:** Broadband Radiation
Technical PAS Session 8: Laser Safety for the Generalist
10:20am Morning Break
10:40am **LSS Session 9:** Measurements and Analysis
Technical PAS Session 9: Laser Safety for the Specialist
12:00pm Lunch on own
1:30pm **LSS Session 10:** Modeling of Risk
Technical PAS Session 10: The Optical Grab Bag
2:50pm Afternoon Break
3:20pm **LSS Session 11:** Safe Use
Technical PAS Session 11: Regulations and the FDA (Panel and Open Forum)

Thursday, March 21

8:00am Registration Desk & Bookstore Open
9:00am **LSS Session 12:** Product Safety I
Technical PAS Session 12: Laser Safety for the Practitioner
10:20am Morning Break
10:40am **LSS Session 13:** Product Safety II
Technical PAS Session 13: Now What?
12:00pm Lunch on own
1:30pm **Closing Plenary Session**
4:00pm Closing Break

**Program subject to minor changes*

ILSC®
INTERNATIONAL LASER SAFETY CONFERENCE

REGISTER TODAY!

ILSC 2019 Sneak Peek!

WELCOME RECEPTION

Sunday, March 17 • 4:00pm

Kick-start the ILSC week catching up with old friends, new attendees and the LIA Team at the Welcome Reception on Sunday afternoon. Enjoy the relaxed environment of the hotel's Key West Terrace ahead of the week's Practical Application Seminars, Scientific Sessions and Ancillary Meetings.

AWARDS LUNCHEON

Monday, March 18 • 12:00pm

Sponsored by: KENTEK

The opening day of ILSC® features an Awards Luncheon and presentation. Enjoy lunch with conference attendees and the LIA Team as we congratulate this year's line-up of award winners, recognizing their contributions to the field of laser safety.

LIA presents the George M. Wilkening Award to recognize individuals who have made extensive contributions to laser safety in science, medicine, industry or education. The R. James Rockwell Jr. Educational Achievement Award is presented in recognition of outstanding contributions in laser safety education.

The 2019 George M. Wilkening Award is presented to:

Robert J. Thomas

U.S. Air Force Research Laboratory,
Fort Sam Houston, TX, USA

The 2019 R. James Rockwell Jr. Educational Achievement Award is presented to:

Jamie King

Lawrence Livermore National Laboratory,
Livermore, CA, USA

INDUSTRY BUSINESS SESSION: PANEL DISCUSSIONS & PRESENTATIONS

Tuesday, March 19 • 3:00pm

Engage in thought leadership discussions with industry experts as they discuss key developments, issues and innovations revolving around laser safety. Speakers will also share the stage as they present the latest solutions for the evolving landscape of the industry.

SPONSOR RECEPTION

Tuesday, March 19 • 5:30pm

Be a part of the world's leading laser safety conference through one of our multiple sponsorship packages. Our tiered packages give you the opportunity to engage with attendees throughout the conference, including during our Laser Safety Scientific Sessions, Technical Practical Applications Seminars and Medical Practical Applications Seminars. All sponsorship packages include a booth space with electricity during the Tuesday evening Sponsor Reception. For more information, please contact the LIA Team at marketing@lia.org or +1.407.380.1553.

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LASER SAFETY AUDITING/CONSULTING

Kentek provides workplace laser safety audits and consultations for any type of organization that needs compliance with OSHA and ANSI. Services include:

- Review entryway, beam and non-beam control measures including Personal Protective Equipment (PPE)
- Provide hazard analysis reports for each Class 3B and Class 4 laser
- Review current laser safety documentation and Standard Operating Procedures
- Review current laser safety training requirements
- Provide written report with recommendations

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We will custom-design a program that provides a basic level of safety for the end-users and any other staff working with Class 3B and 4 lasers. Services include:

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- Employee training
- Provide all laser safety documentation
- Scheduled onsite follow-up visits

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Kentek's Laser Safety Training Courses are created and instructed by Certified Laser Safety Officers who have actually "been there done that" in research, manufacturing and system integration. We focus on real workplace issues, practicality and what makes sense – not theory.

- Online training – Basics of Laser Safety, Industrial Laser Safety and LSO
- Customized onsite training based on your needs ranging from Laser Safety Awareness to LSO
- Classroom training for Industrial LSO, Administrative LSO and Comprehensive LSO

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Opening Plenary Session: Lasers and You

Monday, March 18 • 8:30am

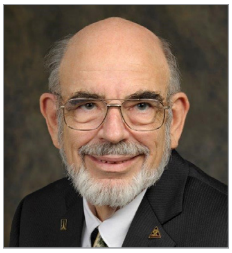
Plenary Session Chair:

Benjamin Rockwell, U.S. Air Force Research Laboratory, Fort Sam Houston, TX, USA

ILSC® 2019 will feature two renowned speakers for our opening plenary session entitled “Lasers and You”. This session will open with Dr. MJ Soileau, the Distinguished Prof. of Optics, Physics, and EE at the College of Optics and Photonics (CREOL), part of the University of Central Florida. As a pioneer in optics and photonics in the central-Florida area, Dr. Soileau will present a talk entitled “CREOL, the College of Optics and Photonics: A Personal Reflection”. The next plenary talk will be given by Dr. Ralf Brinkmann from the Institute of Biomedical Optics at the University of Lübeck, Germany and Medical Laser Center Lübeck, Germany. He will present a talk entitled “Laser damage thresholds of the RPE in the thermomechanical to thermal transition zone (ns-µs)”.

Dr. MJ Soileau is a world renowned professor who has served as the director of CREOL between 1987 and 1999, and Vice President for Research at the University of Central Florida between 1999 and 2016. CREOL is the premier university in optics and photonics and has a continuing synergistic relationship with the Laser Institute of America, as they are both located in the Orlando, Florida area. Dr. Soileau’s plenary presentation will showcase the outstanding quality and growth of CREOL, and highlight specific accomplishments over the past 30+ years.

The plenary presentation by Dr. Brinkmann will outline interesting details on the selective retina therapy (SRT) technique pioneered by him and his group. The aim of SRT is to medically selectively treat the retinal pigment epithelium layer of the retina without adverse effects to adjacent tissues. The technique has the potential to revolutionize the medical treatment of age related macular degeneration and other retinal diseases. Both speakers bring critical information to all laser safety professionals and will address today’s hot topics for all ILSC attendees.



CREOL, the College of Optics and Photonics: A Personal Reflection (OP101)
MJ Soileau
University of Central Florida, College of Optics and Photonics

Laser damage thresholds of the RPE in the thermomechanical to thermal transition zone (ns-µs) (OP102)
Ralf Brinkmann
Institute of Biomedical Optics at the University of Lübeck, Germany and Medical Laser Center Lübeck, Germany.

Closing Plenary Session: Beyond Laser Safety

Thursday, March 21 • 1:30pm

Plenary Session Co-chairs:

Benjamin Rockwell, U.S. Air Force Research Laboratory, Fort Sam Houston, TX, USA
Karl Schulmeister, Seibersdorf Laboratories, Seibersdorf, Austria

The closing plenary session features presentations that discuss issues beyond classical laser safety topics, such as the problem that laser protective features may present a hazard in themselves or ergonomics questions related to laser usage. The densely packed closing plenary session also deals with the safety of autonomous vehicles equipped with LIDAR and lasers as guide stars for telescopes. To close ILSC, two presentations provide food for thought on the conceptual approach to laser safety.

Laser Guide Stars Systems in Astronomy and Aircraft Avoidance (C101)
Gustavo Rahmer

Laser Safety Fortresses Can Be Dangerous (C102)
John Tyrer

Autonomous Vehicle Safety (C103)
Mark Shand

Ergonomics in the Laser Lab(C104)
Ken Barat

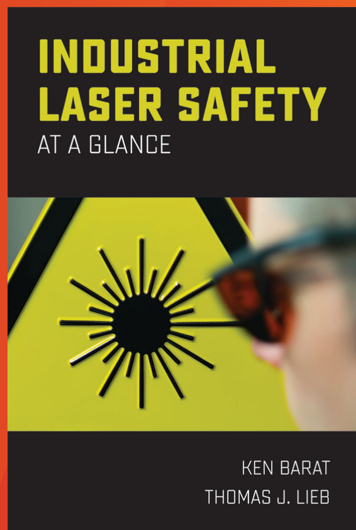
Laser Technology and Safety, the First Half-Centruy, or so (C105)
Tom Lieb

Solving a Quantum Riddle for Laser Safety: Do We Lead, Follow, or get the Photon out of the Way?
Randy Paura

MEET THE AUTHORS

Tuesday, March 19 • 5:30pm

Authors Ken Barat and Thomas Lieb will be in attendance at ILSC and available for a limited time to sign copies of their new book, *Industrial Laser Safety at a Glance*. Copies of the book will be on sale during ILSC at the Registration Desk. Book signing will take place during the Sponsor Reception.



FDA PANEL AND OPEN FORUM

Wednesday, March 20 • 3:20pm

Featured as part of the Technical Practical Applications Seminar, the FDA Panel is an opportunity for LSOs and laser manufactuers to hear from a panel of experts on the latest in FDA regulations and ask questions in an open forum environment.

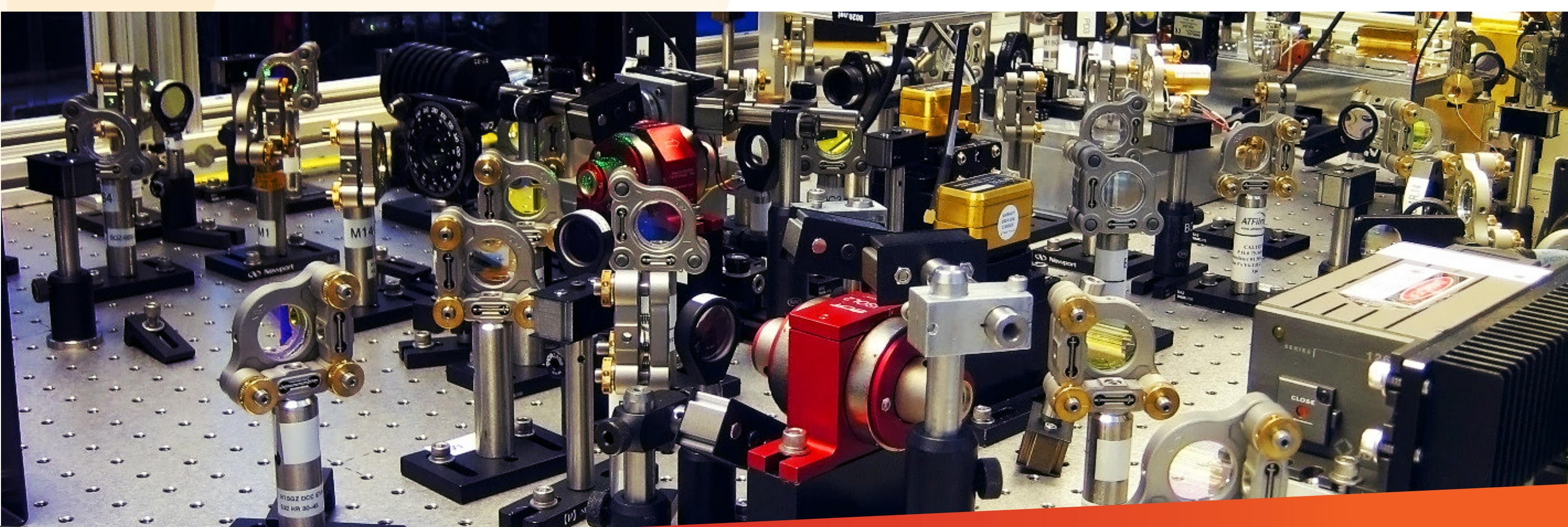
OPTICAL TABLE FUNDAMENTALS

Thursday, March 21 • 9:00am

Catch this presentation and breadboard demonstration at ILSC 2019, presented by Dr. Chrysanthos Panayiotou!

In research and development (R&D) environments the optical table is the place where new ideas are tested and novel applications of lasers and optics are generated. Often the R&D people being preoccupied with the technical problem they are trying to solve forget some of the basics of laser safety and potentially dangerous scenarios are created.

In this presentation we will examine the most common hazards created by 1) placing on the optical table auxiliary equipment, tools, and other objects, 2) the use of overhead and under table storage, 3) preventing the accidental crossing of the beam by users or equipment, 4) use of interlock systems or beam block mechanisms to protect the experimenter and the unexpected visitor.



LASER SAFETY SCIENTIFIC SESSIONS (LSSS)

Monday - Thursday (March 18 - 21, 2019)

LSS Session 1: Bioeffects I
Monday, March 18 • 10:40am
Session Chairs: Jack Lund; Robert Thomas

Informational Bioeffects Atlas of Laser Lesions (IBALL) – Developing an Online Database for Clinicians and Researchers (101)
Amanda Peterson

Femtosecond Pulses Delivered with Adaptive Optics Selectively Damage the Photoreceptor Layer in Macaque (102)
Jennifer Hunter

Revisiting Laser Exposure Limits for Intended Viewing (103)
David Sliney

Ocular Effects of Light: A Selected Look at the Photic Effects of Light Pertinent to New Sources (104)
Bruce Stuck

LSS Session 2: Bioeffects II
Monday, March 18 • 2:00pm
Session Chairs: Brian Lund, Bruce Stuck

Time Dependence of Laser-induced Thermal Retinal Injury (201)
David Lund

Computer Modelling to Support Laser Safety Analysis of Pulse Trains with Varying Peak Power and Pulse Duration (202)
Mathieu Jean

Simulation-Based Analysis of Arbitrary Asymmetric Retinal Images (203)
Chad Oian

Eye Safety Evaluation of Laser Systems Based on Damage Calculations (204)
Nico Heussner

LSS Session 3: Bioeffects III
Monday, March 18 • 3:40pm
Session Chairs: David Sliney, Robert Aldrich

Non-linear Optical Hazards from Near-infrared Ultrafast Laser Pulses in Ocular Tissue (301)
Adam Boretsky

Simulated Supercontinuum Generation in the Human Eye (302)
Benjamin Rockwell

Comparison of Corneal Injury Thresholds with Laser Safety Limits (303)
Karl Schulmeister

Visible Lesion Threshold Modeling of Skin Laser Exposureat 1070-nm (304)
Michael DeLisi

LSS Session 4: Standards
Tuesday, March 19 • 9:00am
Session Chairs: Thomas Lieb

Update on Z136.8 Laser Safety in Research, Development & Testing (401)
Ken Barat

VERISA (Virtual Environment for Real-time Safety Awareness) (402)
Nathaniel Leon

Laser Product Safety Standardization Projects of CENELEC TC 76 (403)
Jan Daem

International Electrotechnical Commission and American National Standards Institute Publications Update and New Developments (404)
William Ertle

LSS Session 5: IEC 60825-1
Tuesday, March 19 • 10:40am
Session Chairs: Bill Ertle

Investigation on Continuously Scanning Laser Systems Classified 3R under the IEC 60825-1 Edition 3.0 in Consumer Products (501)
Gaël Pilard

Overview on the Status of the TC76 Virtual Protective Housing Project (502)
Jay Parkinson

Moving Platforms: Update on Standards Development for Laser Product Classification (503)
Casey Stack

IEC TR 60825-5 Ed. 3 "Manufacturer's Checklist" – a new tool for manufacturers to comply with IEC 60825-1 ed. 3 (504)
Wlodzimierz Strzelecki

LSS Session 6: Regulations
Tuesday, March 19 • 1:30pm
Session Chairs: John Tyrer, Jay Parkinson

Driver's License. Liquor License. Laser License? (601)
Randolph Paura

Laser Safety Product Compliance – Who Cares? (602)
Trevor Wheatley

Reducing Hazards of Consumer Laser Pointer Misuse (603)
Patrick Murphy

From a Call of Evidence to a New Law in the UK, Changes in the Last 18 Months (604)
Michael Higlett

LSS Session 7: Panel Discussion and Presentations
Tuesday, March 19 • 3:00pm

No Sessions – Panel Discussions and Presentations

LSS Session 8: Broadband Radiation
Wednesday, March 20 • 9:00am
Session Chairs: Jan Daem, Casey Stack

Lamp and LED Safety – Classification vs. Realistic Exposure Analysis (801)
Karl Schulmeister

How Hazardous is the Sky? (802)
Neil Haigh

A Revision of Ultraviolet MPEs (803)
David Sliney

Optical Hazard Assessment of 6W Extended Laser Source using Laser Safety (60825) and Lamp Safety (62471) Guidelines (804)
Neil Haigh

LSS Session 9: Measurements & Analysis
Wednesday, March 20 • 10:40am
Session Chairs: Sheldon Zimmerman, Michael Higlett

Reducing the Eye Hazard Posed by DPSS Green Laser Pointer Via Accurate Measurement of Time-Dependent Radiant Power Characteristics (901)
Wlodzimierz Strzelecki

The Practice of Far Field Divergence Measurement for the Purpose of NOHD Assessment (902)
Ronald Mallant

Consideration of Wave Optical Phenomena for Retinal Images in Laser Safety Evaluations (903)
Sebastian Kotzur

Freaky Fast Filter Facts - Using a Smartphone to Characterize Optical Filters (904)
Wesley Kinerk

LSS Session 10: Modeling of Risk
Wednesday, March 20 • 1:30pm
Session Chairs: Edward Early, Karl Schulmeister

Canopies – Curse or Cure for Laser Eye Dazzle? (1001)
Craig Williamson

Human Retinal Laser Dose-Response Model (1002)
Elharith Ahmed

Probabilistic Laser Hazard Modelling for a Fifth-Generation Low-Observable Laser Designator System (1003)
Brian Flemming

Construction and Utilization of Probabilistic Dynamic Bidirectional Reflectance Distribution Functions (1004)
Albert Bailey

LSS Session 11: Safe Use
Wednesday, March 20 • 3:20pm
Session Chairs: Ken Barat, Anthony Zmorenski

Hazard Potentials during Material Processing with Ultra-Short Pulsed Lasers (1101)
Roland Mayerhofer

What's In Your Laser? (1102)
Tekla Staley

Being on the Receiving End of a Government Laser Safety Inspectors Formal Laboratories Inspection (1103)
John Tyrer

Lasers Decommissioning and Practical Laser Training (1104)
Sandu Sonoc

Z535 Compliance for Laser Safety (1105)
Randolph Paura

LSS Session 12: Product Safety I
Thursday, March 21 • 9:00am
Session Chair: Casey Stack, Annette Frederiksen

Safe Design of Laser Consumer Products (1201)
Erwin Lau

Outdoor Range Finding and Laser Safety Limits (1202)
Thomas Piok

LiDAR Design & Laser Safety (1203)
Tyler Banas

Retinal Hazard Analysis for Laser and LED Illumination for Close-in, Long Duration Exposure (1204)
Nicholas Horton

LSS Session 13: Product Safety II
Thursday, March 21 • 10:40am
Session Chairs: Jay Parkinson, Trevor Wheatley

The Effect of Liquid Droplets on Laser Safety for Consumer Products: A Numerical Model (1301)
Edward Fei

Safety Issues Concerning Technical Realization and Usage of a Mobile Laser Rescue Device (1302)
Jörg Hermsdorf

The Design of Medical Laser Surgery Dermatology Hand-Pieces for Radiation Control and Direct Extraction of Infectious Laser Generated Plume (1303)
John Tyrer

CoLaSE (Common Laser Safety Environment) (1304)
Scott Wohlstein

MEDICAL PRACTICAL APPLICATIONS SEMINAR (MPAS)

Monday & Tuesday (March 18 - 19, 2019)

Medical PAS Session 1
Monday, March 18 • 10:40am

New ANSI Z136.3 - What Has Changed (MP101)

Penny Smalley

Health Care Laser Hazards Relative to Application Risks (MP102)

Richard Gama

Medical PAS Session 2
Monday, March 18 • 2:00pm

Rules of the Road for Driving Lasers Safely (MP201)

June Curley

Legal Aspects of a Laser Safety Program (MP202)

Kay Ball

Medical PAS Session 3
Monday, March 18 • 3:40pm

Facilitating Laser Safety Compliance within the Environment of Care of a Large Health System. (MP301)

Veronica Villalon

Integration of a Laser Safety Program in an Expanding Health Network by a Designated Medical Laser Safety Department (MP302)

Devin Kline

Medical PAS Session 4
Tuesday, March 19 • 9:00am

National and International Laser Plume: Regulations and Initiatives (MP401)

Penny Smalley

Surgical Smoke Evacuation Laws How Can You Get Ahead of the Coming Legislative Efforts? (MP402)

Robert Scroggins

Medical PAS Session 5
Tuesday, March 19 • 10:40am

Update on Laser Ocular Injuries (MP501)

Patricia Owens

Laser Safety on the Move with a Fire Risk Assessment Tool Prior to Laser Use Intraop (MP502)

Barbara Robinson

Airway: Life and Breath (MP503)

Vangie Dennis

Medical PAS Session 6
Tuesday, March 19 • 1:30pm

The Safety Implications of Peri-implant Defect Morphology on Temperature Changes During CO2-Laser Decontamination (MP601)

Georgios Romanos

Viable Pathogen Aerosols Produced during Laser Dermatology Surgery – a Quantified Analysis (MP602)

John Tyrer

Creating a Business Case and Plan for Smoke Evacuation (MP603)

Kay Ball

Third party Laser Asset Management-is it Right for You? (MP604)

June Curley

Medical PAS Session 7
Tuesday, March 19 • 3:00pm

MPAS Panel Discussion

Penny Smalley, Kay Ball, Vangie Dennis, Patricia Owens, and Richard Gama

TECHNICAL PRACTICAL APPLICATIONS SEMINAR (TPAS)

Wednesday & Thursday (March 20 - 21, 2019)

Technical PAS Session 8: Laser Safety for the Generalist

Wednesday, March 20 • 9:00am
Session Chair: Jamie King

Laser Safety Programs: What Works and What Doesn't (TP801)
Jennifer Goodnight

So, You Think You Laser Safety Program Is Going Well: Are You Really Sure? (TP802)
Simon Lappi

Performing a Laser Audit, Eyes on the Table (TP803)
Eddie Ciprazo

For the CLSO: The Written Laser Safety Program (TP804)
Randolph Paura

Technical PAS Session 9: Laser Safety for the Specialist

Wednesday, March 20 • 10:40am
Session Chair: Matt Quinn

Making it Class 1... (TP901)
Thomas Lieb

Controls for Multi-wavelength, Tunable and Continuum Lasers (TP902)
Michael Woods

Laser Safety at a Large Facility (TP903)
Radu-Costin Secareanu

Beyond Class 4, Laser Safety Controls for Very High-Power Lasers (TP904)
Jamie King

Technical PAS Session 10: The Optical Grab Bag

Wednesday, March 20 • 1:30pm
Session Chair: Tom Lieb

Laser Eyewear, As LSO What do I Need to Know? (TP1001)
Josh Hadler

Calculating Laser Eyewear Effective OD and VLT using (TP1002)
Igor Makasyuk

Non-Beam to the Extreme! (TP1003)
Wesley Chase

Incoherent Light Sources, Why Worry? (TP1004)
David Sliney

Technical PAS Session 11: Regulations and the FDA

Wednesday, March 20 • 3:20pm
Session Chair: Eddie Ciprazo

FDA Presentation and Open Forum

Technical PAS Session 12: Laser Safety for the Practitioner

Thursday, March 21 • 9:00am
Session Chair: Judi Reilly

Optical Table Fundamentals and Breadboard Demonstration (TP1202)
Chrysanthos Panayiotou

Laser Power Measurement Made Easy and Accurate for the LSO and the Practitioner Needs (TP1203)
Félicien Legrand

Technical PAS Session 13: Now What?

Thursday, March 21 • 10:40am
Session Chair: Barbara O'Kane

You Just Had a Laser Accident, What Do You Do Now? (TP1301)
Rock Neveau

Human Performance Improvement -- How Does It Benefit Your Laser Incident Investigations (TP1302)
Aaron Potash

Laser Accident Working Group Report (TP1303)
Ken Barat

Networking, Certification, and More (TP1304)
DeWayne Holcomb

Where There's Smoke...

Laser Surgical Masks and Respiratory Protection

By Elizabeth Krivonosov, PEng, CIH, ROH, Paul Bozek, PEng, CIH, ROH
KRMC - Krivonosov Risk Management Consultants, Inc. / University of Toronto, ON, CA

MPAS 2017

Medical Practical Application Seminar

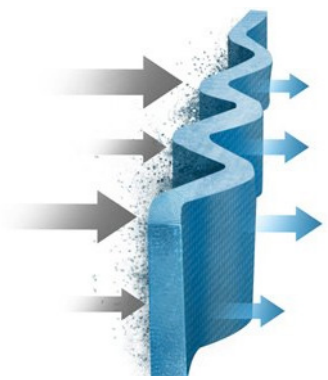
During surgery involving lasers, laser generated air contaminants (LGACs) are produced. According to Occupational Safety and Health Administration (OSHA), more than 500,000 workers are exposed to surgical smoke every year.[1] Studies have shown the surgical smoke (plume) contain hazardous particulates and also viable biological pathogens which are capable of causing adverse health effects.[2]

In a study conducted by the U.S National Institute for Occupational Safety and Health (NIOSH) in 2011 and published in the American Journal of Industrial Medicine, 12,000 Health Care Workers were surveyed. Of the respondents, 53% in laser surgery did not use any means of local exhaust ventilation.[3]

Respiratory protection is essential in the presence of laser-generated air contaminants. The use of a fitted N95 respirator to reduce airborne particulate exposures during laser surgery is recommended by AORN, CDC/NIOSH and OSHA[4].

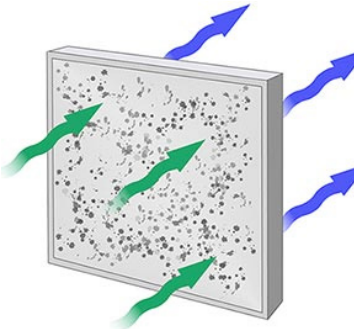
Surgical laser masks (also called laser plume masks) are being promoted in the marketplace. The differences between an N95 respirator and a surgical laser mask are not always clear and the process for certification or validation of the effectiveness of some laser surgical masks may not be as rigorous as NIOSH certification for N95 respirators.

SURGICAL MASKS AS FILTERS

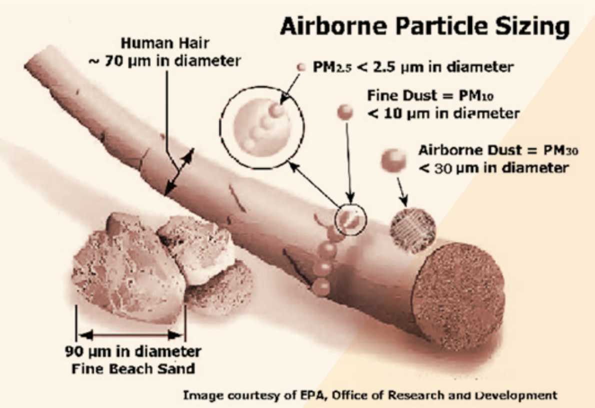


The filters used in modern surgical masks are fibrous and are constructed from flat, nonwoven mats of fine fibers. How well a filter collects particles dependent on:

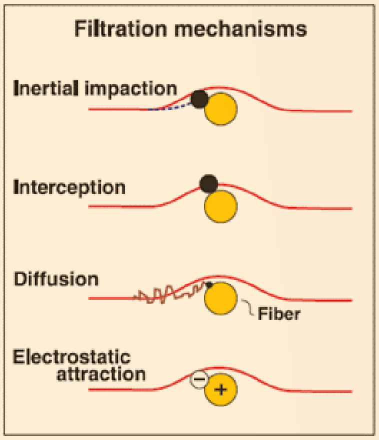
- Filter fiber diameter
- porosity
- filter thickness



It is important to note that filters do not act as sieves. Once a particle comes in contact with a filter fiber it is removed from the airstream by several "capture" mechanisms. Capture of airborne particles is dependent on the size of the particles.



Airborne particles that are very small are sized in microns (or one millionth of a metre, µm). The Environmental Protection Agency (EPA) posted this image comparing the diameters of human hair (~70 µm), fine beach sand (~90 µm) and airbone dust (~30 µm).



For particle with effective diameters greater than 5 µm, inertial impaction and interception mechanisms dominate which aerosols are captured. When passing through a respirator filter, these larger aerosols have significant inertia due to size or mass, and cannot follow the airstream as it changes direction around filter fibres. Particles may also be intercepted if they follow the airstream but simply pass closely to a filter fiber to become intercepted.

For smaller particles less than 5 µm in diameter, the methods of capture include diffusion and electrostatic attraction. Diffusion is a force that affects small particles due to collisions with air molecules to create a random zigzag motion that may force them close enough to a filter fibre to be captured. In electrostatic attraction, electrical charges affixed to particles are attracted to the opposite charges that may be present on the fibers in the mask. For very small particles, manufacturers intentionally introduce static charge on masks to improve collection by this mechanism.

SAMPLE PLUME COMPOSITION

CHEMICAL

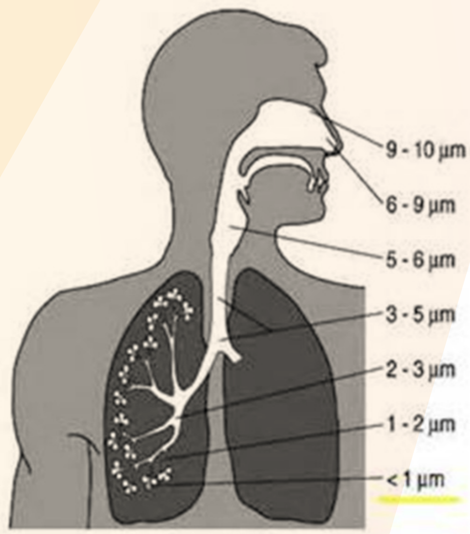
Acetonitrile. Ammonia, Ethylene, Acetylene, Formaldehyde, Acrolein, Hydrogen cyanide, Acrylonitrile, Methane, Alkyl benzene, Phenol, Benzene, Polycyclic aromatic hydrocarbons, Butadiene, Propene, Butane, Pyridine, Butene, Pyrrole, Carbon monoxide, Styrene, Cresol, Toluene, Ethane, Xylene, and Carbon dioxide

BIOLOGICAL

Intact cells, cellular fragments, blood cells or fragments of viral DNA.

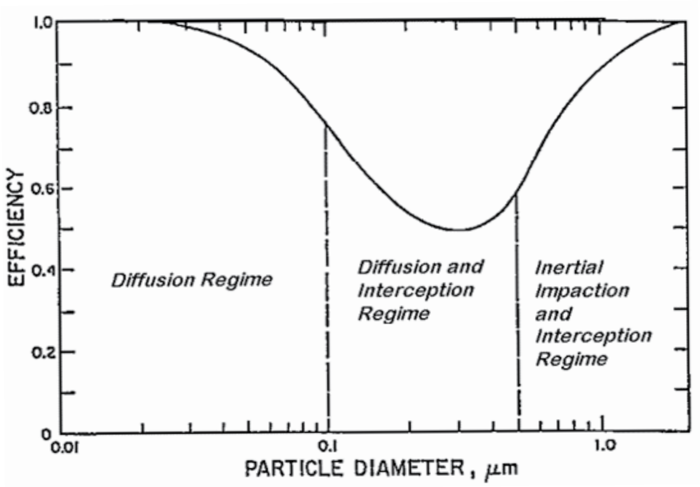
Viable bacteria have been cultured: Bacillus subtilis, Staphylococcus aureus, mycobacteria, Mycobacterium tuberculosis

HOW DOES THIS IMPACT THE HUMAN RESPIRATORY SYSTEM?



Large particles (5-10 µm) will impact on upper respiratory tract (tracheobronchial surface). As the inhaled particle sizes become smaller, deeper penetration occurs all the way down to the alveolar region (1-5 µm particle size range) [5].

MASK EFFICIENCIES:



One of the best accepted test for respirator filter performance involves measuring particle collection at its **most penetrating particle size**. The filter's collection efficiency is normally assumed to be a function of the size of the particles, and not dependent on whether they are bioaerosols or inert particles.

Continued on next page

For important particle sizes deposited in the human respiratory system, 0.3 µm has been historically presumed to be the most penetrating size and thus used in respirator testing. This takes into account the capture mechanisms of impaction, interception and diffusion, but does not consider electrostatic attraction to be significant. When electrostatic attraction is considered, the literature suggests that most penetrating particle size is closer to around 0.08 µm.

The most important factors that influence overall performance of a mask are:

- filter efficiency
- tightness of fit to the user's face

Studies have shown that the filtration efficiency of surgical masks are highly variable depending on the type of mask and the manufacturer[6]. In contrast, respirators are typically designed to pass filter efficiency testing at 0.075 µm and be fit tested to individual users to better ensure that aerosols are significantly reduced during inhalation of contaminated air. [7]

a) N95 DISPOSABLE MASK

An N95 disposable mask is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of small airborne particles. In North America, NIOSH certified N95 respirators must be tested to ensure that the filter material collects at least 95% of the challenge aerosol by mass concentration. The "N" in the designation indicates that the filter media is not resistant to petroleum oils. Oil, if present in the air, can remove the electrostatic charges from the filter media, thereby degrading (reducing) the filter efficiency performance. A proper fit is critical in providing protection to the wearer, and can be validated by fit testing during the selection of a proper size and make/model for each individual user. However, due to imperfect fit during normal day to day use, even a properly fitted N95 mask is assumed to provide a reduction of particles ("protection factor", PF) of 10-fold in terms of airborne concentration [8] .

b) SURGICAL MASKS

Surgical masks are designed to protect the sterile field from mucous generated by the wearer. Exhaled aerosols are attenuated by impact on the inside of the surgical masks, which are not tight fitting to the user's face. These masks are not designed to protect the wearer from the inhalation of airborne contaminants. Approximately 77% of particulate matter in surgical smoke is less than 1 µm in size[9]. The effectiveness of surgical masks for infiltration is limited to particles approximately 5 µm sized and larger. No protection factor is assigned to surgical masks, since NIOSH does not consider surgical masks to be respiratory protection devices [4].

c) LASER SURGICAL MASKS

The filtration efficiency of laser surgical masks is not readily reported in manufacturer's literature. Anecdotally, however, manufacturers advertise that the filter materials used are better than those used in other surgical masks.

PRELIMINARY TESTING OF FILTER EFFECIENCY OF LASER SURGICAL MASKS

In order to study the effectiveness of laser surgical masks, we compared filter efficiencies for respirators to several commercially available laser surgical masks. Filter efficiencies can be expressed as either particle filtration efficiency or particle filtration efficiency[10]. Both are related to the amount of material removed by the filter material compared to that in the air stream passing through the filter. Note that counts per liter were used in our study, and not mass concentrations as is required by NIOSH certification testing.

$$\text{Penetration (\%)} = \frac{T \times 100}{C}$$

$$\text{Particle Filtration Efficiency (\%)} = \frac{C-T}{C} \times 100$$

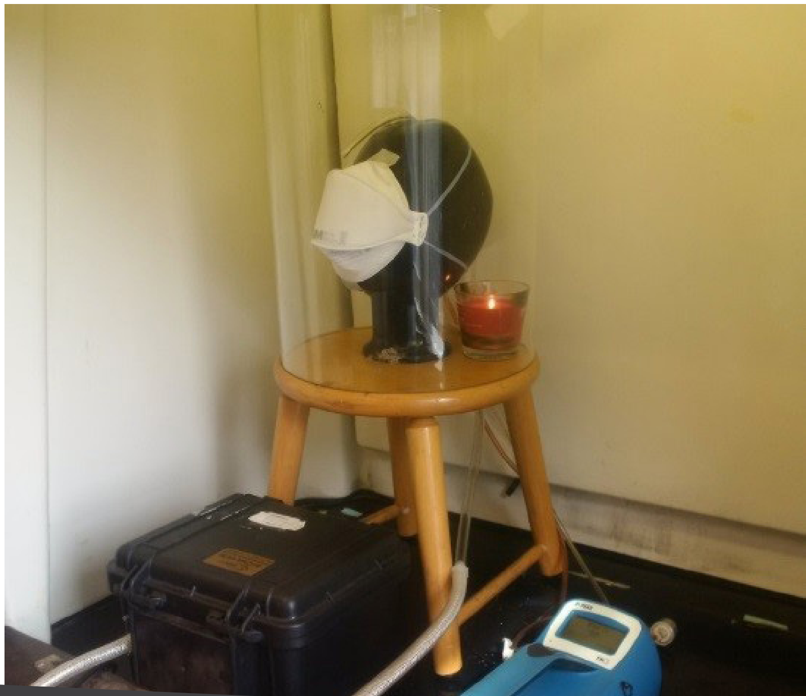
Where;

C = particle count per liter in air outside of mask

T = particle count per liter in air inside of mask

This pilot study was a simulation of laser airborne generated contaminants using smoke from a soy candle as a surrogate for laser aerosols. Fit was not considered in our study, since we used masks that were tightly affixed to a manikin. Manikins have been used in previous studies to evaluate mask field performances and filter efficiencies. [11,12]

Two different particle analyzers were used to quantify the performance of an N95 disposable mask, a P100 non-disposable respirator and three brands of laser surgical masks. The first quantitative measurement used the manikin and a MetOne brand Laser Particle Counter (Grant's Pass, Or, USA). A high volume air sampling pump (30 L/min) was used to draw air through the mouth of manikin while particle concentration was determined in cumulative particle counts per litre of air at each of the instrument's



six channels. With this instrument, the differential particle count reports the airborne particles in six ranges (<0.3 microns, 0.3-0.5 microns, 0.5-0.7 microns, 0.7-1.0 microns, 1.0-2.0 microns, 2.0-5.0 microns). The particle counter was used both inside and outside of the manikin's breathing air to measure both inside and outside of the mask being tested. Particle counts at these two locations were collected sequentially in rapid succession, to measure the aerosols outside of the mask first and then filtered air between the mask and manikin face.

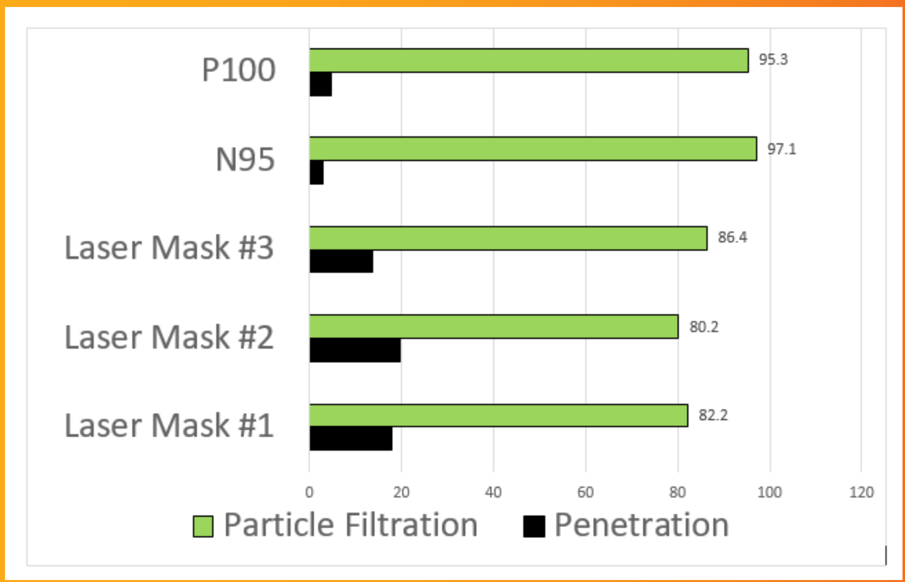
The second type of quantitative measurement used the same experimental setup and a TSI brand P-trak ultrafine particle counter (Shoreview, MN, USA). This instrument can, according to its manufacturer, count all particles between 0.02 to over 1 micron in diameter and reported concentration in unit of particles per cubic centimeter of air.

In both setups, the manikin was covered by a glass bell jar while air at 30 litres of minute was drawn out through the mouth of the manikin. The flow of air has been suggested to mimic the breathing rate of a person under a low physical workload, such as standing or sitting. This is different than the high flow rate (80 litres per minute) used to simulate workers breathing during heavy labour. The replacement air entering the bell jar came from ambient laboratory air that was allowed to enter from below the manikin and pass by the burning soy candle to contaminate it with smoke aerosols.

During the experiments, all disposable masks were tightly sealed (using masking tape) against the manikin. The elastomeric face piece of the P100 non-disposable respirator was not sealed except by normal tightening of the straps to hold the silicone rubber to the manikin's face. The seal used in these experiments meant that results are conservatively high in estimating the actual protection provided by the disposable masks in comparison to normal fit while being worn in surgery.

PRELIMINARY RESULTS:

The preliminary results indicate variability in filter efficiencies of the laser surgical masks tested. None of the laser masks tested had the same effectiveness as an N95 disposable mask or a P100 respirator. In addition, the laser surgical masks were as much as 30% less efficient in filtering smaller particles (< 1 µm) than the P100 respirator. These data suggest that even the tightest fitting laser surgical mask is expected to provide less protection from LGAC's than a certified respirator can provide.



FUTURE WORK IN LGAC FILTER EFFICIENCY EXPERIMENTS

The preliminary study comparing N95 to laser surgical masks indicated differences in filter efficiencies. Further work is planned to study a greater variety of laser surgical masks and compare to regular surgical masks. In addition, the next phase will incorporate laser air generated contaminants using a Class 4 laser rather than the simulated air contaminant generation to be more realistic in terms of the characteristic particles being generated during laser use in surgery. Conditions with varying humidity are also being planned, as recent literature suggests that some types of aerosols have different collection efficiencies at varying humidity, which may be due to a change in effectiveness of electrostatic attraction to filter materials [12] .

MPAS Conference Information:

Co-chair: Vangie Dennis, WellStar Health System, Atlanta, GA

Co-chair: Patti Owens, AestheticMed Consulting International, La Quinta, CA

The Medical Practical Applications Seminar (MPAS) is an essential two-day conference for all professionals working with medical laser devices. This program is designed to meet the various educational needs of the Medical Laser Safety Officer along with that personnel working in operating rooms, surgical centers, aesthetic clinics, veterinary clinics, medical research labs, mobile laser companies, and medi-spas. Cognitive gaps do exist related to national governmental regulations, state statutes, and evidence-based practices regarding what is essential for a facility-based laser safety program. This conference is constructed to bring all attendees the most current safety regulations and practice standards. Register at: www.lia.org/ilsc

Setting up a Laser Lab, Avoid the Pitfalls

Jamie J. King, CLSO
Lawrence Livermore National Laboratory, Livermore, CA, USA

TPAS 2017

Technical Practical Applications Seminar

The design of a laser laboratory is not only critical to its overall functionality, but more importantly to the safety of those who work in and around it. The safe planning of a laboratory is no accident. From conception to commissioning of the laser, safety must be involved in every step of the process.

Each situation presents unique challenges with equally differing solutions. It is up to, and the responsibility of, the Laser Safety Officer (LSO) to ensure that each Laser Controlled Area (LCA) is fashioned in the safest way possible. American National Standards Institute (ANSI) Z136.1-2014 states that the total laser hazard evaluation is influenced by:

1. The laser's capability of injuring personnel or interfering with task performance.

2. The environment in which the laser is used.

3. The personnel who may be exposed to the laser.

The laser part sounds like the simplest problem to solve. This may have been true in the days before ultrashort pulse lasers, OPAs, nonlinear optics, and high-average power lasers, to name a few. Today you may be faced with several of these aspects all at once. The LSO must be part of the design phase very early on to ensure all issues are addressed.

The environment in which the laser will be used is probably the biggest variable to deal with. Being involved in the process early will ensure the crafting of a space that depicts excellence in terms of form, function, and safety. Coming in late can be a disaster, requiring patchwork fixes that look sloppy and may not be safe.

You can minimize the extent of personnel potentially exposed by controlling the design of the laser space. Reducing the potential for exposure to personnel decreases the hazard and downgrades the level of safety training required. This will lessen the overall per annum operational expenses.

In setting up a laser lab, the pitfalls can be a plenty. Without forethought, you won't recognize them until the space is completely built out and you are ready to operate. Any new design or remodel should incorporate the use of a computer-aided design (CAD). With this, you can start to envision the potential problems that might unfold otherwise. Working with the end user, you can discuss the intended operation and process flow. Some of the potential issues you will uncover are:

- Entryway controls – whether defeatable or non-defeatable Safety Interlock System (SIS) you can determine if you might have potential laser beam outside of the LCA.

- Ergonomics – what tasks/operations will be performed frequently? Design the height of the optical table accordingly. Can the worker perform all actions comfortably?

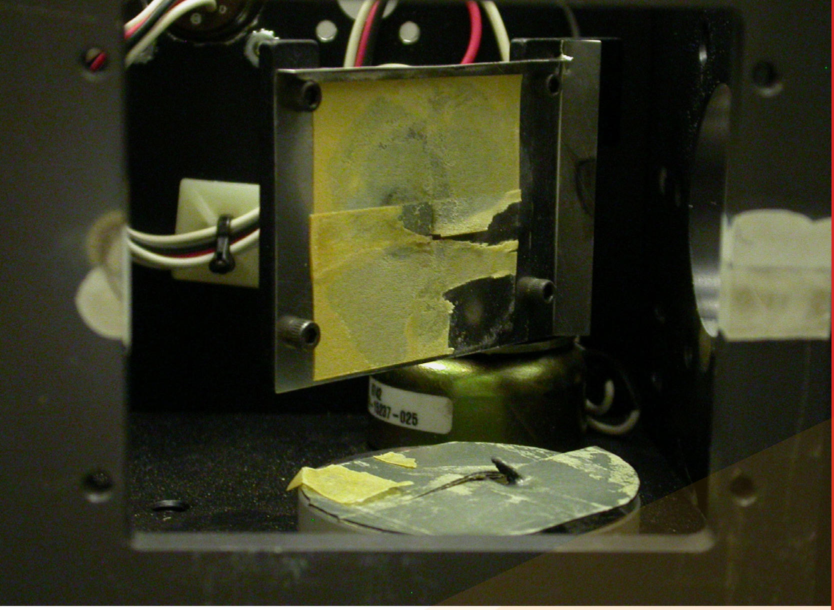
- Utilities – electrical cables, water lines, fire suppression, and ventilation are best thought out and designed early on. Having these engineered in at the beginning prevents patch work fixes after, which surely will create slip/trip/fall issues.

In looking at the layout of the optical tables, you can determine how best to plan the beam path. It is never a good idea to direct a laser beam towards the entryway. If you operate in a seismically active area, you should either brace your tables or locate them such that egress will not be inhibited in the case of an earthquake. As soon as an optical table is installed in the space you should electrically bond it to ground. You never know that will be put on the table in the future. Do not make the mistake of connecting a bonding strap to the bottom of the table unless you ensure there is electrical continuity between the top and bottom plate.

Something to keep in mind in setting up a safe laser operation is that you want to control the hazard as close to the source as possible. Things to look at here are:

- Beam Blocks/Barriers/Enclosures – beam blocks are placed at the end of beam lines or behind optics and are expected to take the power/energy of a full beam. Choice of materials is crucial here in that you don't want to select something that is highly reflective or can't handle the thermal load of the incident beam. Remember that the go-to material of black anodized aluminum is very reflective in the near infrared. Barriers are installed beyond beam blocks, usually around the perimeter of an optical table. They are only meant to see a diffusely scattered beam. Barriers can also be used to block an area, preventing line of site into an LCA. Barrier materials can range from laser curtain material to metal panels or even walls. When installing these types of barriers, one must ensure that physical stature of the worker is considered. This will ensure that the height of the barrier is adequate to protect all outside of the LCA. In more mature and static operations, one can employ an enclosure to take the laser hazard away from the worker. For truly Class 1, the panels must be either interlocked or require a tool for removal.

- Shutters – this is one of the most significant components of a safe operating laser. Limit the open space between source and shutter. Is the shutter in place? This may seem like a ridiculous question, but if your SIS does not have feedback capabilities, how do you know it is even there? Shutters should be "fail-safe," meaning they will close on a failure. Shutters can and do fail internally and may need to be inspected to ensure proper operation. Failures may be broken blades, mirrors, levers, and even drilled holes.



The use of multiple wavelengths creates a nightmare when trying to find adequate laser protective eyewear. Early involvement of the LSO in conjunction with your laser eyewear vendor can help determine what wavelengths can and cannot be blocked. A safe worker is one who can adequately see what they are doing.

What about high intensity/high power lasers? This presents another set of unique challenges altogether. At levels of >1015 W/cm^2, the generation of ionizing radiation is possible. A 25 kW laser beam with a peak irradiance of ~10 kW/cm^2 can cut through simple drywall in a second. With diffuse reflections being the main concern for barriers and enclosures, this may become a real issue. Limited commercially available items rated at these high outputs may necessitate that you become your own tester of materials. In this realm, you are better off just removing the worker from the hazard and go with remote operations.

The result of a well-planned laser laboratory not only promotes pride in the team that will use it, but it fosters safety.

How? The space will be well engineered from the start with safety built-in. There is less reliance on administrative controls, and with the LSO input from the start; the worker sees that their safety is the utmost concern.

TPAS Conference Information:

Co-chair: Eddie Ciprazo, Univ. California Berkely, Berkeley, CA

Co-chair: Jamie King, Lawrence Livermore National Laboratory, Livermore, CA,

The theme for this year's Technical Practical Applications Seminar (TPAS) is "Laser Safety for the 21st Century". Laser Safety Officers (LSOs) dealing with lasers from milliwatts to petawatts will benefit from this unique event. Whether you are working with a budget to make it happen or just to do the best you can, find out how to others are making it work. This is the largest gathering of laser safety experts from academia, industry and government research labs that you will find anywhere in the world.

• Share the ways you have found to make your laser operations safe

• Learn how others are tackling the tough issues

• Present a paper and be recognized by your peers

Whatever your laser safety obstacle may be, rest assured someone has tackled it. So why continue to hit the wall looking for solutions? Come to TPAS 2019 and find answers.

Register at: www.lia.org/ilsc

Laser Eye Dazzle Safety Framework

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ABSTRACT

A safety framework for laser eye dazzle has been constructed to address the urgent need for dazzle advice within international laser safety standards. Simple calculations are presented to permit dazzle effects to be quantified, based upon the new concepts of Dazzle Level (DL), Maximum Dazzle Exposure (MDE) and Nominal Ocular Dazzle Distance (NODD).

INTRODUCTION

Laser eye dazzle is the temporary impairment of human performance caused by light from visible wavelength lasers. It is of growing relevance as thousands of malicious laser dazzle incidents are occurring against aircrew each year, and dazzle is also being used increasingly as a non-lethal option by security forces.

Existing laser safety standards give no universal guidance on dazzle, and therefore a new safety framework is urgently needed to allow the impacts of laser eye dazzle to be understood and quantified. Furthermore, such guidance is needed to inform the protection measures required for those at risk and to assure the safety and effectiveness of laser dazzle devices.

A complete laser eye dazzle safety framework is being produced as a self-contained summary of what laser eye dazzle is, what effects it has on human performance, what the main contributors are to its severity, how to mitigate it, and how to predict its effects with simple calculations [1]. The present paper provides a summary of the calculations from the safety framework together with their methodology. These calculations build upon the authors' previous work [2,3] with more extensive human subject validation [4] and a simplified calculation approach.

DAZZLE LEVEL (DL)

Dazzle Level (DL) describes the size of the dazzle field caused by a laser eye dazzle event. DLs of Very Low, Low, Medium and High, correspond to dazzle field radii of 1, 5, 10 and 20° respectively (see Figure 1).

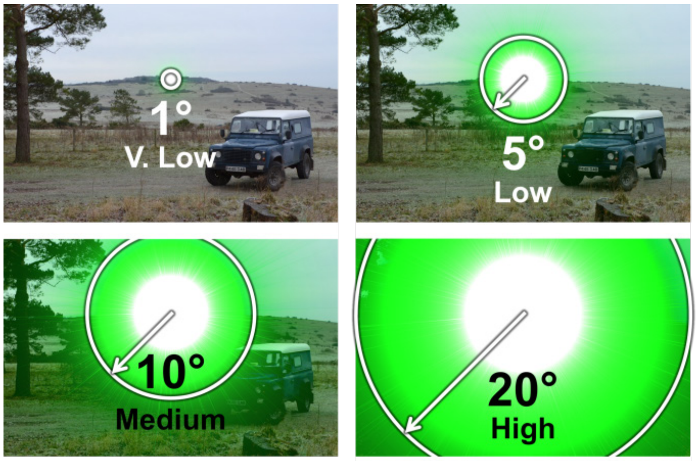

Figure 1 – Illustration of the visual extent of the four Dazzle Levels (image scene horizontal field of view is 40°).

MAXIMUM DAZZLE EXPOSURE (MDE)

Maximum Dazzle Exposure (MDE) is the laser irradiance at the eye above which an object cannot be visually detected. At higher laser irradiances than the MDE, the dazzle field prevents the observer from detecting the object, while at lower irradiances than the MDE the observer is able to detect the object. MDE values given in Table 1 are approximate exposure limits to restrict the dazzle field to the stated DL for night (0.1 $cd \cdot m^{-2}$), dusk (10 $cd \cdot m^{-2}$) and day (1,000 $cd \cdot m^{-2}$) ambient light levels.

All values should be divided by the eye's photopic luminous efficiency, V^{λ} [5], for the laser wavelength being considered (all values of V^{λ} are less than 1, meaning that the MDE values for a given laser wavelength will always be greater than the baseline values shown). 1,000 $\mu W \cdot cm^{-2}$ represents the Maximum Permissible Exposure (MPE) for a 10 second visible wavelength exposure and so this should always be the limiting factor for any safety considerations.

Table 1 – MDE values for the four dazzle levels

at night (0.1 cd·m^{-2}), dusk (10 cd·m^{-2}) and day (1,000 cd·m^{-2}) ambient light levels.

Dazzle level	MDE (μW·cm^{-2}) at			
	Night	Dusk	Day	
Very Low	0.001	0.6	40	÷ V_λ
Low	0.04	30	2,000	÷ V_λ
Medium	0.16	120	8,000	÷ V_λ
High	0.6	450	30,000	÷ V_λ

MDE values provide a useful approximation to give a rapid understanding of the likely impact of given laser irradiances, but they are inherently imprecise and should therefore be used as a framework for safety. The precise dazzle effect varies for different people, different applications, and different visual tasks, with the given numbers having been derived from an average scenario across a range of human subjects [1].

NOMINAL OCULAR DAZZLE DISTANCE (NODD)

Nominal Ocular Dazzle Distance (NODD) is the distance beyond which the irradiance delivered by a laser is below the MDE. At distances closer than the NODD, the MDE is exceeded and an object cannot be visually detected, while at distances further away than the NODD, the irradiance is below the MDE and an object can be successfully detected. The NODD can be calculated from the following equation.

$$\mathrm{NODD} = \sqrt{\frac{4P}{\pi\, d^2\, \mathrm{MDE}}}$$

where P is the laser power (W), d is the laser divergence (mrad), the MDE is in units of W·m^{-2} (= MDE in μW·cm^{-2} ÷ 100) and the resulting NODD is in km. Using the MDE values from Table 1 as exposure limits, the NODD determines the minimum observer-to-laser range to restrict the dazzle field to the stated DL for the given ambient light levels.

CONCLUSION

The MDE values and NODD calculations provide useful guidance for the rapid assessment of dazzle effects. They permit users to quantify the extent of visual obscuration and then specify safe operating ranges to maintain visual abilities. They can also be used to specify appropriate laser eye protection for those at risk of dazzle, and to assure the safety and effectiveness of dazzle devices.

This research was supported by USAF (United States Air Force) and Dstl (Defence Science and Technology Laboratory) funding. DSTL/CP099408.

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For more details, see: C. A. Williamson and L. N. McLin, "Determination of a laser eye dazzle safety framework," *Journal of Laser Applications 30,* 032010 (2018). https://doi.org/10.2351/1.5029384

LSSS Conference Information:

Chair: Karl Schulmeister, Seibersdorf Laboratories, Seibersdorf, Austria

The Laser Safety Scientific Sessions (LSSS) of ILSC® 2019 provide the platform for a truly outstanding assortment of presentations from all fields of laser safety— from bioeffects research to probabilistic risk assessment, from safety management programs to regulations. The 2019 LSSS are particularly strong on product safety standards and the design of safe consumer products, reflecting that laser technology permeates into various types of consumer products, where safety by design is imperative. Attend ILSC 2019 for valuable networking opportunities as well as accessing the expertise of leading experts in national and international standardization and research! Register at www.lia.org/ilsc

UL is a global company supporting safety on many fronts. As part of their many services they help ensure that laser products meet safety standards (FDA/CDRH 21CFR within the U.S. and IEC 60825-1 outside the U.S.) by performing laser testing at their full-service laser labs. LIA interviewed UL, a Diamond Sponsor of ILSC 2019, about where we are with laser product safety and where we're going.

UL is actively involved with TC76 helping to shape laser product safety requirements, can you tell us about TC76?

The TC76 is the IEC Technical Committee for "Optical Radiation Safety and Laser Equipment." The TC is comprised of National Committees and develops consensus based IEC international Standards. Main areas of focus for the TC76 include various subjects from general optical radiation safety to developing / maintaining standards to specifics on non-coherent sources and optical fiber communication systems. The TC76 members typically meet for a week once a year to discuss the current state of optical radiation safety, whether the standards need updating for reasons such as new technologies, and other related matters.

In what ways do you think safety has improved in regards to laser product safety standards?

These days, we know that lasers are used for a variety of applications from additive manufacturing to barcode readers to lidar on the top of automobiles. As technology continues to advance, and laser radiation is becoming more commonly accessible by the general public, it is critical that laser safety is considered to protect the skin and eyes. The laser product safety standards such as IEC 60825-1 and the FDA/CDRH 21 Code of Federal Regulations Part 1040 in the U.S. help to ensure that potential laser hazards from a product are evaluated correctly, and that the products employ the necessary labeling, construction features, and user manual statements to help mitigate laser hazards. These standards result in improved safety for everyone, including the general public who may not even be aware that laser radiation is present around them or emitting from the product they are holding in their hands.

UL certifies products that meet the IEC and FDA laser safety product requirements, in this process do you find that there is a particular area that tends to be overlooked and needs to be addressed before the certification process can continue?

UL does perform certifications to the IEC 60825 series of standards, and we also assist manufacturers in determining compliance with the FDA laser product safety requirements. Often times, a laser product manufacturer will have a great understanding of what they need the laser to do, but may not have a lot of experience with navigating the laser safety regulations. Occasionally, when we first perform a construction review on a product, there are no laser labels, or if there are, the text on the labels is not correct. Other times, the required information in the user manual, such as Caution statements or reproduction of the labels, is not provided. This all is very common, and part of the process is to inform the manufacturer of the requirements so that these issues can be addressed on the path to confirming overall compliance.

What advice would you give to anyone looking to have their laser products certified?

Being an expert, or even having a working knowledge, in these standards is not required to submit a product to UL for certification. However, it helps if manufacturers have a copy of the laser product standard available and a basic idea of how the laser radiation is measured and classified as well as the resulting product requirements. Referring to these standards in the product design phase can help prevent or minimize compliance issues during the certification process. Also, when UL evaluates a product to a laser product standard, we will let the manufacturer know what is noncompliant and reference the applicable clauses in the standard. Being able to refer to the standard supplements the overall evaluation, helping the manufacturer to better understand the rationale for our feedback as well as reducing the time needed for the certification process. Regardless of a manufacturer's experience with laser product certification, we are happy to help guide them through the requirements and certification process.

As a Diamond sponsor, what is UL looking forward to most during the International Laser Safety Conference in March?

UL is looking forward to several aspects of the International Laser Safety Conference in March: first, as an organization that has been dedicated to safety for over 100 years, UL is looking forward to simply providing the overall support for the conference as a sponsor. More specifically, UL is looking forward to participating in the sessions related to laser product safety, learning about new laser related applications, and discussing laser safety with the other experts who will be in attendance.

For more information about UL, visit: www.ul.com

The Very Beginnings of the LIA

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The LIA has always been a national leader in promoting the safe use of lasers; however, many may not realize today that the initial formation was due in large part to concerns about over-regulation of lasers. The original meaning of 'LIA' was the Laser Industry Association; its name was changed to Laser Institute of America in 1971. The leaders of the then-budding laser industry, to provide a unified voice against unwarranted concerns about laser safety, incorporated the LIA in California on 11 January 1968. During 1967 several developments occurred that worried the industry leaders. The 90th US Congress had held hearings regarding radiation hazards from electronic products (x rays from color TV sets; hazardous leakage from microwave ovens, excessive ionizing radiation from dental and medical x-ray machines, and also concerns about lasers).

Those hearings led to the passage of the Radiation Control for Health and Safety Act in 1968. The first large military laser procurement contract (for the Army's XM-23 Artillery Laser Rangefinder) had just been put on hold by the Pentagon – until the Army Systems Analysis Agency could determine that there would not be many laser-induced eye injuries during battlefield use. The Army was so concerned that in 1968 it created a special joint medical research team at Frankford Arsenal (Philadelphia) under the Army Material Command and Army Medical Research and Development Command known as the Joint Laser Safety Team, to study laser biological effects. The American Conference of Governmental Industrial Hygienists (ACGIH) had just issued laser guidance and eary exposure limits (ANSI Z136 had yet to be formed). The State of Illinois had produced a regulation on lasers. With all of these developments the industry was quite concerned that needless governmental regulations might result. The first slate of officers in 1968 were: Arthur Lubin, Korad Lasers (later, V-P of Image Optics) in Santa Monica was elected the first president, Dr. Mason Cox (formerly of American Optical) was President-Elect, Art Johnson – a consultant from L.A. – was Secretary, and Charles Berrington (Westinghouse) was Treasurer.

Bill Schwartz, of Martin-Orlando (later to become the President of International Laser Systems (Orlando) was the 2nd Treasurer (and served as President three decades later). There were a number of Board Members who many would remember today, including Art Schawlow (Stanford U.), Gordon Gould (Polytechnic Institute of Brooklyn), and Bill Bushor (magazine publisher). Individual dues were initially $25.00; corporate dues, $250.00. The LIA Charter listed a dozen aims, but the first was to "assist the establishment of laser health and safety standards," and the 2nd was to "activate and direct procedures to establish adequate legislation…" Other goals included to "organize an annual trade show and an annual laser applications symposium. "Publication of a journal on laser applications," was also listed as a consideration for the future.

The first annual conference of the LIA was held on October 24-26, 1968 at the old Highway-Bridge Marriott Hotel in Arlington, VA (in sight of the Pentagon), which no longer exists after a new Potomac bridge was built. There were over 200 attendees and nearly 20 exhibitors. Both academic and industrial laser research scientists, as well as governmental representatives spoke at the two-day meeting (as I did). Most of the speakers discussed biomedical research studies or laser safety issues. Several of the laser industrial exhibitors and active early participants from industrial start-ups did not survive, eliminated laser work, or were bought out, but all played important roles. These included Carson Laboratories, Hadron, Holobeam, ILC, Image Optics, Litton Industries, Adolf Meller Co., PEK, RCA, TRW Instruments, Korad (a division of Union Carbide), Seed Electronics, and Spacerays.

Annual meetings of the LIA were not so well attended in the following couple of years, but still focused on promoting reasonable laser safety guidelines, exposure limits and regulations as well as promoting laser applications. The first ANSI Z136 Committee on the Safe Use of Lasers met in 1969 after a planning meeting in 1968 under the Chairmanship of George Wilkening and with the Telephone Group as the Secretariat (some years later to pass to the LIA). By 1970 the industry concerns had diminished and the Board, under the 3rd President, Gordon Gould, decided to change the full name to the Laser Institute of America. Gould was followed by Jim Smith (IBM) as the 4th President, and laser safety continued as an important role for the LIA. As Dave Belforte wrote in the previous issue, ICALEO began a few years later.