Understanding Laser Illuminated Projector Safety Regulations

An Informational Webinar

Presented by:

Pete Ludé, Mission Rock Digital LLC
Pete@MissionRockDigital.com
A Word from our sponsor…

About the Laser Illuminated Projector Association

**MISSION:** LIPA will speed the adoption of laser illuminated projectors through cooperative industry activity

- Education
- Regulatory Affairs
- Safety
A Word from our sponsor…

About the Laser Illuminated Projector Association

**GOAL**: Advocate for a positive regulatory environment that will facilitate commercial adoption of laser illuminated projectors.

- Represent the leading projector manufacturers and supply chain companies
  - Projector manufacturers (both laser- and lamp-based)
  - Component manufacturers (laser & micro-displays)
  - Integrators / Installers
  - End Users (Theater-owners, film studios, and theme parks)
LIPA Membership

- Appotronics
- Barco
- Casio
- Christie
- Coretronic
- Epson
- Cinemeccanica
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- Mitsubishi
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Today’s agenda

- About Laser Illuminated Projectors
- Understanding Brightness Measurements
- Regulatory Background
- The new FDA Laser Notice 57
- About “Variances”
- Installation Considerations
- Summary and Q&A
By completing this webinar course, participants can earn the following AVIXA Renewal Units for each designation level:

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Laser Illuminated Projector (LIP) Basics
Lamp based Optical Architecture

- Projector bulb
- Optical diffuser
- Microdisplay (LCoS, DMD, or LCD)
- Projection lens
- Screen
  - Magnification from lens of 100-1000 X

Notes:
- Light must be of uniform intensity
- Light expands from lens to fill large screens

Not drawn to scale.
RGB Laser Projector Optical Architecture

- Laser-like light
- Lamp-like light
- 2D array of red, green and blue lasers
- Microdisplay (LCOS, DMD, or LCD)
- Optical diffuser
- Light combiner
- Projection lens
- Light expands from lens to fill large screens
- Screen (magnification from lens of 100-1000 X)

Not drawn to scale.
Laser-pumped Phosphor Optical Architecture

- Phosphor element and light combiner
- Optical diffuser
- Microdisplay: LCoS, DMD, or LCD
- Projection lens
- 2D array of blue laser diodes
- Screen: magnification from lens of 100-1000 X

Not drawn to scale.
Why Laser *Illuminated*?

A “Laser Projector”  
A “Laser Illuminated Projector”
In normal operation, LIPs are fundamentally as safe as lamp projectors
  • Assuming radiance and beam geometry are equivalent
  • LIPs are designed to emit light nearly identical to a lamp projector

But – “raw”, collimated laser beams can be harmful
  • Since laser sources are inside the projector, care must be taken
  • Particular considerations during maintenance access

Since laser sources are used, special safety regulations apply

Consult your manufacturer for specific safety requirements, and to answer any questions about your particular situation
"How many lumens does a projector need to be before stricter regulations kick in? “
Understanding Brightness measurements

Radiometry

The measurement of light waves in the optical portion of the electromagnetic spectrum (including UV, visible and IR light).

Photometry

A special subset of radiometry weighted for a typical human eye response

Example of typical Radiometer

Example of typical Photometer

Understanding Brightness Measurements

**Radiometry**

The measurement of light waves in the optical portion of the electromagnetic spectrum (including UV, visible and IR light).

**Photometry**

A special subset of radiometry weighted for a typical human eye response.

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**Units of Measure**

- Radiant power (Watts)
- Irradiance (W/m²)
- Radiance (W/m²/steradian)

**Units of Measure**

- Luminous flux (lumens)
- Illumination (lux = lumen/m²)
- Luminance (cd/m² = lumen/m²/steradian)
Understanding Brightness measurements

Luminance Flux

In photometry, luminance flux is a measure of the total quantity of visible light emitted by a source,

Measured in:
The lumen (symbol: lm)
1 lm = 1 cd \cdot sr
1 lux = 1 lumen/m²

For Projectors: "ANSI Lumens"
Defined in IEC 61947-1:2002

Source: https://www.standardpro.com/how-to-measure-light/
Understanding Brightness measurements

Radiance

In radiometry, radiance is the radiant flux emitted, reflected, transmitted or received by a given surface, per unit solid angle per unit projected area.

Measured in:
Watts per steradian per square meter
\((W \cdot sr^{-1} \cdot m^{-2})\)

Source: [http://wtlab.iis.u-tokyo.ac.jp/wataru/lecture/rsgis/rsnote/cp1/cp1-6.htm](http://wtlab.iis.u-tokyo.ac.jp/wataru/lecture/rsgis/rsnote/cp1/cp1-6.htm)
Understanding Brightness measurements

Radiance

In radiometry, radiance is the radiant flux emitted, reflected, transmitted or received by a given surface, per unit solid angle per unit projected area.

Measured in:
Watts per steradian per square meter
\((W \cdot sr^{-1} \cdot m^{-2})\)

The steradian (symbol: sr) or square radian is the SI unit of a solid angle.

Source: Coles Physics II Website
https://sites.google.com/site/colesphysicsiiwebsite/light-and-color
Understanding Brightness measurements

In Summary

- Hazard assessment doesn’t directly relate to Lumens because:
  1) Color spectrum measured
     - “Brightness” is characterized by human-visible wavelengths
     - Safety is evaluated by all wavelengths of light
  2) Geometry of light rays
     - Radiance consider apparent source size
     - Luminance flux does not
Regulatory Background
US Laser Regulations

- Federal Laser Product Performance Standard (FLPPS)
- 21CFR subchapter parts 1040.10 and 1040.11
- Administered by the Center for Devices and Radiological Health (CDRH)
US Laser Regulations

- **ANSI Z136.1 – 2014**
  Safe Use of Lasers

- **Part of a Suite of Standards**
  - ANSI Z136.2 - Fiber Optic
  - ANSI Z136.3 - Healthcare
  - ANSI Z136.4 - Safety Measurements
  - ANSI Z136.5 - Educational Institutions
  - ANSI Z136.6 - Outdoor
  - ANSI Z136.7 - Test/Label Equipment
  - ANSI Z136.8 - R&D/Testing
  - ANSI Z136.9 – Manufacturing

- **Referenced by**
  - CDRH Variances
  - State Regulations
  - OSHA
  - Others

- **US Laser Regulations**
  - Referenced by
    - CDRH Variances
    - State Regulations
    - OSHA
    - Others
US Laser Regulations

- IEC 60825-1:2014
  Safety of laser products
  Part 1: Equipment classification and requirements

- IEC 62471-5:2015
  Photobiological safety of lamps and lamp systems
  Part 5: Image projectors

*Referenced by*
- FDA Regulations
- Worldwide regulators
Laser classifications according to FDA and IEC

*Intended for "raw" (collimated) laser beams*

<table>
<thead>
<tr>
<th>Laser Class</th>
<th>FDA</th>
<th>IEC</th>
<th>Description</th>
<th>Notes</th>
<th>Example Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>1</td>
<td>1M</td>
<td>Considered non-hazardous in normal operation</td>
<td>Hazard increases if viewed with optical aids, including magnifiers, binoculars, or telescopes.</td>
<td>• Laser printers</td>
</tr>
<tr>
<td>II</td>
<td>2</td>
<td>2M</td>
<td>Eye protection normally through aversion response</td>
<td>Hazard increases when viewed directly for long periods of time, or if viewed with optical aids.</td>
<td>• Bar code scanners</td>
</tr>
<tr>
<td>IIa</td>
<td></td>
<td></td>
<td>May be momentarily hazardous when viewed directly or with specular reflection.</td>
<td>Depending on power and beam area. Risk of injury increases when viewed with optical aids.</td>
<td>• Laser Pointers</td>
</tr>
<tr>
<td>IIIa</td>
<td>3R</td>
<td></td>
<td>Immediate skin hazard from direct beam and immediate eye hazard when viewed directly.</td>
<td></td>
<td>• Laser light show projectors</td>
</tr>
<tr>
<td>IIIb</td>
<td>3B</td>
<td></td>
<td>Immediate skin hazard and eye hazard from exposure to either the direct or reflected beam; Potential a fire hazard.</td>
<td>May also produce laser-generated air contaminates and hazardous plasma radiation</td>
<td>• laser light show projectors</td>
</tr>
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</table>
Definitions  (General to laser safety regulations)

- **MPE**  Maximum Permissible Exposure
  - the maximum limit to which a person may be exposed without suffering adverse effects

- **NOHD**  Nominal Ocular Hazard Distance
  - The distance from the projector where the light exceeds the MPE

- **SNHZ**  Skin Nominal Hazard Zone
  - The area where skin burns are possible
Definitions (Used in LIP Regulations)

- **AEL** Accessible Emission Limit
  - maximum accessible emission permitted within a particular risk group

- **HD** Hazard Distance
  - distance from the projector's nearest point of human access, where the beam radiance or irradiance exceeds the applicable exposure limit

- **HZ** Hazard Zone
  - the 3-dimensional space encompassing the region that is considered RG-3 based on the Hazard Distance
The **eye injury** mechanism is identical for laser or lamp projectors

- **Thermal** induced retinal injury model = 0.25s **accidental exposure** through 7mm eye pupil

**Risk** Lamp projector = Risk Laser projector

- For *identical radiance and lens exit pupil geometry*
How are LIPs different than laser beams?

**LIPs have an extended source, not a collimated beam**

A source that emits broadband incoherent radiation represents an extended source, producing a correspondingly large image on the retina.
Projector Safety Regulations

**Risk Factors**

- “Brightness” [lumens]
- Throw Ratio
- Angular subtense $\alpha$ [Rad]
- **Radiance** $L$ [W/m²sr]
  \[ \approx \text{effect on the human eye} \]
Previously, all laser product requirements were defined in IEC 60825-1

- Medical
- Industrial
- Laboratory use
- Laser Welding
- Laser Illuminated Projectors

**IEC 60825-1 Ed 2 (2007)**
Safety of Laser Products
Part 1: Equipment classification & Requirements
But under the latest revision (Edition 3), laser products intended to behave as lamp devices may be carved out...

IEC 60825-1 Ed 3 (2014)
Safety of Laser Products
Part 1: Equipment classification & Requirements

Carve-out for devices with irradiance $< \frac{1\text{MW}\cdot\text{sr}^{-1}\cdot\text{m}^{-2}}{\alpha}$
IEC Laser Regulations

IEC 60825-1 Ed 3 (2014)
Safety of Laser Products
Part 1: Equipment classification & Requirements

Carve-out for devices with irradiance < \( \frac{1\text{MW} \cdot \text{sr}^{-1} \cdot \text{m}^{-2}}{\alpha} \)

IEC 62471 Ed 1 (2006)
Photobiological safety of lamps and lamp systems

…and regulated under Lamp standards

LIPA Webinar: Understanding LIPs Safety Regulations
Slide 34
IEC Laser Regulations

IEC 60825-1 Ed 3 (2014)
Safety of Laser Products
Part 1: Equipment classification & Requirements

IEC 62471-5 Ed 1 (2015)
Photobiological safety of Lamp Systems for Image Projectors

...and this new standard was created specifically for projectors
Evolution of LIP regulations

- The international community TC 76 optical radiation safety experts created a specific classification path for Laser products which are designed to function as conventional lamps.

- Risk from a Lamp projector is the same as from a Laser projector
  - Assuming identical radiance and lens exit pupil geometry

- SOLUTION: Dual classification
  - Laser based Class and
  - Lamp based Risk Group
  - Example: “Class 1 – Risk Group (RG) 3”
Why was IEC 62471-5:2015 created?

- **Lower classification power to consider**, new ICNIRP limits
- **Clear line what is considered safe** for consumer use or not
- **Guidance in what separation height** to maintain for RG 3 Projectors:
  - **Cinema**: Hazard Zone to be 2m above floor
  - **Non Cinema**: Hazard Zone to be 3m above floor
- **Clear labels and user information** instructions generic for projectors
Evolution of LIP regulations

Example: “Class 1 – Risk Group (RG) 3”

IEC 60825-1:2014
section 4.4

Embedded lasers inside enclosure may be Class 3B or 4
But enclosure is protected by light-stops and interlock switches
So product is rated as Class 1 Laser Product

IEC 62471-5: 2015
Photobiological safety of Lamp Systems for Image Projectors

Emission evaluated under
RISK GROUP | Safety Implication
--- | ---
Risk Group 0 | Inherently safe
Risk Group 1 | Safe, for intended use
Risk Group 2 | Safe, based on aversion response (eye blink)
Risk Group 3 | Potential hazardous for eye and skin exposure at close distance
Regulations define “exit pupil”

Irradiance distribution of the image of the exit pupil (taken as the apparent source).

Figure 1 – Exit pupil in projector

From IEC 62471-5: Photobiological safety of lamps and lamp systems – Part 5: Image projectors

LIPA Report: Risk Analysis Data Base and Case Study, Karl Schulmeister, PhD
Apparent Source Size

*Used in the calculation of Radiance (and therefore Risk Group)*

From IEC 62471-5: Photobiological safety of lamps and lamp systems – Part 5: Image projectors
Risk Group Classifications

**RG 3 – Potentially hazardous** at close distance

Professional Use Projectors – with FDA Variance

IEC 62471-5:2015 requires:
- Sold only to professionals. Warning labels
- No access to beam within hazard distance
- Use & installation requirements, Soft start

**RG 2 - Safe based on aversion response** (blink reflex)

Home/office use projectors

IEC 62471-5:2015 requires:
- Caution labels, Soft start, User information and instruction

**RG 0/1 - Inherently Safe**

Pico Projectors

IEC 62471-5:2015 requires:
- User information

For throw ratio 2.0

- 0 lm
- < Several Hundred lm
- < Over 10Klm depends on exit pupil
- < 1MWm$^{-2}sr^{-1}/\alpha$
Introducing: Laser Notice 57!
Timeline for Regulatory Reform

- 2006: LIPA Founded
- 2008: FDA Laser Notice 50
- 2009: First Laser Light Show Variance for LIP
- 2010: LIP Development
- 2011: LIP Prototypes
- 2012: LIP Commercial Deployment
- 2013: LIP exceed lamp
- 2014: IEC 60825-1 Ed 2
- 2016: New LN 57
- 2017: LIPA Webinar: Understanding LIPs Safety Regulations
- 2018: IEC 62471-5:2015 (Ed 1)
Classification and Requirements for Laser Illuminated Projectors (LIPs) (Laser Notice No. 57)

Guidance for Industry and Food and Drug Administration Staff

The draft of this document was issued on October 2, 2017.

This document supersedes Immediately in Effect Guidance Document: Classification and Requirements for Laser Illuminated Projectors (LIPs), dated February 18, 2015.

For questions about this document, contact the Division of Radiological Health at (301) 796-2121 or Patrick Hutz at (301) 796-6927 or via email at Patrick.Hutz@fda.hhs.gov.
US Standards (finally!) harmonize with IEC Risk Groups!

Applies to:

- Laser Illuminated Projectors (LIPs)
  - A type of Demonstration Laser Product*
  - That comply with IEC Standards during laser product classification
  - Not a children’s toy laser product or medical device
- Designed to display an image without use of raster-scanned collimated laser beams

*Demonstration Laser Product: “Any laser product manufactured, designed, intended, or promoted for purposes of demonstration, entertainment, advertising display or artistic composition.”

- 21 CFR 1040.10(b)(13)
Summary of LN 57 Guidance

Classify Projector according to IEC 62471-5:2015

Assign RG

AEL - Accessible Emission Limit
RG - Risk Group
Summary of LN 57 Guidance

Classify Projector according to IEC 62471-5:2015

Assign RG

RG 0, 1 or 2

Appropriate Safety Labels, Manuals and Reports

The dual-classification system is used – for example: “Class 1, RG 2”

AEL - Accessible Emission Limit
RG - Risk Group
Summary of LN 57 Guidance

Classify Projector according to IEC 62471-5:2015

Assign RG

RG 0, 1 or 2

>60% RG 2 AEL?

NO

Appropriate Safety Labels, Manuals and Reports

AEL - Accessible Emission Limit
RG - Risk Group
**Summary of LN 57 Guidance**

Classify Projector according to IEC 62471-5:2015

Assign RG

RG 0, 1 or 2

>60% RG 2 AEL?

NO

Appropriate Safety Labels, Manuals and Reports

YES

Additional Child Safety Labels

----

**AEL** - Accessible Emission Limit

**RG** - Risk Group

**WARNING**

Mount Above the Heads of Children
Summary of LN 57 Guidance

Classify Projector according to IEC 62471-5:2015

Assign RG

RG 0, 1 or 2

>60% RG 2 AEL?

NO

Additional Child Safety Labels

YES

Obtain FDA Variance

Follow Variance Stipulations

Appropriate Safety Labels, Manuals and Reports

AEL - Accessible Emission Limit
RG - Risk Group
As explained by Laser Notice 57…

“CDRH considers LIPS that are in RG3 to be… equivalent to Laser Classes IIIb or IV (IEC Class 3B or 4)”

“When… laser products are Class IIIb or IV, a variance approval by FDA is required… that permits the laser product to exceed the… limit”
First, a brief history...
“It was the coolest show I've ever seen! Unbelievable. They had those glitter balls you'd see later in discos hung all over the place and they'd shoot a laser into one in the center which was spinning and the laser would ricochet to the other balls that were spinning and you felt like you were in a war zone. They seemed to be coming from all directions. They had rings with lasers, guns with lasers and those strobe light laser guns!”
U.S. Pulling Plug On Laser Shows

By DON KIRKMAN
Scripps-Howard Science Writer
WASHINGTON — The U.S. Food and Drug Administration is cracking down on rock groups and art shows that are using powerful laser beams to stage colorful light shows that may be dangerous to the eyes of those watching and participating.

Concern over the danger has risen sharply as an increasing number of rock groups and art shows have turned to bouncing laser light off mirrors, ceilings and imaginative bracelets worn by rock musicians.

According to the FDA's Bureau of Radiological Health, there is fear some people may suffer serious eye damage, or even be blinded.

The bureau doesn't know exactly how dangerous the shows are, but is concerned that someone catching a beam in the exact center of the eye could be permanently blinded and persons hit in other areas of the eye could suffer irreversible vision damage.

To prevent such injuries, the FDA has instituted a nationwide program to check the strength of the lasers used in the light shows, agency director Dr. Norman C. Telles said.

One rock group, "The Blue Oyster Cult," has been prohibited from using an overly strong laser during the past couple of months, Telles said.

The FDA said it's particularly concerned about rock groups' use of bracelets that spray laser light in all directions. The bracelets are connected to a laser which produces exotic colors that usually are directed toward the ceiling.

However, sometimes the laser light is splashed over the audience and may be hitting the performers in the eyes, Telles warned.

Similarly, the FDA is worried about the use of many-prismed mirrors that rotate above audiences and splash reflected laser light in all directions.

Not as dangerous are the laser art shows which forbid viewers to look directly into a laser beam, Telles said. However, people should be aware that these shows are a hazard, he added.

The best advice we can give, Telles said, "is never look directly at a laser. And if you're going to attend a rock show that's using lasers, be aware of the danger.

Additionally, Telles said the bureau has asked eye doctors to be on the lookout for laser-caused eye damage cases and report them to the FDA.
Original Laser Light Show Variance

• Requirements, circa 1978 (Partial list)
  – File specifications on laser equipment prior to use
  – Prior Reporting of every show
  – Annual Reporting of prior shows
  – Safety Checks before every show
  – Regular Variance Renewal, extensive paperwork and logging
  – Subject to Federal Show Inspection, each set-up
  – 3 to 6 meters minimum vertical separation distance
FDA began issuing Laser Light Show Variances for Laser Illuminated Projectors in **December 2010**
FDA Laser Light Show Variance Application
Variance Conditions

Temporary Installation
- Rental and Staging
- Trade Shows

Permanent Installation
- Non-cinema
  - Presentation rooms
  - House of Worship
- Cinema
  - Movie theater
  - Premium Large Format
Example of Variance Application…

13. EXPLAIN THE ALTERNATE MEANS OF RADIATION PROTECTION TO BE PROVIDED. (Check as many boxes as apply. In item 14 "Remarks," justify any boxes not checked, using additional sheets as necessary. State any other means of radiation protection that will be used.)

a. ☒ All laser products, systems, shows, and projectors will be certified to comply with 21 CFR 1040.10 and the conditions of this variance and will be reported as required by 21 CFR 1002.10 AND 1002.11 using the reporting guides provided for such purpose. These actions will be accomplished prior to any introduction into commerce.

b. ☒ Effects not specifically indicated in this variance application will not be performed. No other effects will be added until an amendment to the variance has been obtained and the required reports or supplements, as applicable, have been submitted.

c. ☒ Scanning, projection, or reflection of laser and collateral radiation (Light show radiation) into audience or other accessible uncontrolled areas will not be permitted except for diffuse reflections produced by the atmosphere, added atmospheric scattering media, and target screens.

d. ☒ The levels in excess of the limits of Class I will not be permitted at any point less than 3.0 meters above any surface upon which operators, performers, or employees are permitted to stand or 2.5 meters below in lateral separation from any place operators are permitted to be. Operators, performers, and employees will not be required or allowed to view radiation above the limits exposed to radiation above the limits specified in 21 CFR 1040.11(c).

e. ☒ Any product which relies on scanning to meet access, exposure, or product class limits will incorporate a scanning safeguard system which directly senses scanner motion and which will react fast enough to preclude exceeding the applicable limit.

f. ☐ All laser light shows shall be under the direct and personal control of trained, competent operator(s). The operator(s) will:

   (1) Be an employee of the variance holder who will be responsible for the training and the conduct of the operator;
   (2) Be located where all beam paths can be directly observed at all times; and
   (3) Immediately terminate the emission of light show radiation in the event of any unsafe condition; or, for outdoor shows, upon request by any air traffic control officials.

g. ☒ The maximum laser projector output power will not exceed the level required to obtain the intended effects.
8. All laser light shows shall be under the direct and personal control of a trained, competent operator(s). The operator(s) shall:

(a) be an employee of the variance holder who shall be responsible for the training and conduct of the operator; and
(b) be located where all propagating beam paths, their terminations, and the audience can be directly observed at all times; and
(c) be in communication with personnel assisting in surveillance of the laser display; and
(d) immediately terminate (or designate the termination) of the emission of light show radiation in the event of any unsafe condition and, for open air shows, at the request of any air traffic control officials; and
(e) ensure one or more readily accessible controls are provided to immediately terminate laser radiation.
Variance requirements: Temporary Installs

- Temporary Show Installations containing RG3 LIPS
  - May be installed by LIP (Branded) Manufacturer
  - Or may be sold or leased to valid laser show FDA Variance holders
  - Also applies to Dealers and Distributors

- Examples of Appropriate Operational Practice:
  - Locate projectors so that all beam paths within Hazard Zone, and the audience, can be observed at all times
  - Maintain communications with personnel observing operations
  - Terminate projection immediately upon any unsafe condition
  - Provide readily accessible controls for termination
Variance requirements: Fixed Installs

- Permanent Installations
  - Typical Variance specifies the Hazard zone not lower than:
    - 3m for non-cinema
    - 2m for cinema
  - Horizontal clearance to Hazard Zone should be 2.5m
  - Any human access to Hazard Zone restricted by barriers
  - Installation by trained and authorized installers

Always check with your manufacturer or variance-holder. FDA variances may differ!
FDA Variance Exception

- **RG 3 LIPS** that *prevent human access* to the Hazard Zone by use of **engineering controls** will not require a Variance application

  - Sensors which detect the location of the human body or objects within hazardous areas

  - Output power is reduced automatically when personnel or reflective objects are detected entering the Hazard Zone (HZ)
Installation Considerations & Requirements
Hazard distance RG2 to RG3

- For RG3 products, the HD is determined under *maximum emission power* at each throw ratio.

- For interchangeable lenses, the *maximum foreseeable HD* should be provided.
Hazard zone

- The region of space where the projection light is **greater than Emission Limits for RG2**.
- The **Hazard Distance** is defined* as collinear to the optical projection axis.
- Therefore the Hazard Distance alone does not sufficiently describe a 3-dimensional **Hazard Zone**.
- The Hazard Zone encompasses the entire region of space that is considered RG3.

*Defined in IEC 62471-5:Ed 1
Responsibilities of Cinema Owners

PREVIOUS SITUATION

- Implement local government safety regulation
  - Laser light show variance
  - Event safety regulation
- Requirements based on exposure limits
  - LIP operator
    - Training requirements
    - Projection booth requirements (restricted area, protective barriers)
    - Risk based implementation
  - Cinema visitor (general public)
    - No exposure above safety limits is allowed in any case!
    - Physical barrier or sufficient separation height
Responsibilities of Cinema Owners

TYPICAL VARIANCE REQUIREMENTS (for Class 1 / RG 3)

- Cinema theaters do not need a variance approval
  - Because LIP Manufacturer has variance requiring them to provide adequate instruction
- Projector installed under restricted access location conditions
- Provide basic operator training
- Access to projector must be restricted by key or pass code lock
- Appropriate signage
- Installation test report to be provided to the theater manager
- No dedicated Laser Safety Operator required
  - Falls under general safety management
- Not retroactive except for any retrofit
Servicing

- While servicing, Class 4 (collimated) laser sources could be exposed.
- Training required!
- Only qualified / certified personnel
- Safety features
  - Safety interlocks
  - Beamstop mechanism
  - Fibreoptic interlocks
- Labeling and signage required
Summary and Q&A
Summary

- LIPs present hazard similar to lamp projectors
  - Very unlike raw laser beams
- However, due to embedded laser, laser regulations apply
- US is now (nearly) harmonized to worldwide IEC standard
- Most high-power LIPs are RG3, and therefore require variance
- Variances are specific to a manufacturer & model family!
  - Work closely with your supplier to understand the specific requirements
- Review safety instructions / Hazard Zone constraints carefully
- Special care / training required for servicing LIPs
Join us!

www.LIPAinfo.org

- Newsletters
- Events
- Meetings
- Discounts
Time for Questions
Understanding
Laser Illuminated Projector
Safety Regulations

An Informational Webinar

Presented by:

Pete Ludé, Mission Rock Digital LLC
Pete@MissionRockDigital.com

October 17, 2019