



Laser Hazard Discussion

February 2016

A decorative graphic element in the bottom right corner of the slide, consisting of a dark blue background with a grid of glowing blue lines and a purple horizontal bar at the top.

Relevant Standards: IEC

- ◆ IEC 60825-1 Edition 3.0, May 2014
 - Latest version of the overall standard
 - Eliminates Class 1M for point sources
- ◆ IEC 60825-1 Edition 2.0, March 2007
 - This has been superseded by Edition 3.0
- ◆ IEC 60825-2 Edition 3.3, December 2010
 - IEC 60825-1 defers to this standard for fiber optic systems
 - This standard defines Class 1M for point sources
- ◆ IEC 60825-13 Edition 2.0, October 2011
 - Gives detailed explanation on how to calculate the laser hazard limits for a linear array of lasers

◆ US 21CFR1040.10

- US law governing lasers, has very old and very conservative laser hazard classification scheme

◆ FDA Laser Notice #50, June 24, 2007

- Accepts IEC 60825-1 in lieu of 21CFR1040.10 for laser hazard classification ... but so far only recognizes Edition 2.0 or earlier of IEC 60258-1
- No indication when the FDA will recognize Edition 3.0 of IEC 60825-1

Key Concept: Point source vs. Extended source

- ◆ **Point source** (“small source” in IEC 60825-1 terminology) vs.
- ◆ **Extended source**
- ◆ A **point source** can be focused onto a single retinal cell in the eye. Maximum possible damage to the retina can occur with a point source.
- ◆ An **extended source** *cannot* be focused onto a single retinal cell, but instead has its power distributed over several cells. The damage that can be induced in any one cell is thereby reduced.

IEC 60825-2 Laser Hazard Categories (850 nm light)

◆ Hazard level 1

- Least hazardous, least restrictive, laser power measured through 7 mm diameter aperture 70 mm from source
- Simulates 7X eye loupe

◆ Hazard level 1M

- Simulates unaided visual inspection, laser power measured through 7 mm diameter aperture 100 mm from the source
- For point sources, allows 3 dB more optical power

◆ Hazard level 3R

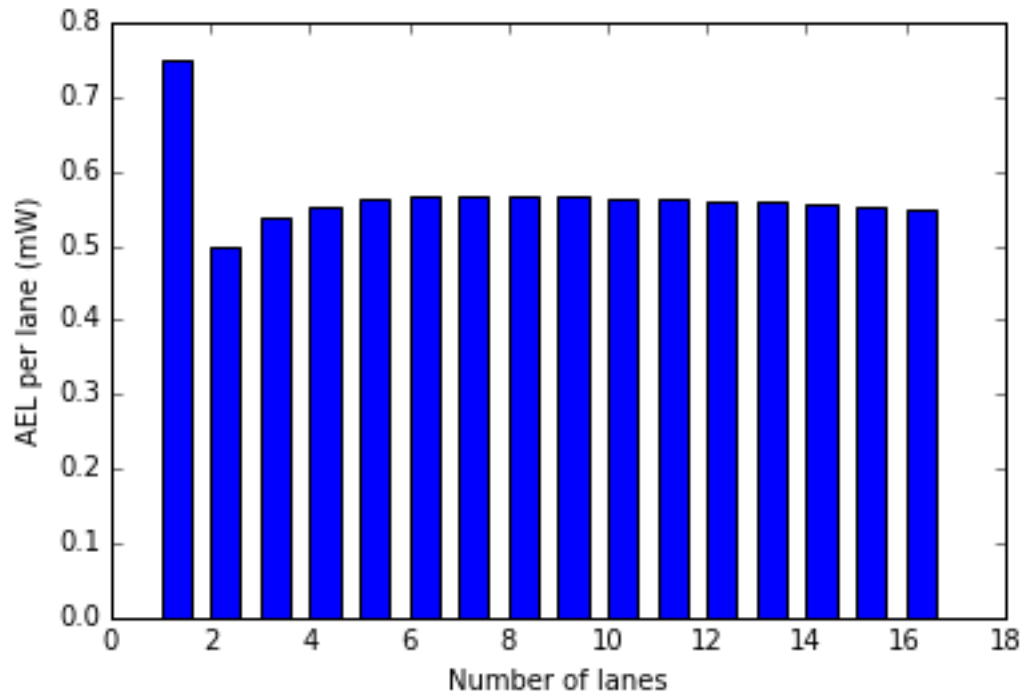
- Not permitted in “unrestricted” locations
- Customers will reject restrictions associated with this class

◆ Hazard level 3B

◆ Hazard level 4

What is the risk of 16 lanes vs. 4 lanes vs. 2 lanes?

- ◆ Assume 840 nm laser light
- ◆ Assume normal optics (no GRIN lenses to collimate the light)
- ◆ AEL = power through 7 mm diameter aperture at 100 mm



- ◆ The most restrictive test for laser hazard classification is normally to have two adjacent lanes turned ON, all remaining lanes turned OFF.
- ◆ Recommended 400GBASE-SR16 should have hazard level 1M.