

# Laser Eye Safety Regulatory Requirements

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# Laser hazard regulations

- US 21cfr1040.10
  - Laser Notice #50
- IEC 60825-1 (general laser requirements)
  - Edition 1 Amendment 2 2001
  - Edition 2 2007
  - Edition 3 2014
- IEC 60825-2 (fiber optic systems)
  - Edition 3.2 2010
  - Edition 4 ?

# Test configurations

- Test consists of optical power captured through a circular aperture of defined diameter placed a specified distance from the focus of the laser beam(s).
- Typical aperture diameters:
  - 7 mm (simulates pupil of eye, dark-adapted)
  - 3.5 mm (simulates pupil, broad daylight)
- Typical test distances:
  - 200 mm (21cfr1040.10)
  - 100 mm (unaided normal viewing)
  - 70 mm, 28 mm, 14 mm (viewing optics, varying magnifications)



# Recent and proposed changes

- IEC 60825-1:2014 eliminates Class 1M for diverging beams
- IEC 60825-1:2014 makes Class 1 the same as previous Class 1M
- Retina hazard limits for 1310 nm have been massively relaxed
  
- IEC 60825-2 Edition 4 makes consistent viewing conditions across wavelengths
- IEC 60825-2 Edition 4 makes Class 1 for VCSEL-based devices much more restrictive

# Component vs. system distinction

- Laser transceivers are “components”
- IEC 60825-1 regulates components
  
- Plug in a fiber optic cable, and this becomes a “system”
- IEC 60825-2 regulates fiber optic systems
- IEC 60825-2 generally has different classification tests
  
- IEC 60825-1:2014 has no Class 1M, new Class 1 is same as previous Class 1M
- IEC 60825-2:2010 defines Class 1M



# Proposed wording FC-PI-7 safety

- Previous text:

The optical output shall not exceed Class 1 maximum permissible exposure limits under any condition of operation, per IEC 60825-1 (reference [x]) and IEC 60825-2 (reference [y]).

- Proposed text:

The optical output of the laser transceiver shall not exceed Class 1 maximum permissible exposure limits under any condition of operation per IEC 60825-1 (reference [x]), and the optical output for the fiber optic system shall not exceed Class 1M maximum permissible exposure limits under any condition of operation per IEC 60825-2 (reference [y]).