Laser Classification and Laser Safety Eyewear Selection

Laser Classification

Laser Classifications referenced from ANSI Z136.1.; 2014. Safety precautions in addition to this information can be found in the Laser Safety Manual "3. Laser Classification".

Class 1

- Considered to be incapable of producing damaging radiation levels during operation
- No Safety measure required and no damage to human eyes and skin
- Previously as Class 2A under the Federal Laser Product Performance Standard (FLPPS)
- Incorporated into consumer or office machine equipment – class 1 product
- Visible and invisible

Class 1M

- Considered to be incapable of producing damaging radiation levels during normal operation unless the beam is viewed with an optical instrument such as an eye-loupe (diverging beam) or a telescope (collimated beam)
- Exempt from any control measures other than to prevent potentially hazardous optically aided viewing and is exempted from other forms of surveillance
- Visible and invisible

Class 2

- Safe for accidental viewing
- Produce radiation that could cause eye damage after direct, long term exposure
- Hazardous only if viewer overcomes natural aversion response such as longer than 0.25 seconds
- Visible
- Maximum Continuous Wave (CW) limit is 1 milliwatt (mW)

Class 2M

- Safe for accidental viewing
- Produce radiation that could cause eye damage after direct, long term exposure
- Hazardous only if viewer overcomes natural aversion response such as longer than 0.25 seconds
- Highly divergent or large diameter beam
- Optically aided viewing exceeds Class 2 but lower than Class 3B
- Visible

Class 3R (formerly 3A)

- Operates between 1 mW and 5 mW if visible or up to 5 times Class 1 in infrared (IR) and Ultraviolet (UV) spectra region
- "R" stands for Reduced Requirements
- Replaces Class 3A from older standards
- Potentially hazardous under direct and specular reflection viewing conditions, but is normally not a diffuse reflection or fire hazards

Class 3B

- Produce radiation powerful enough to injure human eye tissue with 1 short exposure to the direct beam or exposure to its direct reflections off a shiny surface (specular reflection)
- Does not produce hazardous diffuse reflections under normal use
- Not usually capable of causing serious skin injury
- Operate between 5 mW and 500 mW

Class 4

- Operates above 500 mW
- Is hazard to the eye or skin from the direct beam and may also pose a diffuse reflection or fire hazard
- May also produce laser generated air contaminants (LGAC) and hazards plasma radiation

Laser Safety Eyewear Selection

Laser safety eyewear selections referenced from Lawerence Berkeley National Laboratory (LBNL) Laser Reference Guide (2011)

Laser safety eyewear is one of the most important items for laser safety. The following information is needed to select the appropriate laser safety eyewear. Contact the Radiation Safety Officer (or Laser Safety Officer) if more information is needed.

- Wavelength(s)
- Mode of operation (continuous wave or pulsed)
- Maximum exposure duration (assume worst case scenario)
- Maximum irradiance (W/cm2) or radiant exposure (J/cm2)
- Maximum permissible exposure (MPE)
- Optical density (OD)