Old System of Laser Classification

The safety classes in the "old system" of classification were established in the United States through consensus standards (ANSI Z136.1) and Federal and State of Florida regulations. The international classification described in consensus standards such as IEC 825 (later IEC 60825) was based on the same concepts but presented with designations slightly different from the US classification. This classification system is only slightly altered from the original system developed in the early 1970s. It is still used by US laser product safety regulations. The laser powers mentioned are typical values. Classification is also dependent on the wavelength and on whether the laser is pulsed or continuous. For laser classes 1 to 4, see Laser Classes in Laser Safety.

Class I

Any laser meeting the standards as defined in 64E-4.002(10), FAC and 64E-4.002(11), FAC; a laser that poses no threat of biological damage. This can be either because of a low output power (in which case eye damage is impossible even after hours of exposure), or due to an enclosure preventing user access to the laser beam during normal operation, such as in CD players or laser printers.

Class II

Any laser meeting the standards as defined in 64E-4.002(12), FAC. A low power visible light laser or laser system which can emit radiant power exceeding Class I for the maximum duration inherent in the design or intended use of the laser, but not exceeding 1 mW or, in the case of repetitively pulsed laser, not exceeding a Class I accessible emission limit for a 0.25 second exposure limit. This class includes only lasers that emit visible light. Some laser pointers are in this category.

Class IIa

A region in the low-power end of Class II where the laser requires in excess of 1000 seconds of continuous viewing to produce a burn to the retina. Commercial laser scanners are in this subclass.

Class IIIa

Any laser meeting the standards as defined in 64E-4.002(13), FAC. A medium power laser or laser system which has an output power between one and five times the Class I accessible emission limits for wavelengths less than 0.4 micrometers or greater than 0.7 micrometers, or the Class II accessible emission levels for wavelengths greater than 0.4 micrometers and less than 0.7 micrometers. Lasers in this class are mostly dangerous in combination with optical instruments which change the beam diameter or power density, though even without optical instrument enhancement direct contact with the eye for over two minutes may cause serious damage to the retina. Output power does not exceed 5 mW. Beam power density may not exceed 2.5 mW/square cm. Many laser sights for firearms and laser pointers are in this category.

Class IIIb

A medium power laser or laser systems which has an output power greater than that defined for Class IIIa, but having less than 0.5 W for all continuous wave laser types for periods greater than or equal to 0.25 seconds or having levels less than 10 J/cm-2 for exposures less than 0.25 seconds. Lasers in this class may cause damage if the beam enters the eye directly. This generally applies to lasers powered from 5–500 mW. Lasers in this category can cause permanent eye damage with exposures of 1/100th of a second or less depending on the strength of the laser. A diffuse reflection is generally not hazardous but specular reflections can be just as dangerous as direct exposures. Protective eyewear is recommended when direct beam viewing of Class IIIb lasers may occur. Lasers at the high power end of

this class may also present a fire hazard and can lightly burn skin. A few "laser pointers" at 300 mW visible green output are now available in this category.

Class IV

Any laser meeting the standards as defined in 64E-4.002(14), FAC. A high powered laser or laser system that requires control measures to prevent exposure to the eye and skin from the direct and reflected beam. Lasers in this class have output powers of more than 500 mW in the beam and may cause severe, permanent damage to eye or skin without being magnified by optics of eye or instrumentation. Diffuse reflections of the laser beam can be hazardous to skin or eye within the Nominal Hazard Zone. Most industrial, scientific, military, and medical lasers are in this category.