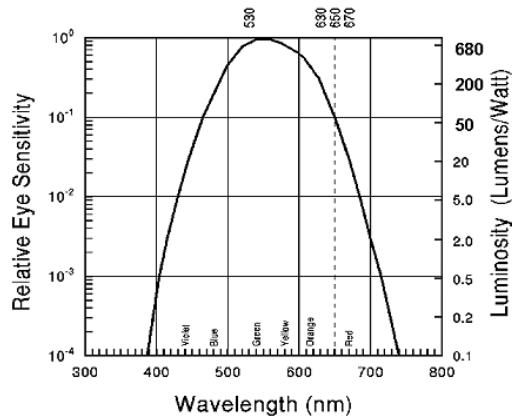




Laser Pointer Safety Factsheet

Laser pointers have received a great deal of attention in the news media when they have been misused and they continue to raise safety concerns regarding the optical hazards involved when using one. **However, they are very safe when used for their intended purpose which is often as an aid in oral presentations and similar applications.**

Laser pointers have historically employed laser diodes as the source of the light. The initial *red-beam diode laser pointers* produced beams at a wavelength of about 690 nm. Subsequently, diode lasers were developed that produced red to reddish-orange light at progressively lower wavelengths (670, 650, and now 640 nm), mostly because the human eye senses 640 nm light to be about five times brighter than 690 nm light for the same laser output power (see the eye sensitivity vs. light wavelength graph below). Today the most common laser pointers sold have beams that appear to be relatively bright.



More recently, even brighter laser pointers have been developed that produce *green light* at 532 nm. This newer technology uses a frequency-doubled Neodymium:YAG laser with a blocked infrared component to produce the light. Since the human eye is about 50 times more sensitive to green light at 532 nm than to red light at 640 nm, the green laser beams appear to be very much brighter when in reality they are at about the same output power as the red/orange laser beams. An advantage of the green laser pointers is that the beam itself can be seen in the air and not just the spot on the target hit by the beam.

Most red and green laser pointers used today operate at 1-5 milliwatts (mW) output power; they are Class 3a laser devices. The beams can be hazardous if viewed unless the eye exposure is momentary such as if a laser beam is accidentally directed rapidly across an audience. Possible optical hazards include startle effects, flash-blindness, glare, and after-images if a person is struck in the eye. Reports of those exposed include automobile drivers, airplane and helicopter pilots, sports figures, and the police. **This is very dangerous since such exposures can cause serious accidents.** Longer eye exposures can cause more permanent eye damage including retinal burns.



In order to use a laser pointer in a safe manner, follow the rules below:

- ❖ Never intentionally direct a laser beam towards your eyes or the eyes of others.
- ❖ Do not point a laser pointer at shiny/mirror-like surfaces like polished metal or glass. The reflected beam can hit you or someone else in the eye.
- ❖ Do not view a laser beam through light-collecting optics such as binoculars and microscopes.
- ❖ Ensure that the laser is inactivated (the button is not pressed) when facing an audience during a presentation. It should only be activated when facing the screen or board.
- ❖ Do not purchase a laser pointer that has an output power of greater than 5 mW by making sure the label on the pointer says Class 3a (an image of a label is below; sometimes inscribed using Roman numerals: Class IIIa). Some green laser pointers can produce up to 300 mW of power (they are *very* dangerous Class 3b laser devices)!! As the beam power goes up from 5 mW, the hazard also increases proportionally.
- ❖ Purchase a red-beam laser pointer for use in training or meetings since the beam is not perceived to be as bright as the green beams at the same output power. Thus, the red-beam laser pointers are less likely to cause severe flash-blindness and after-images if eye exposures accidentally occur.
- ❖ Do not direct a laser beam at a moving vehicle as this can cause an accident due to flash blindness or a startle effect. It is also illegal and you can be arrested and/or fined for it.
- ❖ Do not buy laser pointers or laser-related toys for your children. Remove the batteries from your laser pointers if children will have unsupervised access to them.
- ❖ Do not purchase laser beam pet toys that are used to entertain people while pets chase the beams around. There is too great a risk of a reflected beam striking the eye of the laser user or somebody else in the room -- at a minimum causing flash-blindness, thus increasing the risk of tripping over obstacles and falling.
- ❖ Discourage the inappropriate and irresponsible use of laser pointers.



In summary, laser pointers are very useful tools but they must always be used responsibly. If you have any questions about laser pointer safety, contact Rick Mannix, the UC Irvine Laser Safety Officer, at 949-824-6098 or rcmannix@uci.edu.