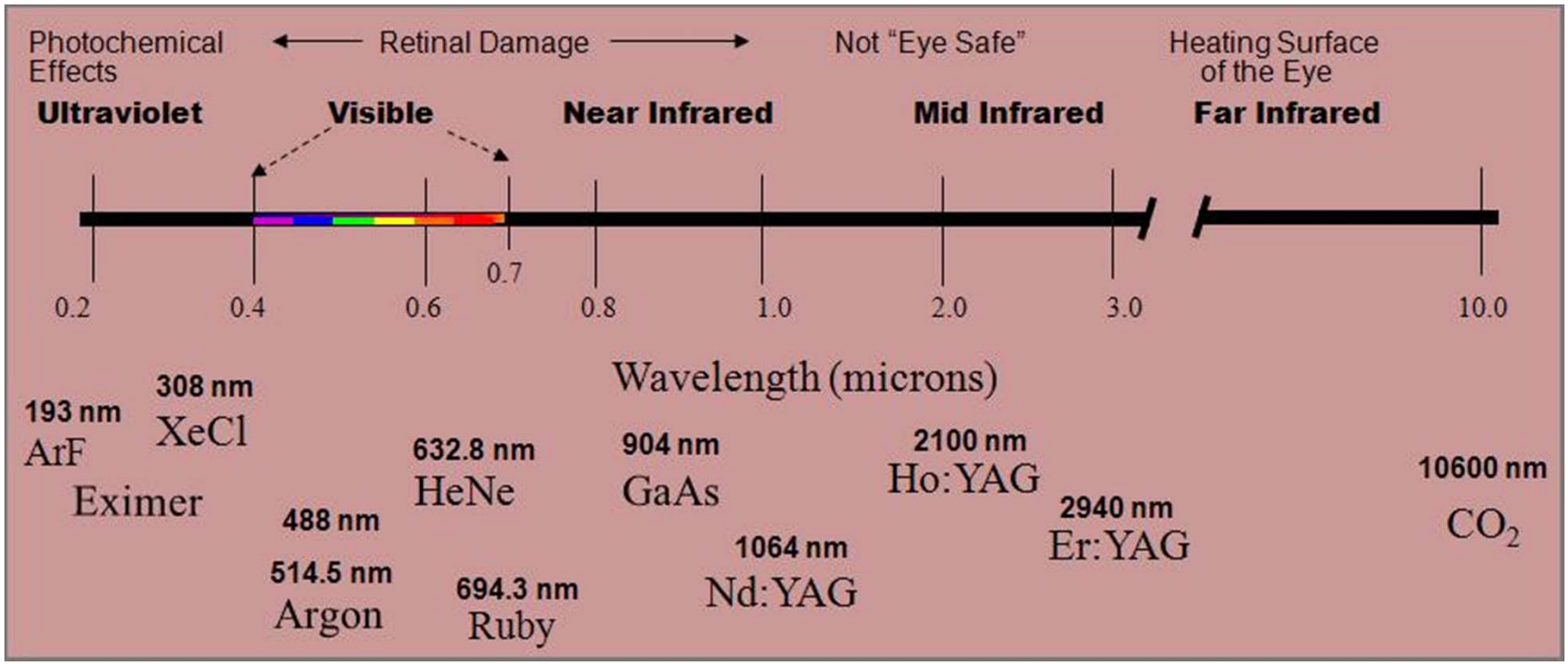
Laser Safety



From MIT EHS: Laser Hazards

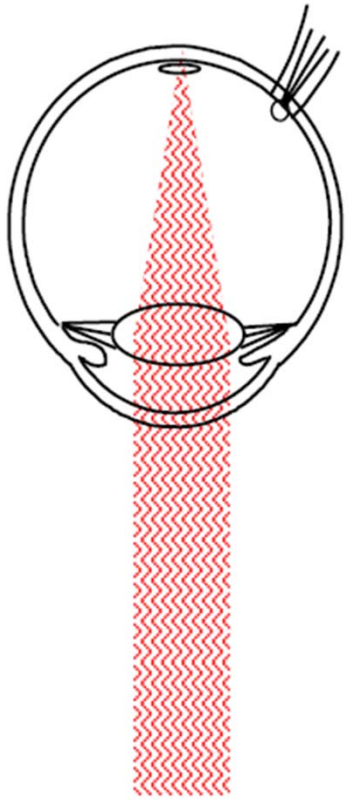
Primary beam: Direct hit/exposure from primary beam. This is the most hazardous.

Specular reflection: Exposure from laser hitting a "shiny" object. This can be as hazardous as the primary beam

Diffuse reflection: Exposure from a rough object. The "roughness" depends on the wavelength of the light.

Classification of Lasers

Class	Procedures	Training	Eye Exam	Energy	Hazards
1	Not Required	Not Required	Not Required		Non-hazardous to eye
1M	Not Required *	Not Required *	Not Required		Hazardous with collecting optics
2	Not Required	Not Required	Not Required	< 1 mW	Only hazardous if person overcomes Aversion Response
2M	Not Required *	Not Required *	Not Required		Hazardous with collecting optics and/or Class 2 hazards
3R	Not Required	Not Required	Not Required	1 - 5 mW	Hazardous when person overcomes Aversion Response or uses optics
3B	Required	Required	Suggested **	5 - 500 mW	Direct beam eye hazard. No serious injury from diffuse reflection or to skin.
4	Required	Required	Suggested **	> 500 mW	Hazard to eye & skin from direct, diffuse, or specular reflection; Fire hazard



Laser Precautions – Class 3b

1. Do not aim the laser at an individual's eye.
2. Permit only experienced personnel to operate the laser.
3. Enclose as much of the beam path as possible. Even a transparent enclosure will prevent individuals from placing their head or reflecting objects within the beam path. Terminations should be used at the end of the useful paths of the direct beam and any secondary beams.
4. Shutters, polarizers and optical filters should be placed at the laser exit port to reduce the beam power to the minimal useful level.
5. Control spectators.
6. A warning light or buzzer should indicate laser operation. This is especially needed if the beam is not visible, i.e., for infrared lasers.
7. Do not permit laser tracking of non-target vehicles or aircraft.
8. Operate the laser only in a restricted area - for example, in a closed room without windows. Place a warning sign on the door.
9. Place the laser beam path well above or well below the eye level of any sitting or standing observers whenever possible. The laser should be mounted firmly to assure that the beam travels only along its intended path.
10. Always use proper laser eye protection if a potential eye hazard exists for the direct beam or a specular reflection (Figure 5).
11. A key switch should be installed to minimize tampering by unauthorized

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