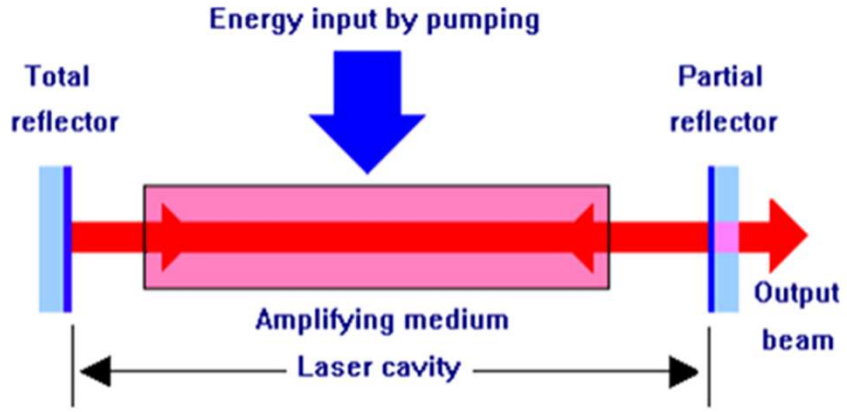
Lasers



Light **A**mplification y **S**timulated **E**mission of **R**adiation

Many lasers are capable of eye injury when you look directly into beam

Reflections alone from high-power laser beams can cause permanent eye damage.

High powered lasers can burn skin

Laser operators must be aware of other potential dangers such as fire, electrical, biological, and chemical hazards

Personal Protective Equipment

- Use proper eye protection (make sure your laser safety glasses are rated for the intensity you are working with)
- Avoid looking into the beam
- Avoid using reflective tools
- Clear personnel from the beam path
- Avoid wearing jewelry

Laser glasses are rated for power and wavelength

Be aware that clear handled hex wrenches can cause stray beams

Avoid wearing all jewelry, watches, earrings, etc. to avoid causing stray beams

Safe Laser Practices

- Lasers should be isolated from public areas
- The beam path should be below eye level
- Reflections should be minimized
- Main and reflected beams should be terminated or dumped
- Use notices to let others know when a laser is running
- Use enclosures to minimize stray beams

Containment for laser beams used in the Shaw lab

https://shawgroup.lab.uiowa.edu/equipment

As a laser operator you must

- Complete all applicable requirements including training, medical surveillance as applicable before operating a laser
- Operating lasers safely in a manner consistent with safe laser practices, requirements and standard operating procedures (including PPE as possible)
- Maintaining a safe environment/ area during the operation of a laser

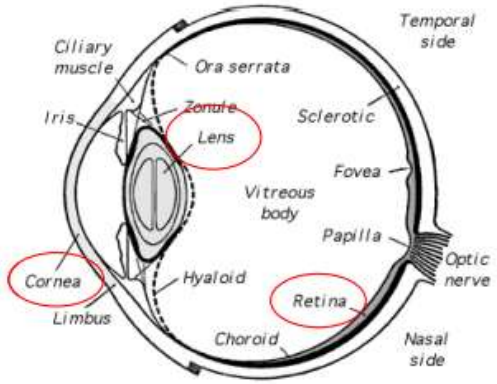
Laser Safety Research W028RD

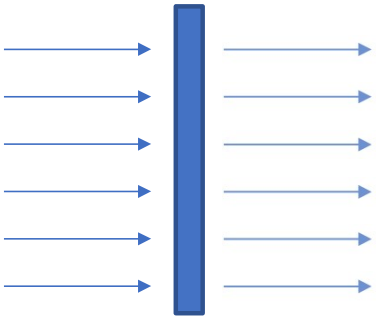
Laser Processes

When a laser strikes solid pieces (mirrors, hex wrenches, substrates) it can be transmitted, absorbed, or reflected.

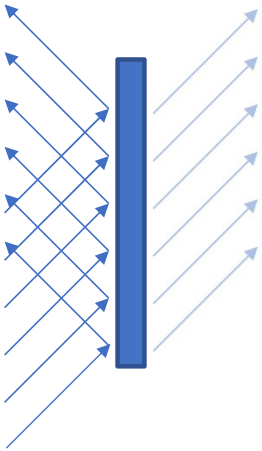
Light impacting can result in heating the substrate, diffuse light to be reflected in all directions, or transmission to a dangerous space.

The human eye can act as a lens to focus stray light causing serious damage to retinas

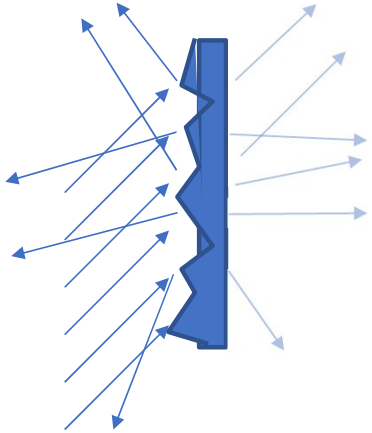




Transmission and adsorption



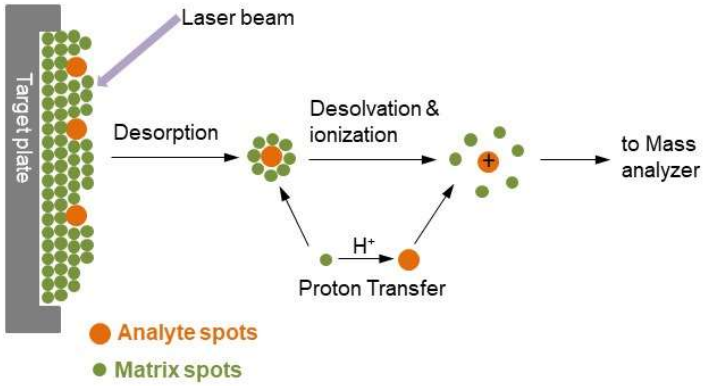
Reflection, transmission and adsorption



Reflection, transmission, and adsorption

Laser Generated Airborne Contaminants

- High intensity lasers (class 3B or class 4 lasers) with irradiance on the order of 10 e7 W/cm^2 can cause formation of aerosolized materials
- This can include metallic fumes, dust, chemical fumes, and aerosols containing biological contaminants
- Make sure there is the proper ventilation when this is a possible hazard



This process is utilized for MALDI-TOF mass spectrometry

https://www.creative-proteomics.com/technology/maldi-tof-mass-spectrometry.htm