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AdLIGO PSL Safety Plan

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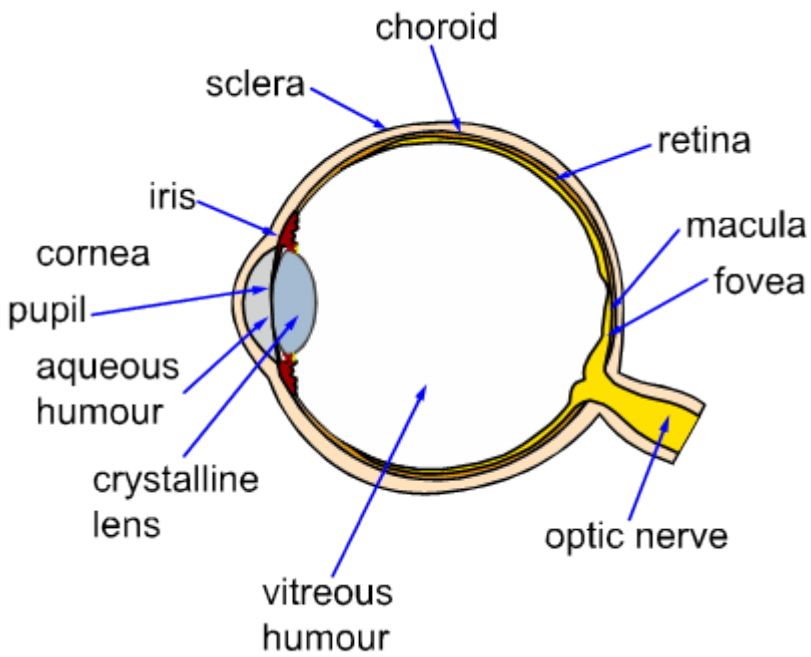
AdLIGO PSL Laser Safety Plan

- The laser safety is to be based on ANSI Z136.1.
  - » No fundamental changes from Z136.1-2000 to Z136.1-2007 as far as calculation of the maximum permissible exposure (MPE) levels and the accessible emission limit (AEL) is concerned.
- With the advent of the 200 W laser, now is a good time to review our practices.
  - » Are existing practices sufficient? Unwieldy?
  - » What, if any, changes shall we make?

The Eye

- Why bother?
  - » Eye injuries tend to be irreversible in nature.
  - » Even low power beams can produce high intensity spots on the retina.



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Terminology

- Accessible Emission Limit (AEL)
  - » The maximum accessible emission level within a class of laser that human eye or skin may be exposed to.
  - » For a Class 4 laser operating at 1064nm the AEL is 0.5 W.
- Maximum Permissible Exposure (MPE)
  - » The level of exposure that can be thought of as the border line between safe and potentially harmful. The MPE depends on the wavelength and exposure duration.
  - » Two MPEs apply: ocular and skin exposure MPE.

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The Advanced LIGO Laser

- Assumed properties:
  - wavelength λ = 1064 nm
  - total power P = 200 W
  - output beam size w_0 = 150 – 200 μm
- Also need to consider the output of the pump diodes:
  - wavelength λ_p = 808 nm
  - total power P_p = 315 W
  - output beam size w_p = 1 mm
- For classification purposes:
  - 200-W laser is an extended source
  - pump diodes are a small source

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Power Levels

- At 1064 nm:
  - » ocular AEL is 4.4 mW
  - » skin exposure AEL is 96 mW
- At 808 nm:
  - » ocular AEL is 118 mW
  - » skin exposure AEL is 32 mW
- Dump all beams above the ocular MPE – mandatory.

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Safety Eyewear Requirement

- The optical density (OD) of laser safety eyewear must bring the output power of the source down to the ocular MPE level.
  - » minimum OD of +4.7 at 1064 nm
  - » minimum OD of +5.7 at 808 nm

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Suggested Plan

- Restricted access to diodes and laser.
- Use beam tubes.
- During installation, manipulation of objects in the high power beam path requires a person to scan the optical table during the activity.
- Use of phone or intercom link to coordinate activities between the diode enclosure and the laser enclosure (if any).