



## Laser Safety Protocol #008

**TO: Laser users**  
**FROM: Laser Safety Program**  
**SUBJECT: Use of Alignment Eyewear**  
**VERSION DATE: May 2008**

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### **Goal**

Document the application of alignment laser protective eyewear at LBNL

### **LBNL Protocol**

The Laser Safety Program at LBNL has determined that on a case by case basis the use of Alignment Laser Protective Eyewear “will be authorized. This is to allow greater visibility of visible beams during alignment activities.

### **ANSI Z136.1 / CDRH Specification**

The ANSI Z136.1 standard for the safe use of lasers is the Laser Safety Program’s general guidance document. The Center for Devices and Radiological Health (CDRH) is the Food and Drug Administration body tasked with developing laser-light-product performance safety standards for lasers sold in the United States.

Laser use at LBNL is also guided by LBNL PUB-3000, Chapter 16 (Lasers). The ANSI Z136.1-2000 standard for the safe use of lasers lists controls for a Class-4 laser use.

**4.6.2.1 Eye Protection (Class 3b or Class 4).** Eye protection devices which are specifically designed for protection against radiation from Class 3b lasers or laser systems should be administratively required within the NHZ and their use

enforced when engineering or other procedural and administrative controls are inadequate to eliminate potential exposure in excess of the applicable MPE.

Eye protection devices which are specifically designed for protection against radiation from Class 4 lasers or laser systems shall be administratively required and their use enforced when engineering or other procedural and administrative controls are inadequate to eliminate potential exposure in excess of the applicable MPE.

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Laser protective eyewear is usually not required for Class 2 or Class 3R lasers or laser systems except in conditions where intentional long-term (> 0.25 seconds) direct viewing is required.

Laser protective eyewear may include goggles, face shields, spectacles, or prescription eyewear using special filter materials or reflective coatings (or a combination of both) to reduce the potential ocular exposure below the applicable MPE level.

Laser protective eyewear shall be specifically selected to withstand either direct or diffusely scattered beams depending upon the anticipated circumstances of exposure. In this case, the protective filter shall exhibit a

damage threshold is not exceeded in the “worst case” exposure scenario.

Important in the selection of laser protective eyewear is the factor of flammability.

#### **Section 4.1 Z136.1-2000**

Review of reported incidents has demonstrated that accidental eye and skin exposures to laser radiation, and accidents related to the ancillary hazards of a laser or laser system, are most often associated with personnel involved with the use of these systems under the following conditions:

- (1) Unanticipated eye exposure during alignment
- (2) Misaligned optics and upwardly directed beams
- (3) Available eye protection not used
- (4) Equipment malfunction
- (5) Improper methods of handling high voltage
- (6) Intentional exposure of unprotected personnel
- (7) Operators unfamiliar with laser Equipment

#### **Rationale**

As stated in the ANSI Z136.1-2000 & 2007 version section 4.1 General Considerations the majority of laser accidents occur during the alignment or manipulation of laser beams. What is termed full protection laser protective eyewear is designed to block or reduce any laser radiation below the MPE level. For invisible laser wavelengths such as Ultra Violet or Infrared wavelengths this is completely appropriate. In the case of visible wavelengths there are times that the user may need to see the beam to perform the alignment activity. With full protection eyewear on this is not possible and sets up a scenario where the user might be tempted to remove the eyewear in order to visualize the beam

and complete the alignment. For experimental, space or budget reasons remote viewing and motorize mounts may not be available.

Alignment eyewear is intended to reduce any laser radiation which penetrates the eyewear to a class 2 exposure level; it is the position of the LBNL LSO and Laser Safety Committee that the use of alignment eyewear needs to be approved on a case by case basis. In particular in situations where ultrafast pulsed visible lasers are in use. The maximum reduction in required full protection eyewear allowable for alignment eyewear for pulsed lasers is 1.4 OD. For Continuous Wave lasers the OD can be reduced to a figure equivalent to a class 2 or 3A/3R laser.

For situations where low power laser are in use as always intentional viewing is not allowed, but viewing of diffuse reflections without eyewear maybe appropriate. This would involve class 3B lasers. 5-15 mW CW no eyewear is required. 15-30 mW, depending on the beam path configuration and controls the laser eyewear controls maybe waived during alignment. For outputs greater than 30 mW, the laser alignment assessment will be documented in the AHD eyewear section.

#### **Contact Information**

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