


Slide 1 Admin/Procedural Controls



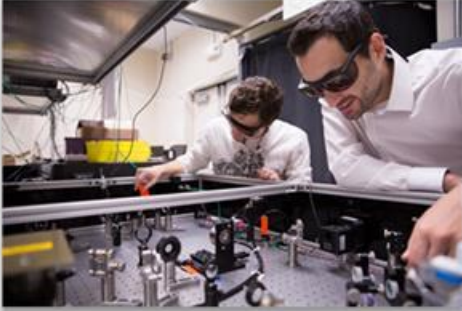
Administrative/Procedural Controls

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After completing this module, you will be able to:


- Identify safety documentation on hazards and controls
- Identify training requirements
- Recognize warning signs and labels
- Know procedures for safe beam alignment



After completing this module, you should be able to:

- Identify safety documentation that describes hazards and control measures
- Identify the training necessary to do your job
- Recognize warning signs and labels
- And know procedures to use for safe beam alignment

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Safety Documentation

Talk to your supervisor to review safety documentation.

Safety documents must be easily accessible:

- Standard Operating Procedures (SOP)
- Laser parameters and eyewear OD requirements
- Training plan
- Training records
- Facility schematics



Work and hazard control documentation must be current and approved.

Talk to your supervisor to review the safety documentation for your area. Different sites will have different documentation and procedure requirements. Safety documents must be easily accessible. They typically include: Standard Operating Procedures; laser parameters and eyewear optical density requirements; a training plan and list of qualified laser workers; and facility schematics with locations for lasers, safety shutters, and Emergency Off devices. Work and hazard control documentation must be current and approved!

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Training

- Refresher training every 3 years
- Site or task-specific training



After completing this course, you will have completed the basic laser safety requirement. However, you are required to take this training every 3 years to maintain your laser safety qualification. In addition to this course, all laser users shall receive site- or task-specific training or orientation.

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Site-specific training

- Hands-on alignment and operations training
- Operation modes (Laser Off, Laser Enclosed or Class 1, Laser On)
- Laser systems and safety controls
- Normal operation vs. Maintenance/Service
- Laser eyewear requirements
- Warning signs and labels
- **Safe alignment procedures**



Item #	Syllabus
1	Operation modes <ul style="list-style-type: none">i. Overview of different modesii. Procedure for setting or changing mode, how to enable laser, how to shut them down. New operators need to demonstrate changing modes while under supervision.iii. Review zero energy verification requirements when setting Laser Off or Class 1 modes.iv. Review requirements for unattended operation in Class 1 and Class 4.
2	Eyewear PPE: <ul style="list-style-type: none">i. Eyewear requirements for each operation modeii. Eyewear inspection and storage; how to clean and maintain eyeweariii. Proper fit and adjustment; Discard if damagediv. Review issues with dielectric-coated eyewear if used. Sensitivity to scratches + OD information not specified for incidence angles > 30 degrees.
3	Skin PPE: <ul style="list-style-type: none">• Availability of gloves and when to use them, especially if have UV beams• Recommend to enclose UV beams
4	UV Laser Operation <ul style="list-style-type: none">• Enclosures and barriers for UV laser beams• Skin PPE requirements (when to use gloves and face shields)
5	Entry and Exit procedures to the LCA <ul style="list-style-type: none">• Review verification requirements when entering/exiting the lab in Class 1 or Class 4.• Review requirements for securing lab entry door and any equipment doors.
6	Emergency Entry and Egress
7	Emergency Off
8	Fire extinguisher locations
9	Keys and key control: Master Key, Room Keys, Laser Keys, Keysafe
10	Overview of laser systems
11	Safety Shutters
12	Interlocks
13	Audible and Visual alarms
14	Warning signs and labels

Site-specific training will have an associated syllabus of items to cover. Some items will require hands-on training. The syllabus typically includes: reviewing different operation modes for the laboratory and how these are established, laser systems present in the lab and their associated controls and safety devices, distinguishing normal operation from maintenance and service, laser eyewear requirements, warning signs and labels, and safe alignment procedures

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Laser Worker Training

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Laser Labels

Display:

- Class of laser
- Wavelength
- Maximum power
- Pulse duration

Types:

- *Logo label* - class, maximum power and wavelength
- *Protective housing label* – interlocks
- *Aperture label* - beam exit area
- *Certification label* - if built to Federal Product Safety Standards

Inspect labels when you receive a new laser!



The image displays three types of laser labels. The top-left label is a 'DANGER' logo label with a red starburst icon and text: 'INVISIBLE AND/OR VISIBLE LASER RADIATION - AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION', 'ENERGY/PULSE PULSE DURATION NO. 140 WAVELENGTHS 7.0 Joule Maximum 7 to 40 Nanoseconds 1064, 532, 355, 266 Nanometers', and 'CLASS IV LASER PRODUCT'. The top-right label is a yellow 'CAUTION' label for 'CLASS 4 VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCKS DEFEATED AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION', with '310-0170 REV. C' at the bottom. The bottom-center label is a black 'AVOID EXPOSURE' label with 'VISIBLE AND INVISIBLE LASER RADIATION IS EMITTED FROM THIS APERTURE' and '310-0198 REV. C' at the bottom. The bottom-right label is a 'Continuum Electro-Optics, Inc' certification label with address '140 Baytech Drive, San Jose, CA 95134', 'MODEL: SLI-10', 'P/N: S14/14768-001 DATE: 08/14', 'SERIAL No: 14768', 'Pursuant to Laser Notice No 50, date June 24, 2007 Complies with 21 CFR 1040.10 except for deviations', '310-0025 Rev. E', and 'Made in USA'.

Commercial lasers come with a variety of labels that display important information about the system, such as the class of laser and its wavelength, maximum power, and pulse duration. Logo labels tell you the class of the laser, its wavelength, and its maximum power or pulse energy. Protective-housing labels are found on equipment beam housings and enclosures to tell you if they are interlocked or not. Aperture labels show where the beam exits a laser or laser equipment, and certification labels will be found on commercially manufactured lasers if they were built to Federal Product Safety Standards. When you receive a new commercial laser, be sure to inspect that the required labels are present and correct!

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Laser Worker Training

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Laser Area Warning Signs



<u>Wavelengths</u>	<u>Eyewear OD Required</u>
532 nm	OD>6
1064nm	OD>6

Laser Safety Officer: _____ Ext. _____

WARNING

Class 4 Laser Controlled Area
Avoid eye or skin exposure to direct or scattered radiation.

Radiation **above** Class 3R, >5x MPE

- Class 3B, most Class 4

Warning signs for Laser Controlled Areas are required at the entryway and indicate a potential personal safety hazard. These signs will give the laser wavelengths, optical density requirements, laser classification and a signal word: “Caution” indicates that laser radiation levels are low, and must be less than 5 times the MPE. Caution is used for Class 2, Class 2M and Class 3R lasers. “Warning” indicates that laser radiation levels are above the Class 3R limit, and is used for Class 3B and most Class 4 lasers. “Danger” indicates high laser radiation levels, and is only used for very high power, high pulse energy or high irradiance Class 4 lasers. “Notice” indicates a temporary situation or hazard, such as during alignment or service work. Specific wording and information listed on the signs will have to conform to requirements at the local site.

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Alignment Procedures

Key practices:

- Exclude unnecessary personnel
- Verify correct laser eyewear
- Reduce beam power or use a low power alignment laser
- Block beam when inserting/removing optics and when not needed
- Use enclosures, barriers and beam blocks
- Use sensor cards, cameras and viewers
- Check for and block stray beams
- Secure all optics to laser table
- Use irises
- Use extra caution with periscopes



Good alignment procedures are necessary for safe laser operations, and for procedures to work, they must be followed. Key practices for safe alignment include: exclude unnecessary personnel, verify that correct laser eyewear is used, attenuate laser beam or use a low power alignment laser, block the beam when inserting or removing optics, and when it is not needed; use enclosures, barriers and beam blocks; use sensor cards, cameras and viewers; check for and block stray beams; secure all optics to the laser table; use irises, and use extra caution with optics that generate out-of-plane beams, such as periscopes.

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Sensor Cards

- Used for locating beams during alignment
- For UV beams, many paper cards will fluoresce
- Beware of specular reflections from coated cards

Other types of sensor cards:

- Polaroid paper
- Burn paper



Sensor cards are a good way to locate beams during alignment. With a sensor card, the beam will produce a fluorescence or glow depending on the material used. For ultraviolet beams, paper will often fluoresce and can be used as a sensor card. Try to use cards with a matte finish that only produce diffuse reflections. Beware of specular reflections from sensor cards with a plastic coating. Polaroid paper and burn paper can also be used as sensor cards.

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Viewers

- Beam alignment
- Stray beams



Viewers enable you to see beams during alignment procedures. They can also be used to locate stray beams. When viewers are used during Class 3B or Class 4 laser operation, protective eyewear is also required.

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Cameras:

- Hands-free alignment tool
- Enhances safety

Uses:

- Precision alignment and co-aligning two beams
- Beam profile measurements/optimization
- Viewing hard-to-access areas

Remote viewing:

- Enables remote laser operation
- When used together with motorized optics, enables more engineering controls (barriers or enclosures)




Cameras can provide a hands-free alignment tool, and can have better sensitivity than fluorescent cards or viewers depending on the wavelength. You can view a beam interaction with a target more safely from a video monitor than by standing over the laser beam with a sensor card. Cameras can be used for: Precision alignment; Co-aligning two beams; Beam profile measurement and optimization, and Viewing hard-to-access areas. Cameras and monitors allow remote viewing by providing diagnostics for remote laser operation. Cameras and monitors are also often used in association with motorized optics; this allows you to install more barriers and enclosures for beam paths to improve the engineering controls. Remote viewing needs to be considered for Class 3B and Class 4 laser operation, especially for Class 4 lasers that require a DANGER area posting sign.

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(Drag and Drop exercise)

Laser Worker Training



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Alignment Exercise

Which of the following do you do during preparation prior to alignment, during alignment, and after alignment?
With your mouse, drag each box to the appropriate area. If the boxes snap back, try again.

Check for and block stray beams

Exclude unnecessary personnel

Reduce beam power or use low power alignment laser

Remove or cover jewelry, watches, ID badges

Verify correct laser eyewear for all personnel

Have all equipment and materials available

Replace enclosures, covers, beam blocks

View beams with sensor cards, viewers or cameras

Block beams when inserting or removing optics

Alignment Preparation

Alignment

After Alignment

SUBMIT

Let's do an Alignment Exercise. Which of the listed actions do you do during preparation prior to alignment, during alignment, and after alignment? Match each action to its corresponding alignment phase below.

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(Drag and Drop exercise)

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Laser Safety Tools Exercise

Engineering and administrative controls devices are “Laser Safety Tools.” Drag the appropriate controls device to the correct area. When you have all four in place, click the ‘Submit’ button to check your answers.

1 2 3 4

beam block interlock viewer path barrier

SUBMIT

In this module and the previous one, you learned about a number of devices that can be used for engineering and administrative controls. We like to call these devices, “Laser Safety Tools.” For this exercise, match the controls devices to the correct areas. When you are done, click the “Submit” button to check your answers.