

Alignment Guidelines

In research settings, serious laser accidents are known to occur during laser alignment. Be careful!

Appropriate steps must be taken to minimize the risk to beam injuries occurring during alignment procedures. Class 3B and Class 4 lasers must have corresponding alignment procedures written and maintained with the laser for reference.

Alignments should be done only by those who have received laser safety training. It is best to perform alignments with another trained person. Review all procedures before attempting the alignment. Make sure that all warning signs, lights and locks are operating.

At alignment conclusion, normal laser hazard controls must be restored. Controls set back in place include replacing all enclosures, covers, beam blocks, barriers and checking affected interlocks for proper operation.

Alignment Procedures for Class 3B and Class 4 Lasers

Pre-alignment Procedures

1. Exclude unnecessary personnel from the laser area during alignment.
2. Post the "Laser Alignment in Progress" notice sign on the doorknob to the laser laboratory and lock the door.
3. Housekeeping is paramount. The work area and optical table should be free of objects or surfaces that could reflect the light. Remove any jewelry, watches, rings (or cover rings with tape), remove objects in shirt pockets, and remove id badges. Make sure any reflective surfaces in the area are blocked or covered. Remove any unnecessary equipment, tools and combustible materials.
4. Make sure all materials needed for the alignment are readily available and that you have carefully thought through the alignment procedure in advance so there will be no surprises that could increase the likelihood of an accident.
5. Wear protective eyewear and clothing to the extent practicable. Use special alignment eyewear when circumstances (e.g. wavelength, power, etc.) permit their use. In some cases (low power visible beam only), low optical density alignment eyewear can be worn. M-rated eyewear is needed for lasers with pulses < 1 nsec. Alternate means of viewing the beam such as CCD and web cameras should be considered before allowing the use of alignment eyewear.

6. Whenever possible, use low-power (< 5 mW) visible lasers for path simulation of higher-power visible or invisible lasers like a He-Ne laser or a diode laser (i.e., a laser pointer) to align the optics.
7. Isolate the beam from other areas of the laboratory using laser curtains, beam barriers, and beam stops. Enclose as much of the beam as you can to protect your eyes and skin.

During the Alignment

8. Keep protective eyewear on during the entire alignment process. Remember that special alignment eyewear is available for visible beam laser use (only safe for output power up to about 100 mW).
9. Use beam display devices such as image converter viewers or use an indirect means of viewing the beam (beam detector card, infrared viewer scope, Zap-it paper) to locate beams except when aligning low power (<15 mW) visible beam lasers.
10. Keep the beam on the plane of the optical table and well below normal sitting eye level. Never direct a beam upwardly or across a walkway!
11. Perform alignment tasks that use high-power lasers, at the lowest possible power level. Pulsed lasers are aligned with single pulses if possible. If the laser is Q-switched, turn off the Q-switch and use low power or CW.
12. For near infrared mode-locked and Q-switched laser, considered most dangerous, use a high degree of caution when aligning these lasers.
 - They are dangerous because of invisible or barely visible beams. Also they tend to have short pulse durations which translates to very high peak powers
 - M-rated eyewear is needed to absorb picosecond and femtosecond pulse laser radiation. Contact the LSO for ordering information
13. Use a shutter or beam block to block high-power beams at their source except when actually needed during the alignment process.
14. Use a laser-rated beam block to terminate high-power beams down range of the optics being aligned.
15. Use beam blocks and/or laser protective barriers in conditions where alignment beams could stray into areas with uninvolved personnel.
16. Place beam blocks behind optics (e.g., turning mirrors) to terminate beams that might miss mirrors during alignment.

17. Locate and block all stray reflections before proceeding to the next optical component or section.
18. Be sure all beams and reflections are properly terminated before high-power operation.
 - Whoever moves or places an optical component on an optical table (or in a beam path) is responsible for identifying and terminating each and every stray beam coming from that component (meaning reflections, diffuse or specular).
19. There must be no intentional intrabeam viewing with the eye.

After the Alignment

20. Replace the enclosures or other safety barriers that were removed for the alignment.
21. Remove the alignment doorknob sign.
22. Always store your protective eyewear near the lasers for which it is worn such that it will not get scratched or broken.

Procedures derived from: ANSI Z136.1