

LASER BEAM ALIGNMENT

Laser beam alignment requires working with an open beam and directing the beam toward a series of reflective or partially reflective surfaces, so that the beam follows a predetermined path. Beam alignments may be internal or external.

Internal alignments occur within the laser cavity and often place the worker at increased risk of electrical accidents as well as beam exposure. The need for internal alignments arises most often because of problems associated with beam mode or power.

External alignments occur from the laser's end window to some terminal target (beam stop). In between those two locations may be a number of optical components arrayed in configurations that may be simple or complex. The need for external alignments arises because of requirements for an initial setup, reconfiguration, or replacement of components in the beam path. External alignments include optical table, laser-to-fiberport, fiberport-to-fiberport, free-space delivery, beam-to-sensor, and laser therapy.

MANDATORY PRACTICES

1. Alignments shall only be performed by those who have received laser safety training
2. A Class 3B or Class 4 laser controlled area (LCA) shall be established
3. Restrict area to only those personnel involved in laser beam alignment
4. Laser eye protection must be worn (alignment eyewear, or operational power eyewear)
5. Wear PPE: face shields for scattered UV & skin protection as necessary
6. Ensure work area is free of specular reflectors
7. Remove jewelry or cover with electrical tape. Remove tie tacks, tie clasps, neckties, and any items in shirt pockets that could fall into the beam path.
8. Check for stray beams at each step and again after completing all alignment steps
9. If alignment eye protection was used, switch to operational eye protection when power is increased.
10. Be patient

BEST PRACTICES

1. Perform alignments with a 'buddy'
2. When possible, use low-power visible lasers, or the lowest possible power level, for path simulation of higher-power visible or invisible lasers
3. View beams (invisible or visible) indirectly: remote viewing, thermal paper, ceramic discs, IR/UV viewing scopes, paper business cards, phosphor-viewing cards. Ensure cards have diffusing surfaces.
4. Use a shutter or beam block to block high-power beams at their source when beam is not needed
5. Use a laser-rated beam block to terminate high-power beams down range of the optics being aligned
6. Use beam blocks and/or barriers to prevent beams straying into areas with uninvolved personnel
7. Place beam blocks behind optics to terminate beams that might miss mirrors during alignment
8. Locate and block all stray reflections before proceeding to the next optical component or section
9. Be sure all beams and reflections are properly terminated before high-power operation
10. Post appropriate area warning signs during alignment where lasers are normally Class 1 Systems