CO_2 LASER: Standard operating procedure

Rev. 08/01/2013

Description

This Class IV laser emits ***invisible*** infrared laser radiation in the 10.6 μm CO_2 wavelength band.

The laser operator should clearly understand the major principles of laser operation, the laser components and their location in the lab, as well as safety information related to the laser operation: all risks and possible hazards related to the laser operation, and safety precautions. Before receiving the access to the laser, it is required that the operator studies carefully the laser manual available in the lab or online at the Synrad website:
http://www.synrad.com/Manuals/L48_Seriesv7.6.pdf,
and the Universal Laser Controller manual available in the lab.

Additional useful safety information can be found at the following websites:
the Synrad (http://www.synrad.com/LaserFacts/lasersafety.html)
OSHA (http://www.osha.gov/dts/osta/otm_iii/otm_iii_6.html)
Laser Institute of America (http://www.laserinstitute.org)

Safety Precautions

All personnel must wear eye protection suitable for 10.6 μm CO_2 radiation when in the same area as an exposed laser beam.

Eyewear protects against scattered energy but is not intended to protect against direct viewing of the beam – never look directly into the laser output aperture.

Direct or diffuse laser radiation can inflict severe corneal injuries leading to permanent eye damage or blindness. Avoid the objects in the laser beam that might act as specular reflectors (e.g., metallic surfaces) which may create a serious hazard outside the immediate working area.

A CO_2 laser is an intense heat source and will ignite most materials under the proper conditions. Do not operate in the presence of flammable or explosive materials, gases, liquids, or vapors in the quantities that may lead to the fire or explosions. Performing experiments with flammable powder or material always ensure that small quantity of material is used.

Remember that invisible-beam near-infrared lasers are the most dangerous. Severe burns may result from exposure to the laser beam. Do not place your body in the laser beam path.

Safe operation of the laser requires the use of external beam block to safely block the beam from traveling out of the desired work area. Use a water-cooled beam dump or a brick or similar non-scattering, noncombustible material as the beam block. Never use organic material or metals as beam blocker.

CO_2 LASER: Standard operating procedure

Before starting:

1) Ensure that the all the personnel in the area are wearing protective eyewear.

2) Ensure that the laser beam path is clear of any obstacles.

3) Ensure that a beam block terminates the laser beam path.

Starting the laser:

1) Turn on the chiller (set between 18C˚ and 22C˚). Examine all cooling connections carefully for leak.

2) Turn on the AC power using the circuit breaker labeled "Laser" outside the lab door.

3) Follow the procedure as described in the Section 'Starting the laser between the runs'.

Starting the laser between the runs:

1) Move the Shutter Switch to the Open Position.

2) Turn on the DC power supply.
.

3) Rotate the keyswitch to the ON position. Verify that the green PWR LED illuminates. If the keyswitch is already ON, turn it OFF, and then back ON to reset the laser.

   NOTE: Each time the Keyswitch is cycled ON/OFF, a five-second delay occurs between the time that the PWR LED illuminates and the laser is permitted to lase.

4) Press the Universal Laser Controller (UC-2000) *Lase On/Off* button. The *LASE* indicator on the Universal Controller should illuminate.

5) Verify the power level reading on the UC-2000 display. If the reading is 0.0%, set the UC-2000 to MANUAL mode and use *Adj. Knob* on the UC-2000 to slowly increase power to the necessary level.

Shutting off the laser between the runs:

1) Press the UC-2000's *Lase ON/OFF* button to stop lasing. Verify that the *LASE* indicator on the UC-2000 turns off and the laser's *LASE* LED turns dim.

2) Move the Shutter Switch to the Closed Position.

3) Rotate the keyswitch to the *OFF* position. Verify that the green *PWR* LED turns dim.

4) Turn off the DC power supply.

Shutting off the laser permanently:

1) Follow the procedure as described in the Section 'Shutting off the laser between the runs'
2) Set the *PWM Adj Knob* to provide 0% output (0.0%).
3) Turn off the chiller.
4) Turn off the AC power using the circuit breaker labeled "Laser" outside the lab door.