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Internal directive LA-1-2008: Risks with lasers of classes 3B and 4

A LASER (Light Amplification by Stimulated Emission of Radiation) is a source of spatially and temporally coherent light; these properties induce radiation with unique wavelength and focused high-energy. This light, which may be emitted in infra-red, visible or ultra-violet, is produced by photon emission when an excited electron returns to its fundamental state from an excited state. As the eye is the most sensitive organ to the laser radiation, it is the reference for the classification of the laser hazard, from class I (harmless) to class 3B (harmful for the eye and often for the skin) and 4 (harmful for the eye, the skin and can cause a fire). An accident can occur in case of direct exposition to a beam but also when the beam is reflected or diffused on a surface. In accordance with the directive SUVA 66049 and the norm EN 60825, lasers class 3B and 4 must be used only in areas with delimited optical risk and clearly signposted.

Before switching the laser beam on, the experimentalist has to make sure that everyone present is wearing appropriate protection equipment and that nobody of unauthorized persons can enter the area with optical risk.

The access to the lasers class 3B and 4 is forbidden to any person who has not been trained on the correct use of the apparatus and the related hazards. The training has to be certified (in written form) by the instructor. The laboratory head is responsible for the organization of the training. A summary of the important work instructions must be signposted on the working place.

Protection measures:

1) ***Access limitations:***

- a. The lab door must have an automatic closing system, the key is necessary for access,
- b. A ring bell is installed near the door, so the visitors can ask for an authorisation to access.
- c. The entrance must have an airlock configuration for instance with a protection curtain.
- d. A flashing light signalization (if possible diode based) has to be installed above the door. It is activated as soon as the laser is functioning (if this kind of setup is technically feasible)



2) ***Beam confinement on the optical table:***

- a. The laser beam has to be kept in a horizontal plan at a level lower than eyes' level of a person in a sitting position. It is prohibited to incline the beam upwards and downwards without authorization of the laboratory head. A shielding of the beam is highly recommended.
- b. The optical elements are fixed to the table as well as the mandatory beam stop.
- c. If there is more than one beam, individual confinement is recommended.

3) ***Personal protection:***

- a. Laser protective eyewear (adapted to laser wavelength and power) is to be worn by all personnel working with laser. Even if you are wearing laser goggles, NEVER look into the laser beam directly because the goggles do not protect against the direct beam.
- b. If no ocular protection is available, only persons duly trained for this situation are authorised to enter the laboratory. The written orders are given to everyone by the laboratory head.