

## Laser Personnel Safety System Glossary

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- a) **Alignment mode** – Operational mode of the laser safety system in which the user is allowed into normally restricted areas as long as the laser is kept in a low duty cycle configuration ( $\leq 250$   $\mu$ sec. macropulse length,  $\leq 4.67813$  MHz micropulse repetition rate, and  $\leq 2$  Hz macropulse repetition rate). The user must wear goggles. The yellow GOGGLES REQUIRED light is illuminated on the door when in alignment mode. Only approved laser users are allowed in the lab during alignment mode.
- b) **Approved Laser User** – Someone who has completed all the training spelled out in the LSOP for a given lab. Only approved laser users are permitted in a lab when the LPSS is armed.
- c) **Exclusionary mode** – Lab mode in which no access is permitted. The red NO ACCESS light on the door to the lab is illuminated.
- d) **FEL** – Free-electron laser. Device which uses an optical cavity and a *wiggler* to extract optical power from an electron beam. The IR Demo is a FEL.
- e) **FEL operator** – Jefferson Lab employee trained in laser operations and the laser safety system who is permitted to operate the IR Demo FEL. An FEL operator must be present in the FEL building during laser operations. Only FEL operators are allowed in the OCR during laser operation.
- f) **FEL shutter** – Mirror inserted into the FEL cavity which stops lasing by reducing the laser cavity Q to near zero. Two of these are inserted whenever the laser safety system crashes.
- g) **Home Position** – Mirror cassette position that allows all laser light to pass through the user lab. The master LPSS ignores all labs with their mirrors in the home position.
- h) **Hutch mode** – Mode in which the FEL light is confined to an interlocked, class I laser hutch. Multiple hutches may be present in any lab. If any access point in the hutch is opened during laser operation, the LPSS will crash. Only approved laser users are allowed in the lab in hutch mode.
- i) **Hutch bypass shutter** – Shutter tied to the *lab shutter* that, when inserted, bypasses the hutch interlocks, allowing an approved user to enter the hutch. This shutter automatically closes the *lab shutter*.
- j) **Lab crash** – When the state of a lab's LPSS drops from armed to safe. If the lab is using the FEL beam this will crash the master LPSS as well. If the mirror cassette is in home position, the lab crash is local and does not affect the master LPSS.
- k) **Lab shutter** – This is a movable mirror that deflects the laser beam into a water-cooled dump when inserted. The power to open this shutter comes from the master LPSS. The shutter has a key switch that can shut off this power locally to prevent laser light from entering the lab.
- l) **Master LPSS crash** – When the FEL operation is terminated by the master LPSS. This is generally in response to some unauthorized access or

interlock chain failure. During a laser crash all shutters are inserted and all mirror cassettes are returned to their *home position*.

- m) **Laser Permit** – When the laser safety system in a given room is swept and armed and class IIIb or class IV laser light is allowed in the room.
- n) **LOTO** – Lock out tag out. This is a set of OSHA specified procedures for locking out and tagging hazardous energy sources (electrical, pneumatic, mechanical, etc.) in order to allow maintenance or repair work on them.
- o) **LPSS** – Laser Personnel Safety System. This is a safety control system that prevents unauthorized access by personnel to the laser labs and maintains the integrity of the laser enclosures.
- p) **LSO** – Laser Safety Officer. This person is responsible for laser safety at Jefferson Lab. The position is held now by Patty Hunt.
- q) **LSS** – Laser System Supervisor. The person responsible for laser safety in a given area. The LSS for the FEL is now Stephen Benson.
- r) **Mirror cassette** – Vacuum enclosed stage with four available mirror positions. Three of these are filled with mirrors with high reflectivity at a given wavelength range. One position has no mirror and is referred to as the *home position*. The cassette returns to home after a lab crash. Both the laser shutter and the OCR shutter must be closed before the mirror cassette is permitted to move.
- s) **Mode Key** – This key switches the state of a lab from *hutch mode* to *exclusionary mode* and back. During *alignment mode* the state of the key is ignored. The key can be removed in *exclusionary mode*.
- t) **MPE** – Maximum permissible exposure, as defined in the ANSI Z136.1 standard, section 8.
- u) **ODH** – Oxygen deficiency hazard. Inert gasses can displace oxygen in the air and produce a hazard. If the level of oxygen falls below 19.5%, the area is considered unsafe. All laser users must have ODH hazard training. Visitor without ODH training must be escorted at all times.
- v) **OCR** – Optical control room. This is the diagnostics room for the IR Demo laser. The beam is deflected into a power meter by the *OCR shutter* when any of the mirror cassettes needs to move. A small fraction of the beam is picked off using a hole in a mirror for diagnostic purposes.
- w) **OCR shutter** – Insertable mirror in the OCR room that deflects the laser light into a water-cooled power meter. This prevents the laser beam from being transported to the user labs. The shutter is locked in the in position when the lab lockout key is turned and closes automatically during a laser crash.
- x) **OTS** – Optical transport system. This is a set of evacuated mirror cans and pipes used to transport the laser light from the FEL to the OCR and the user labs.
- y) **PSS** – Accelerator personnel safety system. This is the safety system operated by the Safety System Officer (SSO) in the Master Control Center (MCC) which ensures that no one is present in the accelerator enclosure during operations and which shuts off the accelerator if radiation levels exceed permitted levels outside the accelerator vault.

- z) **Safe a lab** – The FEL operator can change the state of a lab from armed to safe using the LPSS control screen. This is called *safing a lab*.