# PPS Zones for the LCLS

revised 29 October 2003

The LCLS is divided up into the following Personnel Protection System (PPS) zones.

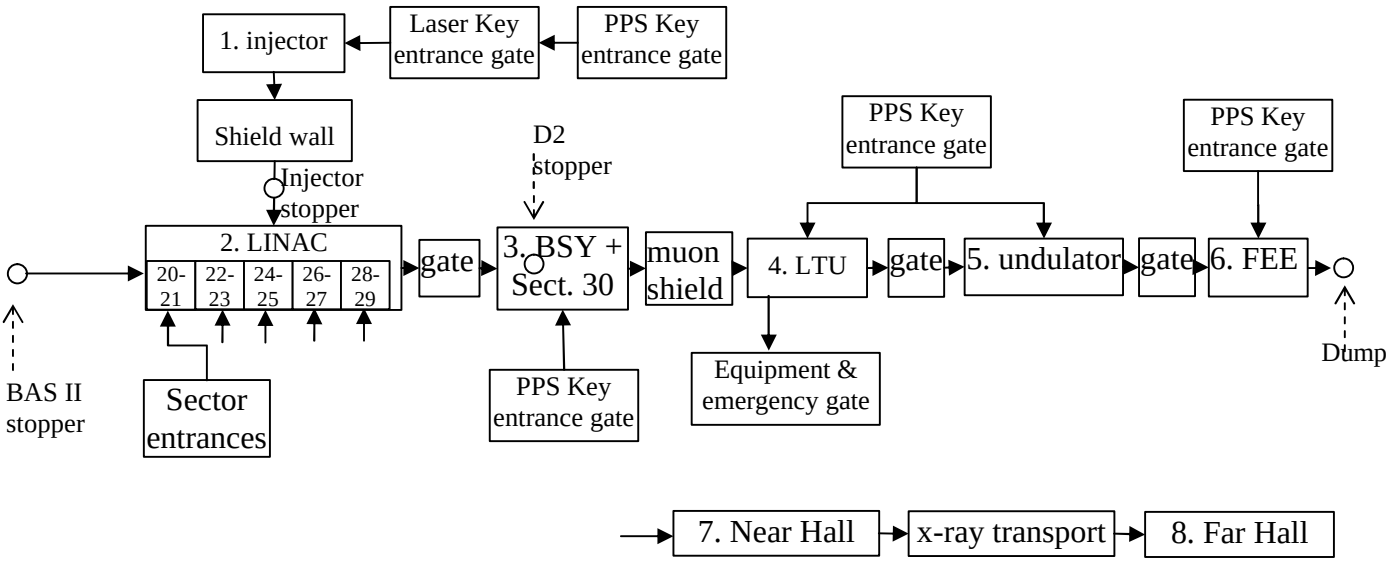


**Figure 1 Schematic layout of the PPS zones for LCLS**

| Zone | PPS entry | Second egress | Access conditions | Search requirement |
|---|---|---|---|---|
| 1. injector vault | Gate key and laser key (new) | None | No RF, elec. hazards off, inj. stopper in. | Vault only |
| 2. linac | Individual sector manways (existing) | Gate to adjacent sector (existing) | No beam in linac, or LCLS injector, elec. hazards off | Accessed sectors only |
| 3. BSY and sector 30 | Gate key (existing) | Numerous (existing) | linac in BAS II mode, elec. hazards off, or linac off | Entire BSY |
| 4. LTU | Gate key (new) | Equipment and emergency gate (new) | Beam stopped in BSY, elec. hazards off | LTU only if gate to undulator has not been opened |
| 5. Undulator hall | Gate key (shared with LTU) | gate to FEE | Beam stopped in BSY, elec. hazards off | undulator only if gate to LTU has not been opened |
| 6. Front End Enclosure | Gate key (new) | gate to undulator hall | Beam stopped in BSY, elec. hazards off | FEE only if gate to undulator has not been opened |
| 7. Near Hall | Independent access to hutches | | x-ray shutters in | Hutch only |
| 8. Far Hall | Independent access to hutches | | x-ray shutters in | Hutch only |

1. The LCLS injector vault has one entry gate with PPS control. Access requires that the RF and electrical hazards be turned off and the radiation stopper in the injection line between the permanent shielding and the linac be inserted. Normally, the RF is turned off by switching off the VVS power to the modulators in that sector. However, the VVS for sector 20 klystrons used by the injector is shared with sector 19. Therefore in order to allow access to the injector vault without interrupting the PEP II linac operation in sector 19 requires that the modulators for the injector klystrons have direct interlocks (as is done now for the e+ vault).
   A second key interlock is to be implemented for access with the laser on. The injector vault can be entered without using the laser key system, in which case the laser will switch off. A qualified laser operator with a special laser key will be able to open the vault door without tripping off the laser.

2. The linac PPS zones consist at present of two adjacent sectors, with the exception of sector 30 which has the same radiological requirements for access as the BSY zone. Entry to a linac sector is typically via the manways which have keyed doors but are not at present equipped with full PPS video monitoring, so the sectors must be searched each time. In addition to the manways there are equipment hatches in sectors 19, 24 and 30 where heavy equipment can be lowered into the housing.
   An upgrade to the linac PPS could include making the PPS entry for the LCLS sectors into video monitored gates for controlled access. Combining several sectors into larger PPS zones would also simplify operation and require fewer certification procedures. PPS zones of approximately 5 sectors could always include one of the equipment hatch access points.
   Access to the linac requires shutting off all linac beams. At present, linac access downstream of the DRIP would also require shutting off the LCLS injector. It is foreseen to include one or two backward beam stoppers in sectors 19 and 20 upstream of the LCLS injector to allow access to sectors 2 through 18 during LCLS operation. The existing BAS II stopper in sector 19 could also serve as a backward beam stopper in this mode of operation. A new radiation stopper in linac sector 20-9, which will be installed to calibrate dose in the injector vault versus linac beam loss, could be used as the second backward beam stopper.

3. The BSY PPS zone comprises linac sector 30, the PEP II NIT and SIT lines, the BSY common line, the SLC 51 and 52 lines, A-, B- and C-line tunnels. There is controlled PPS access through the BSY manway and permitted access through the BSY main access.

4. The new Linac To Undulator (LTU) PPS zone extends from the muon shielding in the former FFTB tunnel up to the entrance of the Undulator Tunnel. Controlled access to the LTU will be through a keyed PPS entrance at the downstream end of the tunnel, adjacent to the Undulator Hall (UH) entrance. A second equipment access for permitted access and emergency exit is foreseen at the upstream end of the LTU.

Access to the LTU is allowed when electrical hazards are off and the beam is stopped in the BSY, as is done now in the FFTB tunnel.
The PPS entrance to the LTU is to be shared with the Undulator hall where a gate separates the two PPS zones. If the LTU is accessed but the gate to the UH is not opened then its search remains made up. This is done to minimize entries into the UH for maintaining temperature stability.

5. PPS access to the new Undulator Hall (UH) is through the common PPS keyed entry at the end of the LTU. A second exit gate is at the downstream end going into the Front End Enclosure (FEE) but will not normally be opened during controlled access.
   Access is only allowed when hazards are off and beam is stopped in the BSY. The adjacent areas in the LTU and FEE do not have to be searched if the gates to these areas are not opened.

6. The new Front End Enclosure (FEE) houses the electron dump beamline and x-ray components such as the gas cell attenuators. PPS access is through a new PPS keyed entry into the FEE. A second exit gate is at the upstream end going into the Undulator Hall, but will not normally be opened during controlled access. Access to the FEE is only allowed when hazards are off and beam is stopped in the BSY.

7. The Near Hall and Far Hall contain only X-ray beamlines so that access to the experiment hutches is not dependant on the state of the electron beam. Shutters for the x-ray beam will control access to the hutches. The x-ray beam line from the Near Hall to the Far Hall is not in a PPS zone. The x-ray beamline itself will have a vacuum interlock to prevent it being opened while the beam is operating, but the tunnel for the x-ray beamline is not considered as a PPS zone.