



---

# Advanced LIGO PSL Infrastructure and Safety Review

## Response to Committee Comments

P. King, R. Savage & R. Wooley



# Room Location

---

- The paragraph in question does not actually propose a room location. However the review process has revealed a flaw in the concept in that there is not enough room at LLO in the originally proposed location.
  - » We are working the numbers to see if the newly proposed location, the short-term storage area, meets the requirements at both sites.



# Cleanliness

---

Supply a drawing and specifications showing the portable HEPA configurations to help with LLO's layout.

- A drawing for the HEPA configurations will be generated.

Is there a specification to be met in the design for acoustic and vibration mitigation or are we using proven techniques as a precaution?

- There is no specific acoustic and vibration mitigation techniques related to the PSL that we are aware of. However proven techniques are being incorporated as a precaution. The chillers are a different story, and their acoustic and vibration isolation will be discussed in the PD document.



# Heat Load

---

## Chillers

- » Power requirements?
  - » Are the chiller specifications available?
  - » Are separate chillers to be used for the diodes and the laser head?
  - » Are the hose and chiller capacities sufficient unlike iLIGO.
  - » Are closed systems (like TCS) being considered to possibly minimize maintenance?
- We feel that the heat load is more in the scope for the laser PDR.
  - The chiller specifications for the model used at LZH are available.



## Heat Load (cont.)

---

- For EnL, the one chiller is used for the pump diodes and the head (the MOPA).
- For AdL, two chillers are required. The second chiller is for the pump diodes for the High Power Stage.
- The chiller capacity is estimated to be more than enough for the laser requirements.
- Closed systems are being considered. However modifications to the current TCS cooling system for the PSL is not being considered.



# Electrical

---

## Power supplies

- » Can the AdLIGO supplies be 208V instead? Some equipment comes with voltage ranges (120/240). For LHO at 120V we are looking at 120 amps just for the laser not counting the fans and computers.
- The pump diode supplies are specified by the manufacturer to be single-phase with an input voltage of anywhere between 90VAC to 264VAC.



## Electrical (cont.)

---

HIBB's Eng DWG 4. Why so many 277V ckts?

- I am not aware of any HIBB's Eng DWG 4 and so cannot answer the question about the number of 277V circuits. We expect five circuits per PSL, not counting the circuits for the chillers.



# Lighting

---

You should probably specify at least 30 foot-candles of light at your work surfaces. This is standard for office areas. This way when someone designs the lighting for this room they can determine the fixtures. If you do not do much work in there lower values can work. 10 is acceptable in many areas.

- We will address this in the PD document. 30 ft.-candles in front of and behind the racks with the ability to switch to a lower lighting level to enable camera surveillance of the area without undue heat load.



# Fiber Optic Access

---

## Fiber routing

- » Will the fiber be laid into the cable trays for the entire run?
  - » Will the fibers be armor jacketed?
  - » Will fibers be installed into conduit?
- The optical fibres will be installed in a raceway.
  - Each optical fibre bundle has a metal jacket around it.





## Fiber Optic Access (cont.)

---

- All the optical fibre bundles will be in a protective housing.



# Cooling Water Piping Access

---

Cooling penetration

- » Define the penetrations and fiber protection from water leaks.
- Wall penetrations for cooling water and the optical fibres will be specified.



# Monitoring and Services

---

CDS connections via fiber?

- » 3.21.15 CDS network will be present. Will there also be a GC need?
- » 3.21.16 Make phone jacks standard RJ45 (for digital).
- There is no need for a GC connection. The standard digital, RJ45, phone jack will be specified.



# Monitoring and Services (cont.)

---

## Webcam

- » Availability/support not constant surveillance. 3.21.14 Constant surveillance would imply a continuous monitor. Is this what you really want? Tying up a computer and display. Also does it then need to be recorded? We could install a camera and tie it into the video switch to allow operator to check the room if need be.
- The webcam is meant for surveillance of the laser diode enclosure on an as-needed basis. It is not meant for round-the-clock surveillance.



# Room Configurations

---

Finalize details of the requirements with the engineering firms.

- A preliminary design document will be provided for review, and after modifications as required, to engineering firms.



## Room Configurations (cont.)

---

Is LLO facility manager okay to go with new location?

- » New room layout needed.
- » 10 ft. min. ceiling hts.
- » 3.2.9 LLO argues that bare concrete floors are okay for them.
- » 3.21.13 Convenience receptacles:
  - Do you want to specify a height so if you put tables along the wall the outlets will be above the surface? Sometimes this is useful. Also code requires 6 ft intervals will you need more?
- A minimum ceiling height of at least 10 ft. will be specified, consistent with the requirements for cable trays.



## Room Configurations (cont.)

---

- Convenience electrical receptacles conforming to the standard will be sufficient. The height of which will be approximately 18 in. from the floor.





# Laser Safety and Access Controls

---

## Kill Circuit

- » Any reason to have the pump diode power supplies on the same “KILL” circuit as the other Class 3b and 4 lasers?
- » Should probably specify Panic Bars on doors for egress in an emergency.
- We think it is important that emergency crews have a single point to go to shutdown lasers. There is no reason not to have the pump diode power supplies on the kill circuit.
- The door opening mechanism will be consistent with facility requirements.



# PSL Hazard Analysis

---

I hoped to see some discussion of the hazard associated with a split system – for example:

- » Will it be possible to confuse H1 and H2 (Hanford only) – this could cause a live fiber to be treated as if it were de-energized. Mitigation might be a well labeled lock/tag point.
  - » Is it possible to feed laser light the “wrong direction”? If not possible I (John) think this still deserves some discussion.
  - » Is remote computer operation of laser components while a person is performing “hands on” work?
- The issue of confusion between laser systems will be addressed with operating procedures. It will be a matter of procedure that work on the fibres only takes place when the pump diodes are off.



## PSL Hazard Analysis (cont.)

---

- The issue of having the light come back down from the other end of the fibre will be included even though the possibility of this happening – as I (PKing) understand the question – is zero.
- Remote operation is possible whilst a person is performing hands on work. This will be addressed with procedures and possibly a lock out. However nothing can stop a person deliberately intent on operating the laser.



## PSL Hazard Analysis (cont.)

---

It would be helpful if Figure 2 had a box showing the outline of the diode room.

- The figure was schematic diagram of the laser, not the system. However the drawing has been modified as requested.



# PSL Hazard Analysis (cont.)

---

## Hazard Risk Code Criteria

- » Risk Code Criteria of 1A, 1B, 1C, 2A, 2B, 3A (Unacceptable) – are non-existent here.
- I (PKing) do not understand the comment. Is the comment that there are no risks of this criteria and that there should be?



# AdLIGO PSL Safety Plan

---

7.1 Would it help if we procure a camera sensitive to the wavelengths in question with a video out that can plug into a monitor? I think this would make it easier to watch the table and less taxing on the individual tasked with monitoring the stray beams.

- The CCD cameras we already use are sensitive to infrared.



# Miscellaneous

---

Is there a need for smoke detectors, warning strobes or to be part of the existing fire alarm system? The strobe tied to the existing system to alarm should another part of the building be burning.

- Standard practice with smoke detectors, warning lights ... etc will be consistent with state and local codes, as exists for any other occupiable space.