

**Lessons Learned:
Incomplete FEL Lab Sweep
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Workshop

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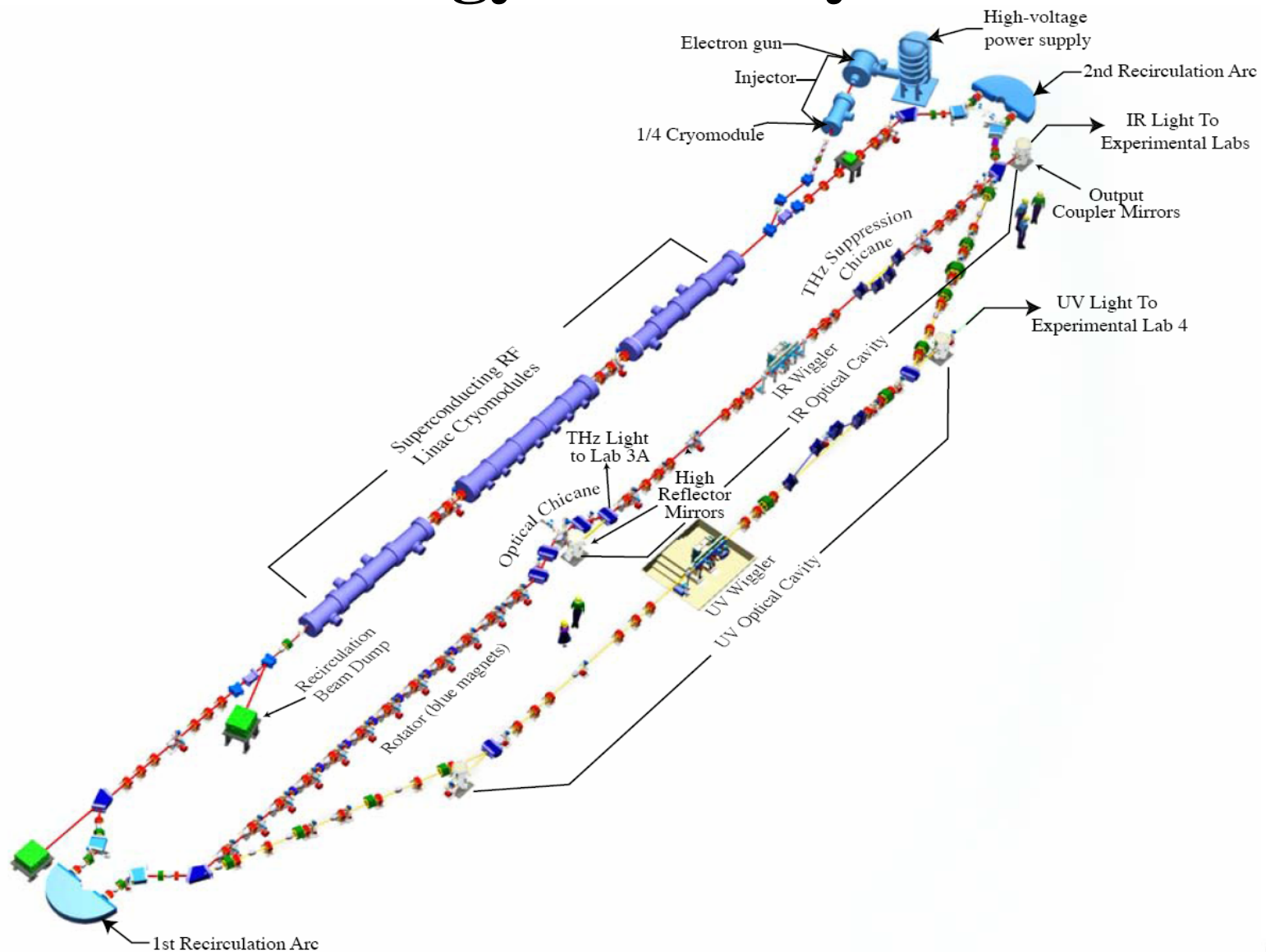
- During laser operations in the Jefferson Lab Free Electron Laser (FEL) Laboratory #1, control room staff unexpectedly discovered the presence of a worker in the laboratory. This discovery was made after a sweep to remove all workers was performed and laser operations were underway.

JLab Accelerators

- 6 GeV CW Recirculating Linac
 - Basic Research
- THz-UV 10kw CW Free Electron Laser
 - Basic Research
 - Applied Research



JLab FEL Energy Recovery Linac

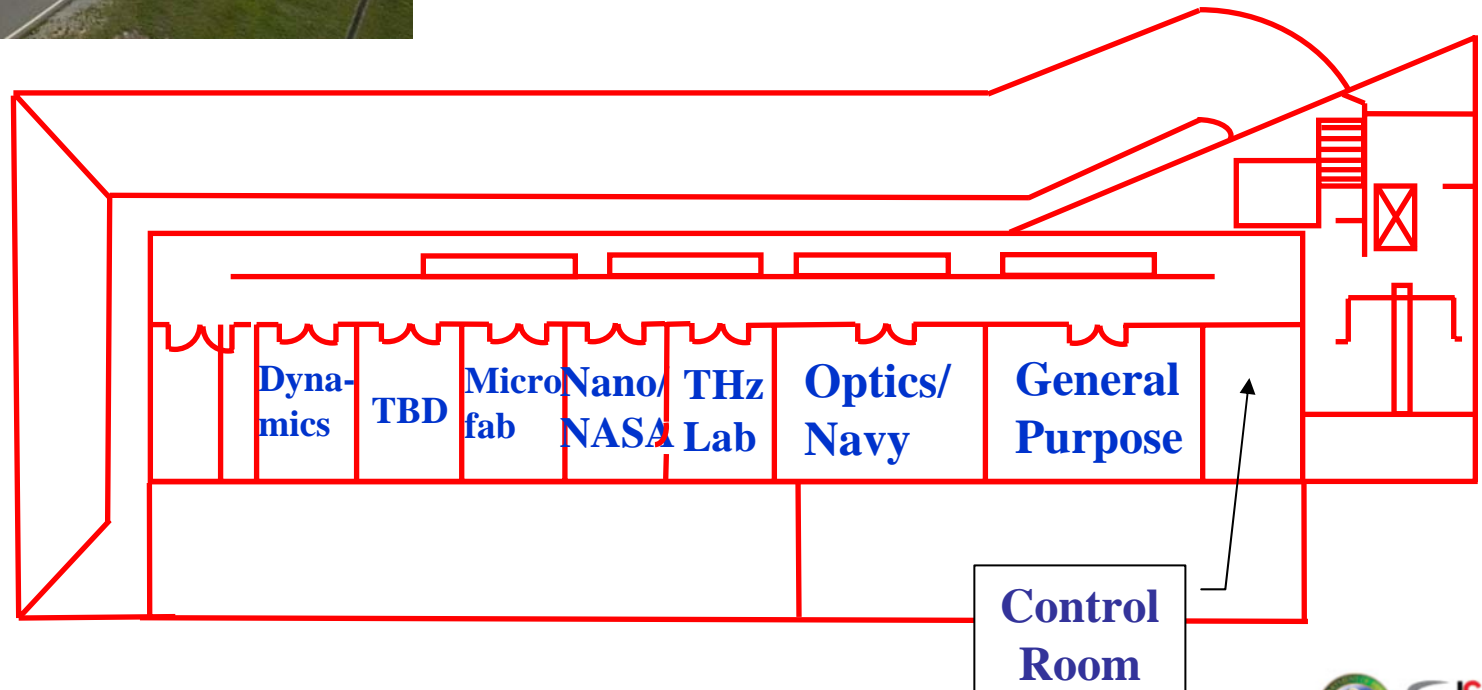


The JLab FEL User Facility

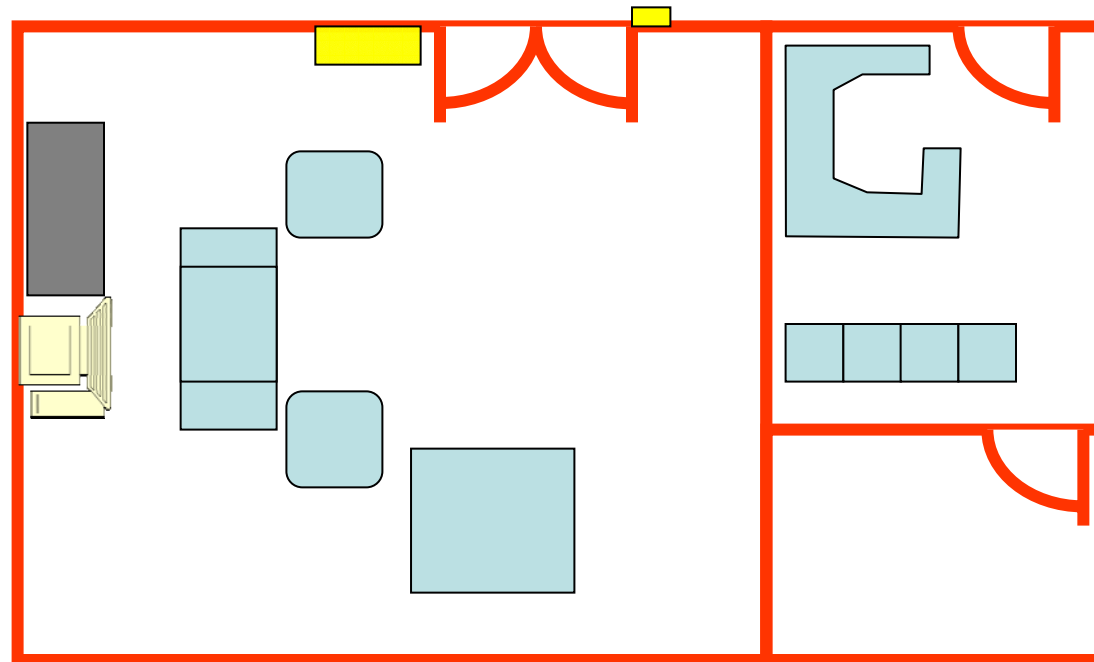


Current User Facility has 7 Labs

- Lab 1 General set-ups and prototypes
- Lab 2 Initial propagation studies
- Lab 3 THz dynamics and imaging
- Lab 3b NASA nanofab
- Lab 4 Aerospace LMES
- Lab 6 FEL + lasers for dynamics studies

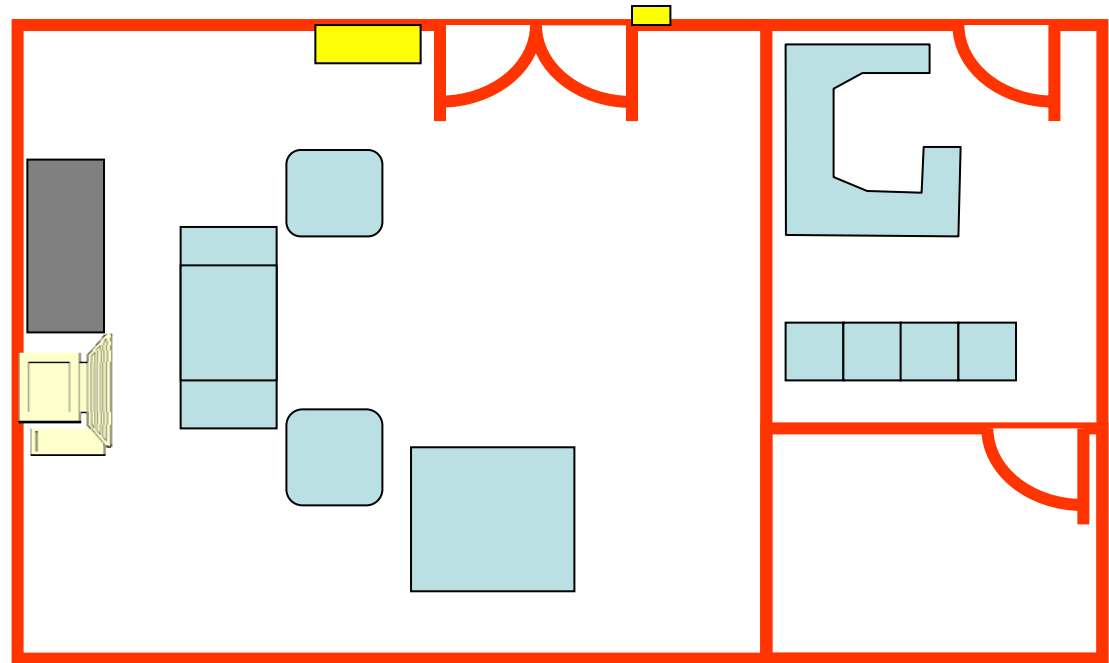


Lab 1 and Control Room



Event

- Operations underway
- Dropped sweep for adjustment by laser personnel
- User followed in to access his PC
- After laser personnel left, operator entered and performed minimal sweep
- User did not hear sweep alert
- Lab armed, User heard pre-ops alert
- Exit button on door bypassed, would not unlock
- Laser operations started
- User flicked lights on/off to get operator attention
- Operator saw lights and pushed crash
- Crash released door lock and User exited.



View from door



View from workspace



Position of user at computer workstation in Lab 1. This view is from the right-rear corner of the lab.

Circumstances

- JLab did not require User to have lab specific training for open access.
- Multiple roles and responsibilities – no one person responsible for oversight.
- LSS designed and installed when lab was empty.
- Exit switch was designed for sweep procedure exit, not emergency exit.

Lessons Learned

- Training for special hazard environments, such as laser labs, needs to ensure people understand the consequence and significance of alarms.
- Emergency egress scenarios need to be considered in lab interlock design. In this event, laser lab door signage and hardware were inconsistent with function and did not allow prompt egress.
- Sweep techniques must adapt to the changing room configuration. There was an obstruction created after the experimental setup was first approved.
- A persistent problem with administrative controls in safety systems is that their effectiveness depends on the diligence of the person enforcing the control.

Lessons Learned

- Some people do not like to hit a crash switch if that action is not included in their training.
- “Success” oriented planning may lead one to omit or even preclude consideration of plausible accident scenarios

Actions Taken

- LSS redesigned
- Audible sweep tone and recorded announcement
- Sweep stations and programmed sweep pattern added
- Exit button after sweep crashes lab
- Pre-sweep added to procedure
- Two person sweep required
- Personnel training, to include lab specific training, keyed to badge reader
- One person responsible for all laser operations