# ELI Beamlines – Facility Operation and Lessons Learned

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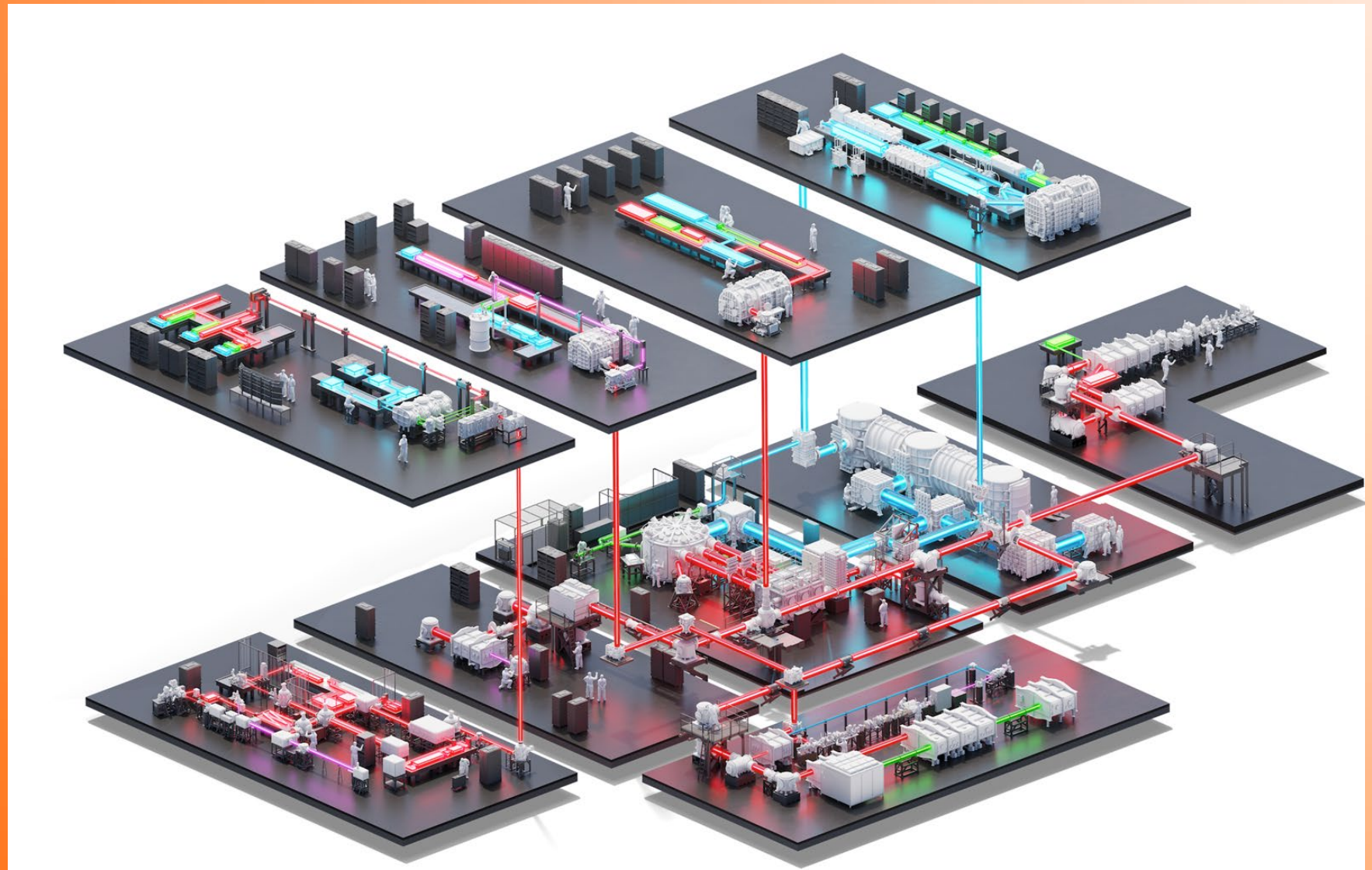
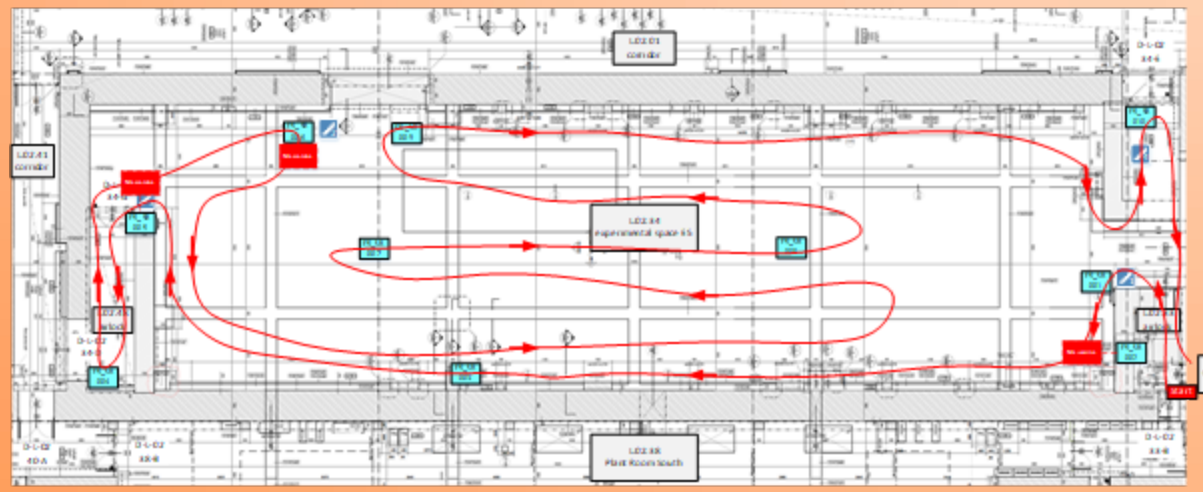
# ELI Beamlines Facility Layout



# Operation in the experimental halls

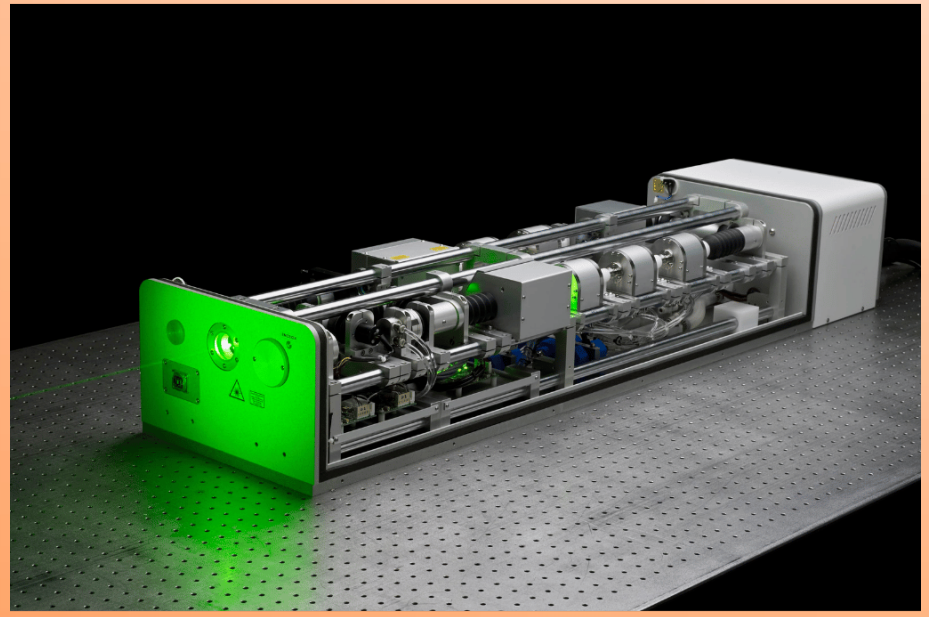
- Elevation of the hall status
  clear mode – alignment mode – high-power mode
- Alignment mode
  - Search procedure
  - Standard access with laser safety glasses
  - Low power laser beams, no ionizing radiation
  - Interlocked power sockets for lasers
- High-power mode
  - Search procedure
  - No access
  - High-power beams
  - Possible ionizing radiation
  - Interlocked power sockets for lasers



# 1. Installation of the laser shutter

- Nd:YAG laser, 2nd harmonic, installed in the hall with NIR wavelength ranges using green laser safety glasses
- Additional safety measures include powering the laser via an interlocked socket
- The power is shut down during the search procedure, but the laser must have continuous power
- The hall team reconnected the laser to the non-interlocked socket

- Solution: installation of the laser shutter on the laser exit aperture



# 2. Underestimating people

- Complex experimental hall
- Regular maintenance of the Legend laser (Coherent)
  - Work in clear mode of the hall
  - Open laser cover
  - Wavelength outside the standard range in the hall
  - Additional safety controls
    - warning signs
    - solid partitions
    - different laser safety glasses
    - infoemails

# 2. Underestimating people

- Technical visit of approx. 15 people
- People spread out within the hall
- Two persons entered the restricted area
- One person stated: „I saw the warning sign, but I ignored it; I thought it was obsolete. “

- Solution: installation of an additional retractable belt barrier – physical barrier

# 3. Users

- User campaign in the experimental hall
- Approx. 10 users in the team
- The area manager caught team members several times without laser safety glasses in low-power mode, where the protocol requires wearing them
  - Laser safety glasses worn on top of the head in the hall
  - Entering the hall without laser safety glasses – young researcher forgot to put them on
  - User sitting next to the interaction chamber while operating an oscilloscope without glasses

Solution?

In this case – escalation, interruption of the campaign, limiting the number of users in the hall, additional training

In general – I do not know

# 4. Laser welding

- Testing of a new welding technology
- Work in a confined space
- Multi time reflection of the beam
- Burn marks on the clothes, surrounding surfaces and glasses

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- Solution:
  suspension of work
  risk analysis
  PPE
  Standard Operational Procedure
  Laser welding training

# 5. Low power laser

- Alignment mode of the experimental hall
- Researches with the glasses on top of their heads
- Possible approach:
  1. Escalation to the line management
  2. Investigation, understanding, revision
- Solution:
  - investigation – alignment HeNe laser with 17 mW power
  - understanding – whole hall must be elevated to alignment mode for 17 mW laser, the hall, where 10 PT laser is operated
  - revision – instalation of the neutral density filter to the exit aperture of the HeNe laser to decrease its power below 5 mW and plug it to the standard power socket
  - it is possible to use the laser without elevation of the hall and without the glasses

# 6. What will be next?

- Hopefully no injury.