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Joint Universities Accelerator School
Radiation Safety

Part D. Radiation Safety Systems

1. Engineering solution
2. Administrative approach

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1. Engineering solution

THE PSS (Personnel Safety System)

also called PPS (Personnel Protection System)

PSS Objective:

- NOBODY is left inside the Bunker + Tunnel+BLs
- NOBODY receive more that 1 mSv/year

PSS Patrol (2 + 1 persons / 1 person):

- Training
- Responsibility in each 'search button'
- MUST guarantee that NOBODY is left IN

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3. PSS - BASIC DESIGN

❖The PSS should be implemented following the IEC-61508[1] standard, covering all the cycle life of the system.

✓Main technical specs:

- •Scope: LINAC, booster, storage ring & BLs
- •SIL-3: redundant and diverse
- •PLC based
- •Modular structure: LINAC + booster+ storage tunnel & BLs
- •3 cabinets

✓Main installation's supplies:

- •Hardware: SIL3-PLC, emergency buttons, etc.
- •PLC code
- •Installation
- •Certification (by an external company)

[1] *Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems*

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- PSS components control:
  - ✓LINAC:
    - e- Gun
    - RF klystron
    - Bending magnet
    - Bremsstrahlung shutter
  - ✓Booster:
    - RF IOT
    - Specific magnets (dipole and/or quadrupole)
  - ✓Storage Ring:
    - RF IOTs
    - Specific magnets (dipole and/or quadrupole)
  - ✓Front End:
    - Photon & Bremsstrahlung shutters
  - ✓BLs:
    - Safety shutters

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THE PSS (Personnel Safety System)

The access to the Tunnel is controlled by:
(you will get the permission from)

The PSS (no permit at all):

When the PSS cabinet light is RESTRICTED, INTERLOCKED or BEAM ON

- When the Search Starts: sound + message + light -> **LEAVE THE BUNKER / TUNNEL IMMEDIATELY**

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PSS: CONTROL TUNNEL ACCESS

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1. Engineering solution

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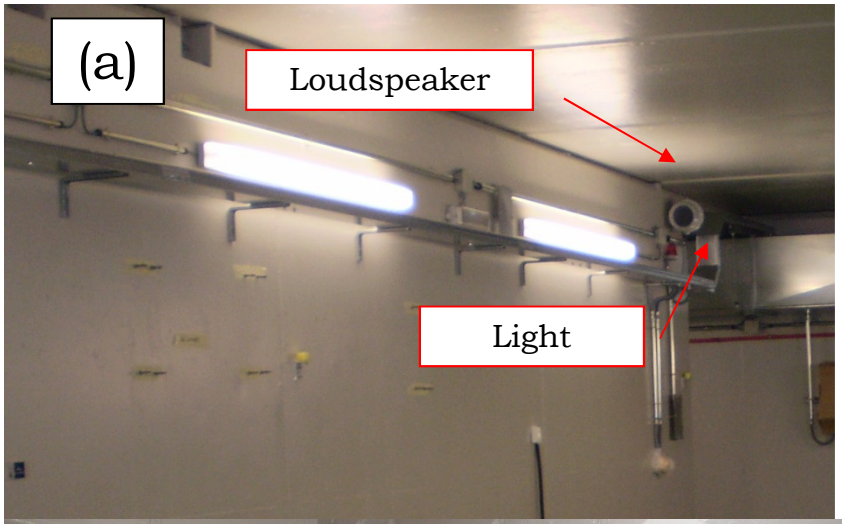
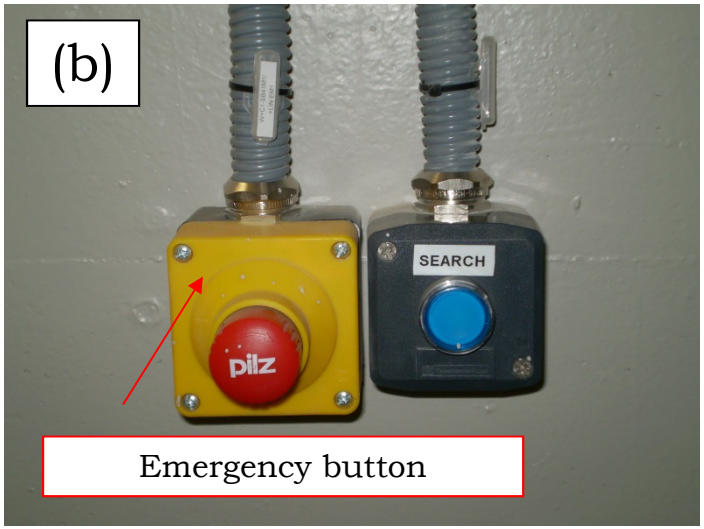
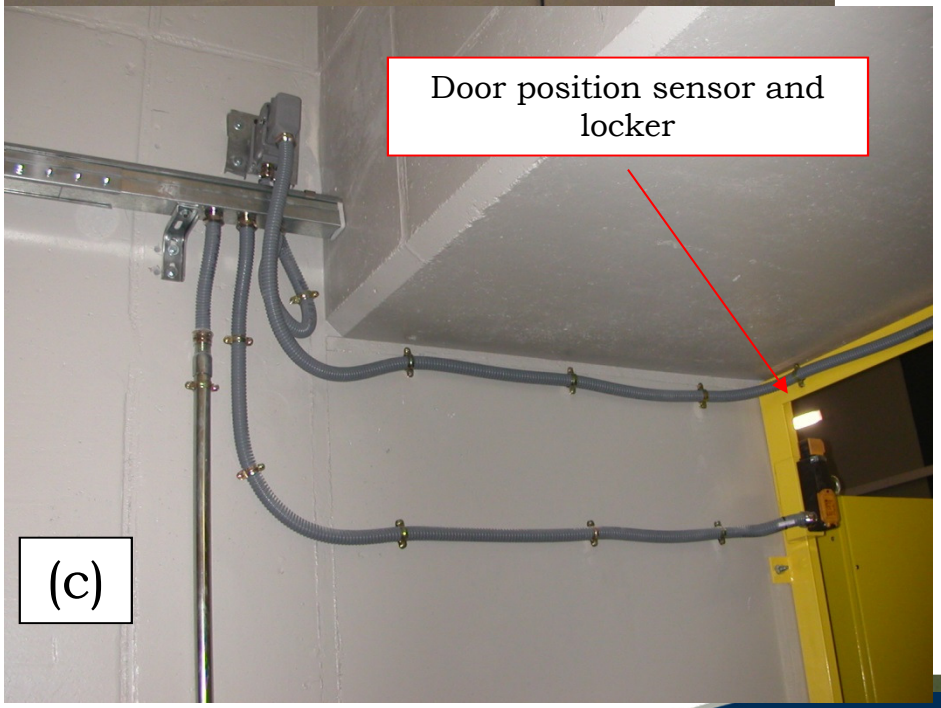
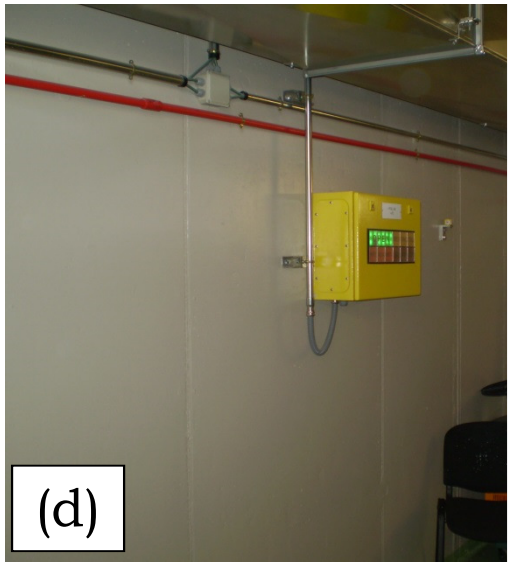
1. Engineering solution









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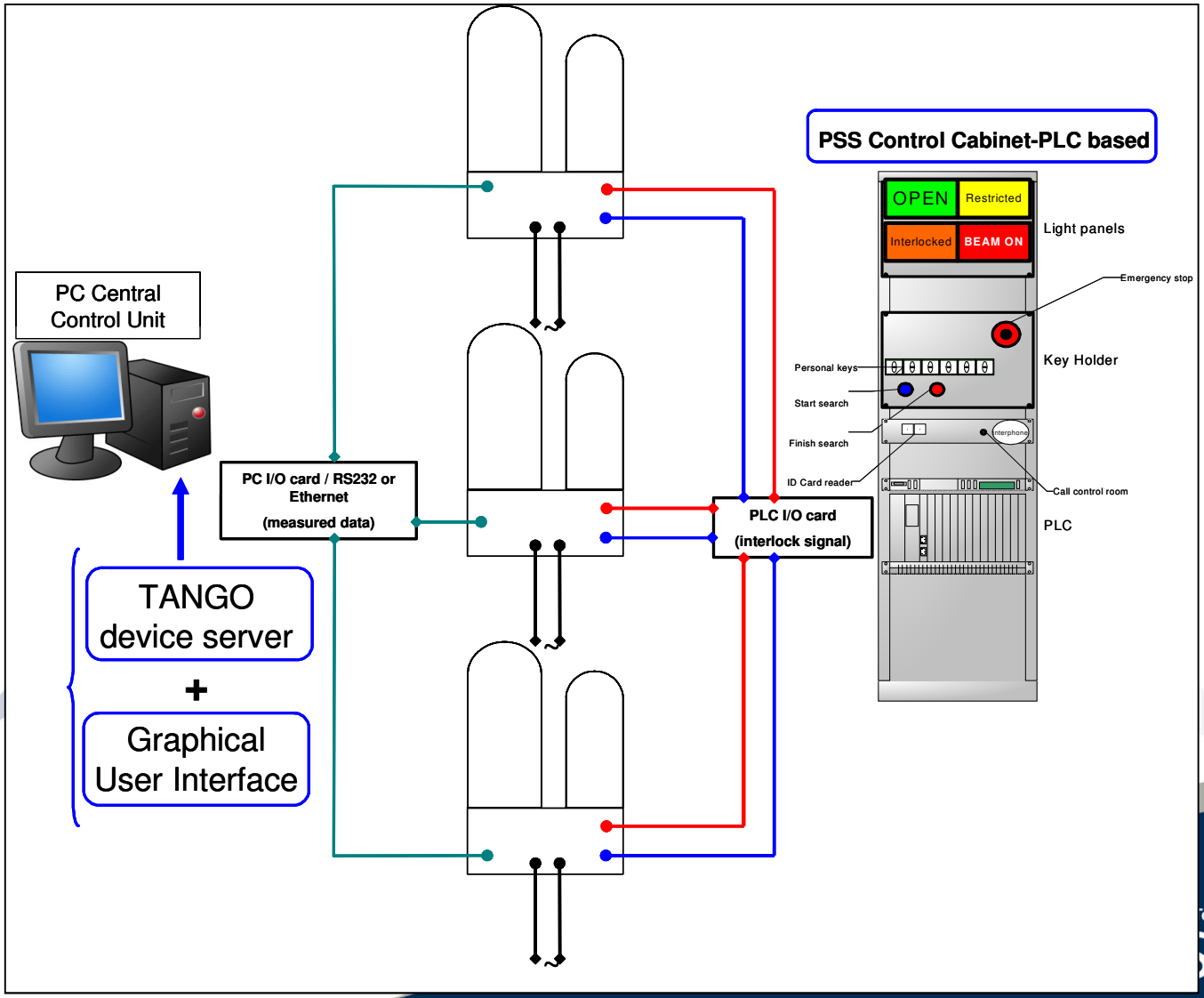
3. PSS - HARDWARE COMPONENTS

❖Radiation monitors network:



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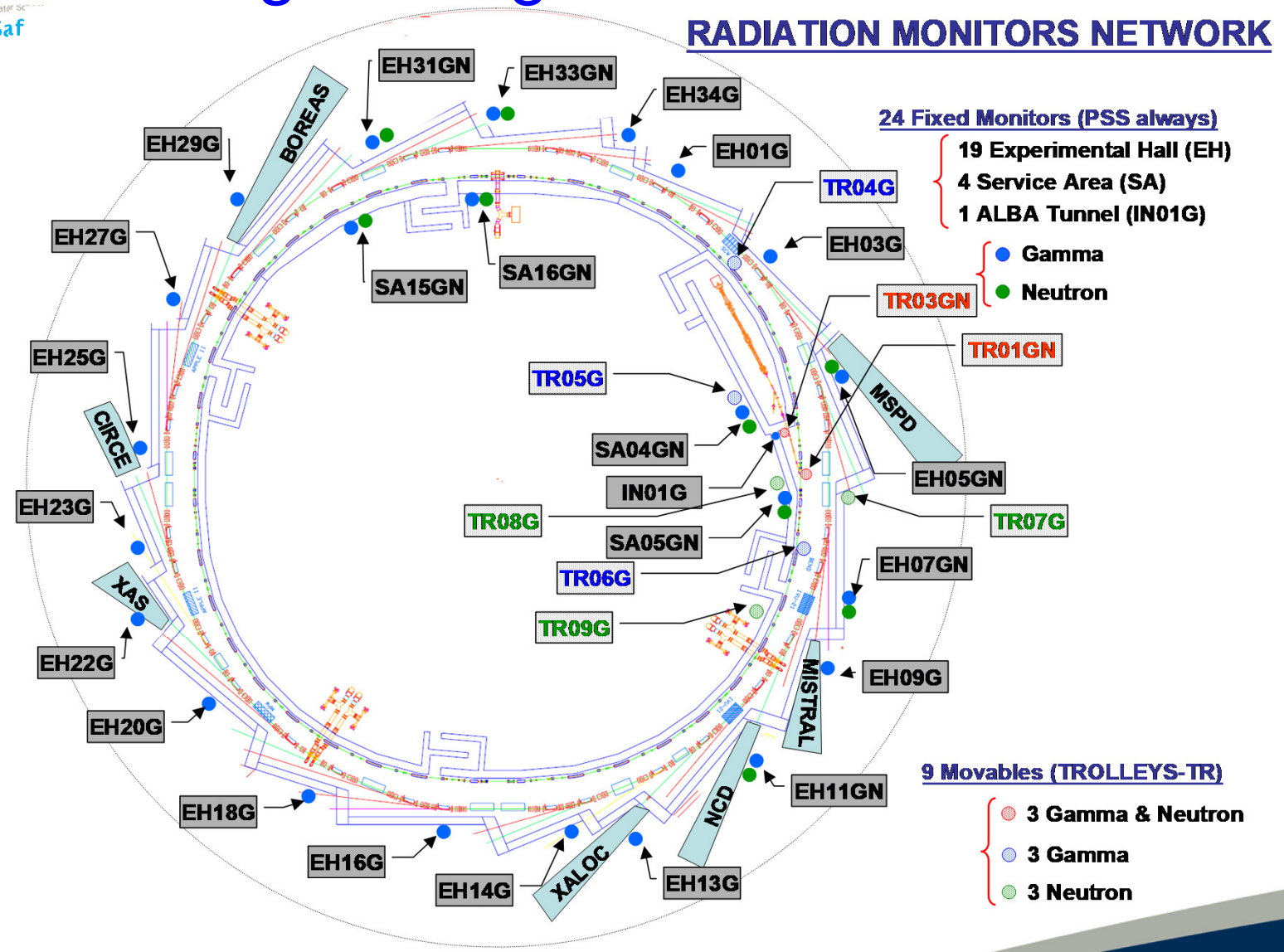

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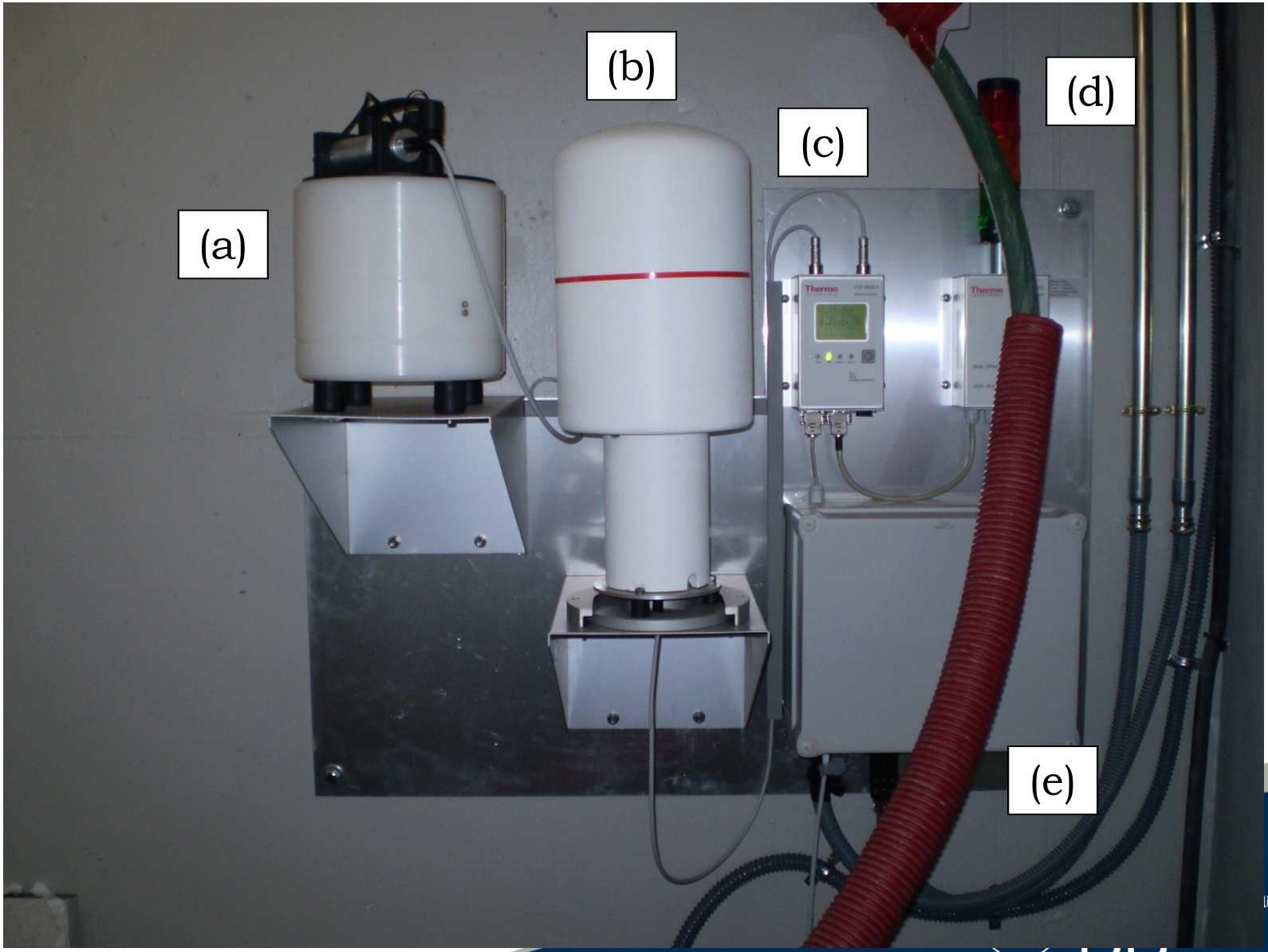

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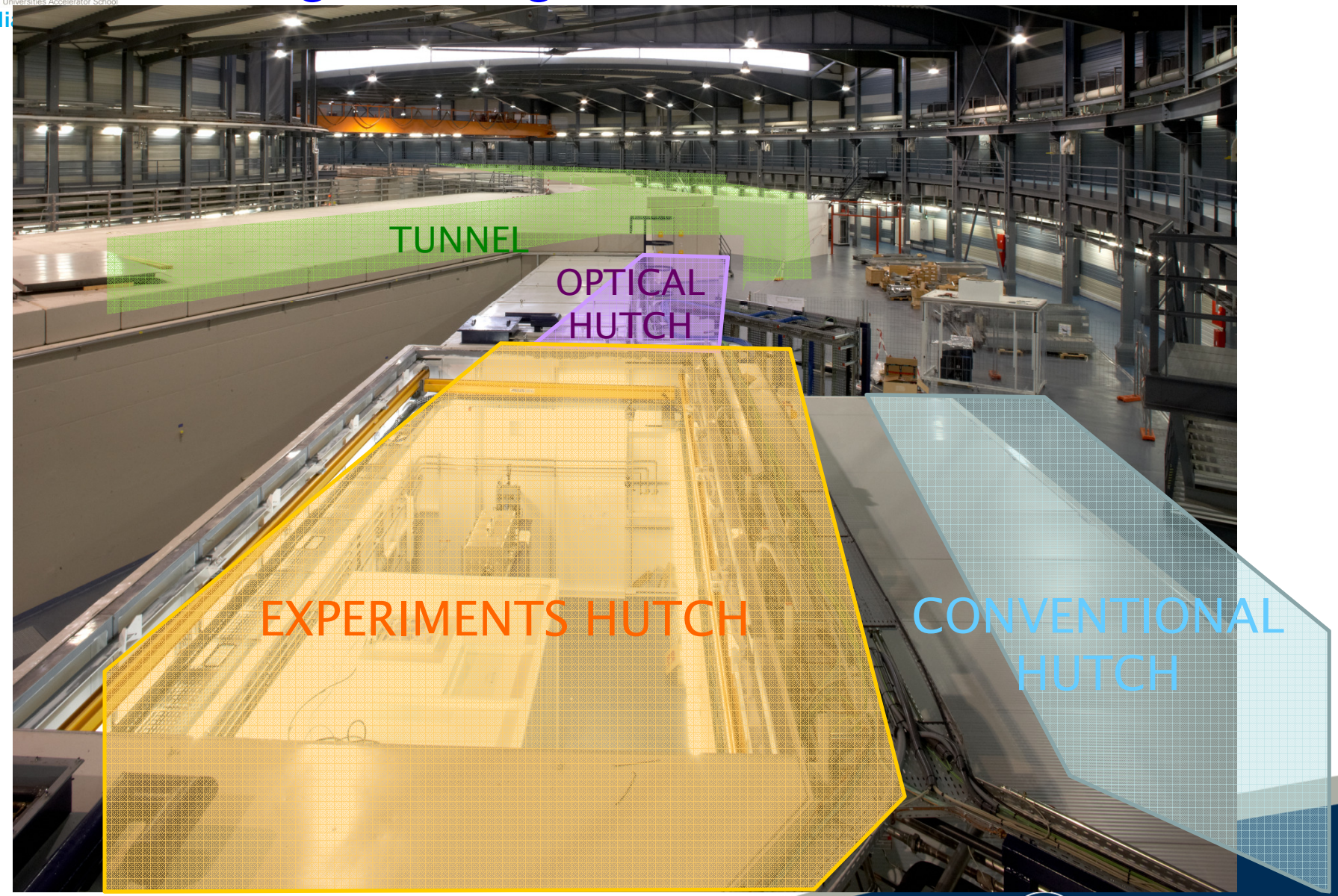

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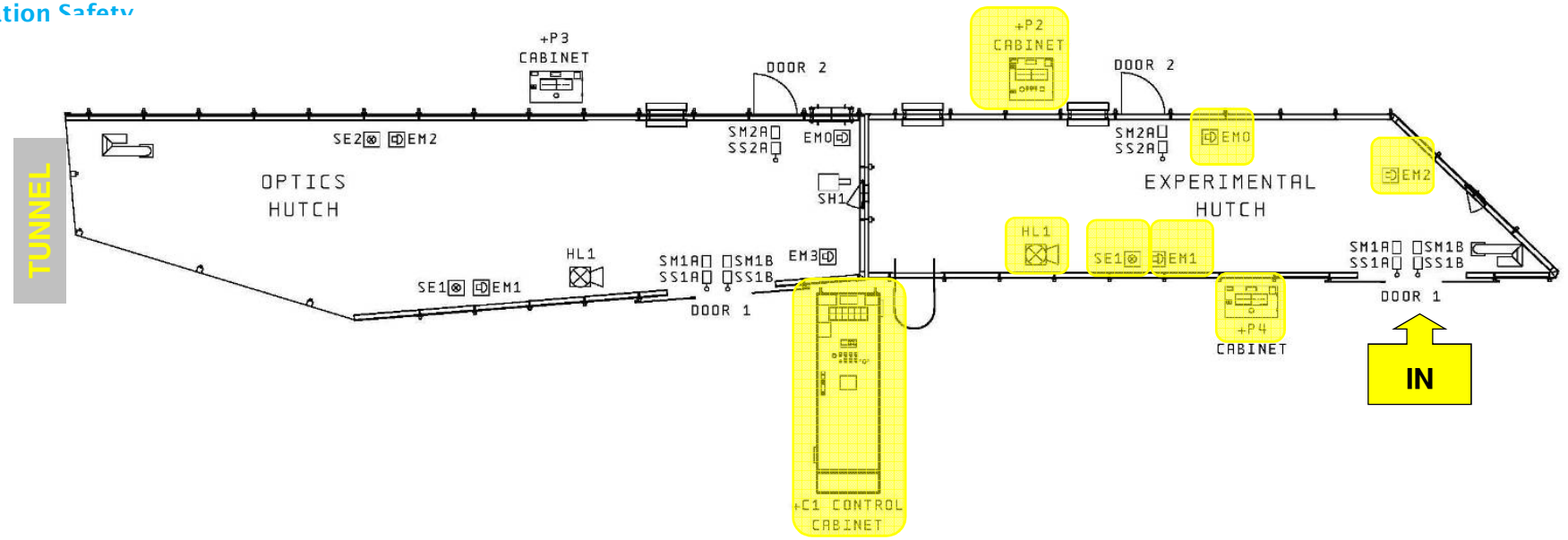


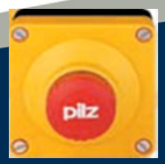
PSS Cabinets

Lead doors

Horns

Search buttons

Emergency buttons



2. Administrative approach

ACCESS TO THE EXPERIMENTAL HALL

FREE ACCESS

2. Administrative approach

ACCESS TO THE EXPERIMENTAL HALL

ACCESS WITH ELECTRONIC PERSONAL DOSIMETER

An Electronic Personal Dosimeter - EPD:

- Registers radiation received by an individual
- Is used as an additional backup for radiation control

2. Administrative approach

ACCESS TO THE EXPERIMENTAL HALL

USER ARE NOT AUTHORISED TO ENTER

2. Administrative approach

TWO RULES:

- ✓ Everybody in a Supervised/Controlled area MUST:
  - -Always wear a TLD dosimeter (all workday) and:
    1. Take your TLD always with you in a visible place.
    2. Do not knock it.
    3. Do not warm it up, ie do not put next to a heater
  - -Depending on the task use an electronic dosimeter
- ✓ Accelerators operation

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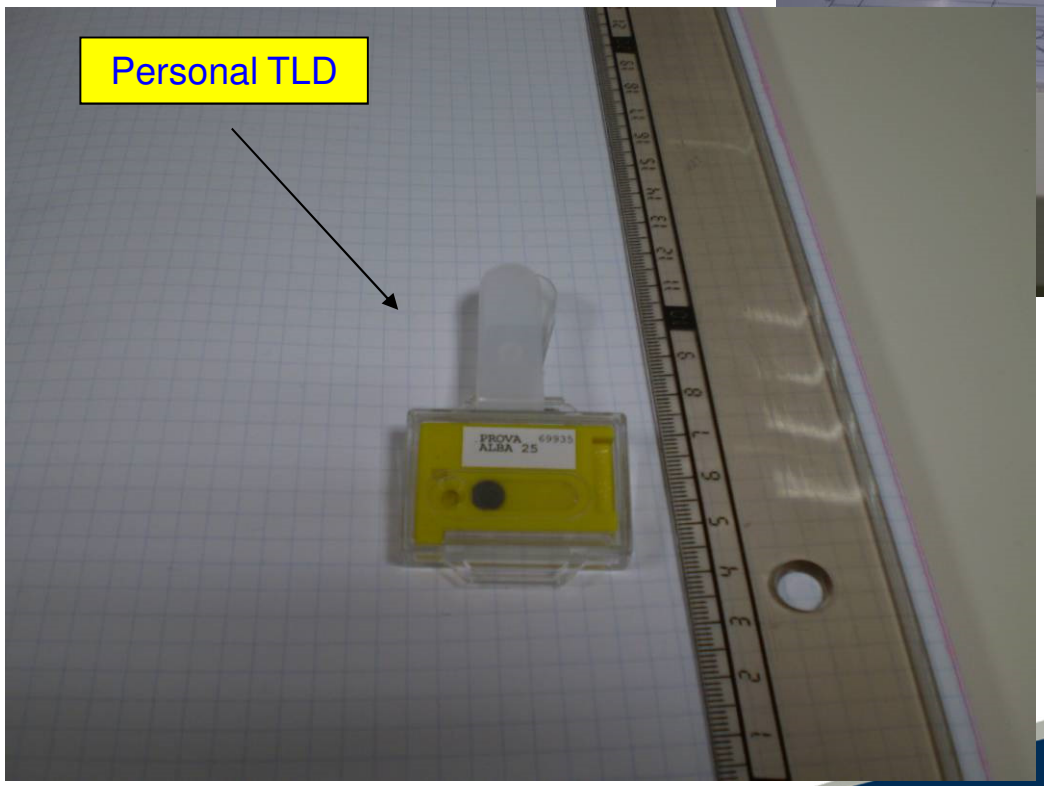

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➢Radiation Safety Protocol