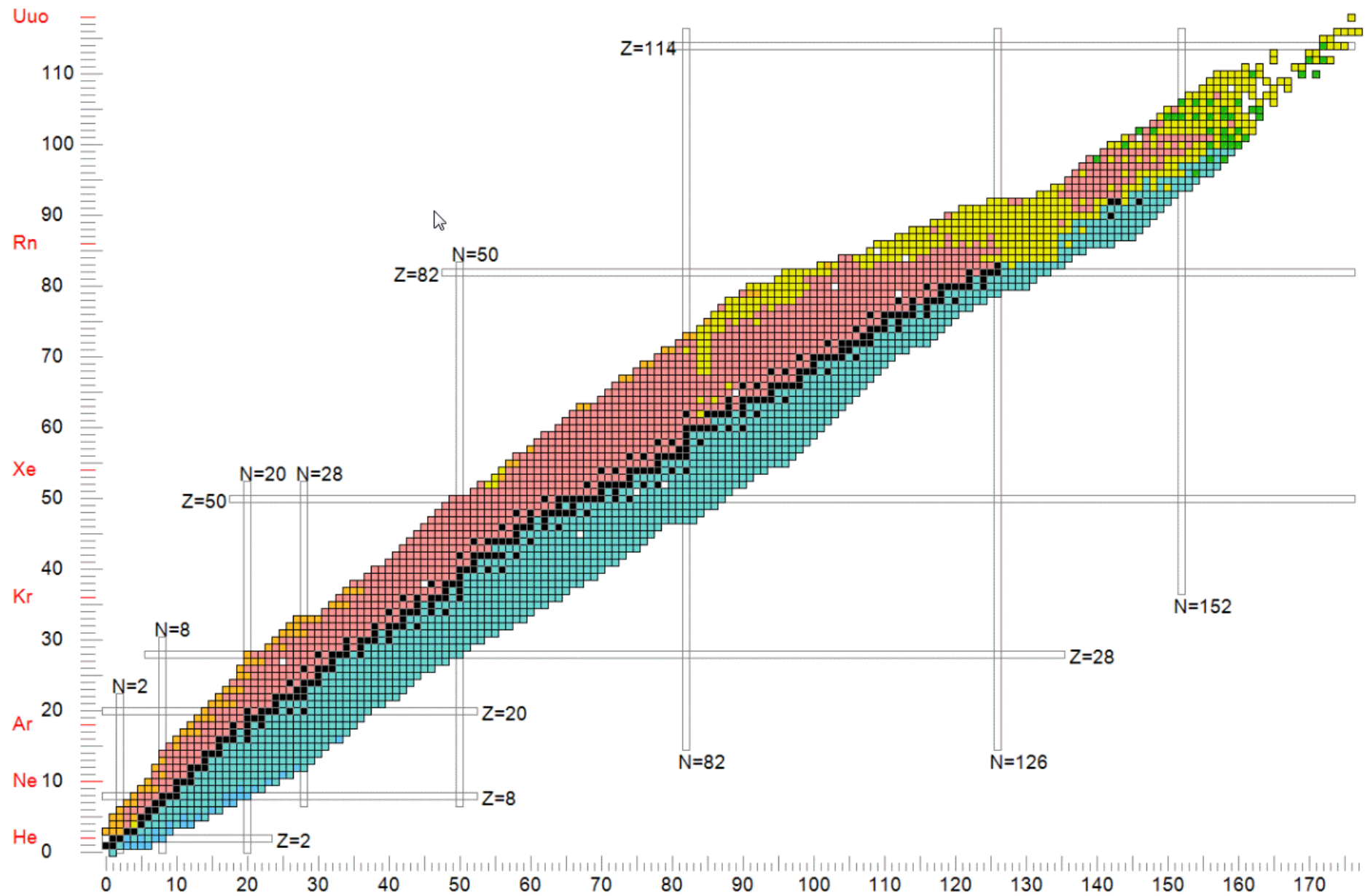




Radiation protection for Beamline for Schools

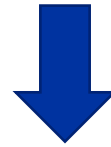
Arnaud Devienne, HSE-RP (Radiation Protection Group)

13 September 2024



Radiation protection - Basics

Ionising radiation may be harmful to human bodies



Radiation protection aims to protect humans against negative impact from ionising radiation.



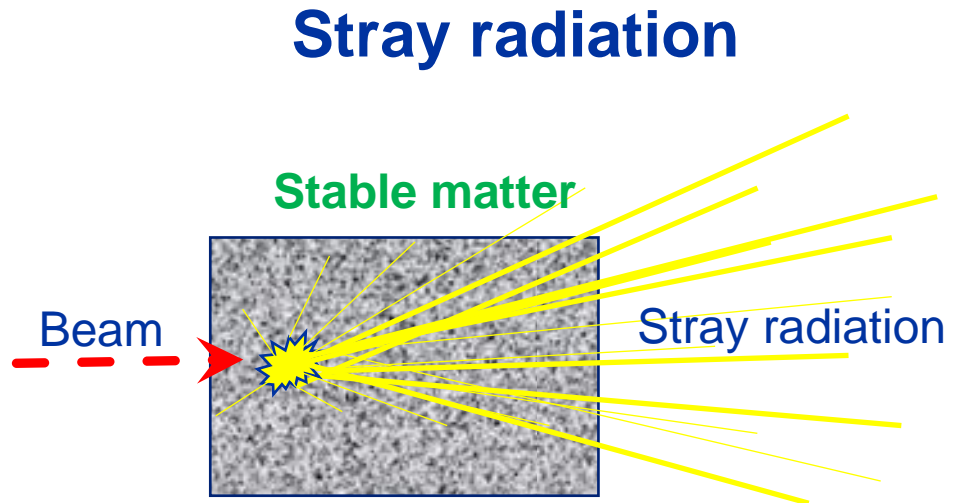
Radiation protection principles:

Justification – Limitation – Optimisation

Radiation at CERN

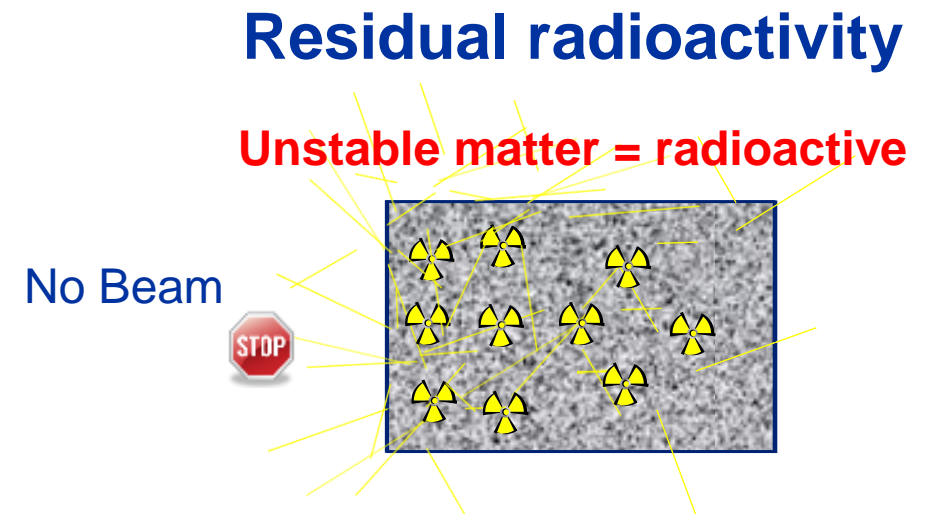
Accelerator operating

The interaction of the beam with matter generates stray radiation

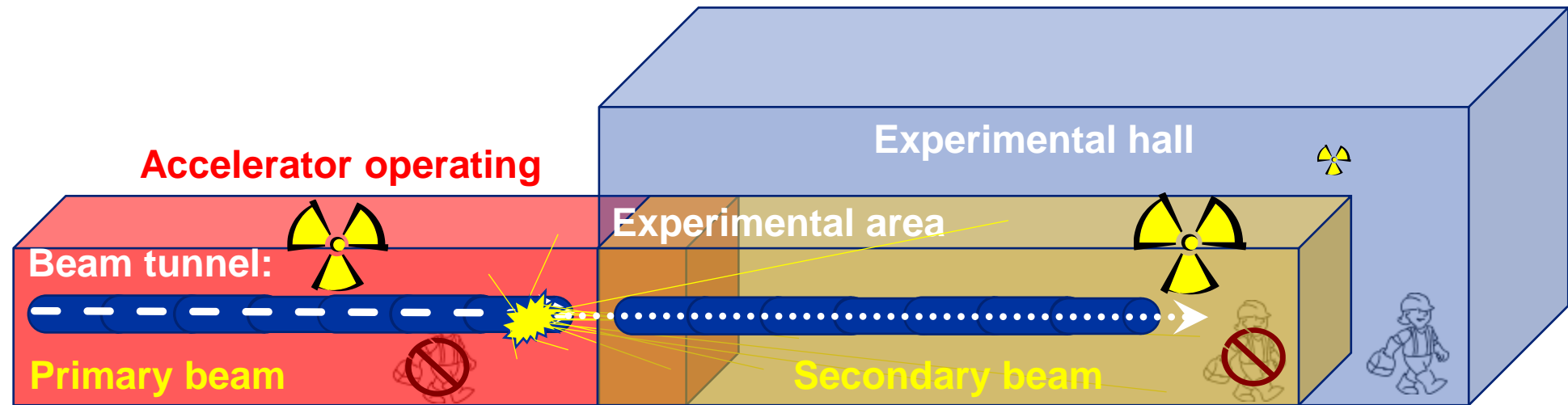


Accelerator stopped

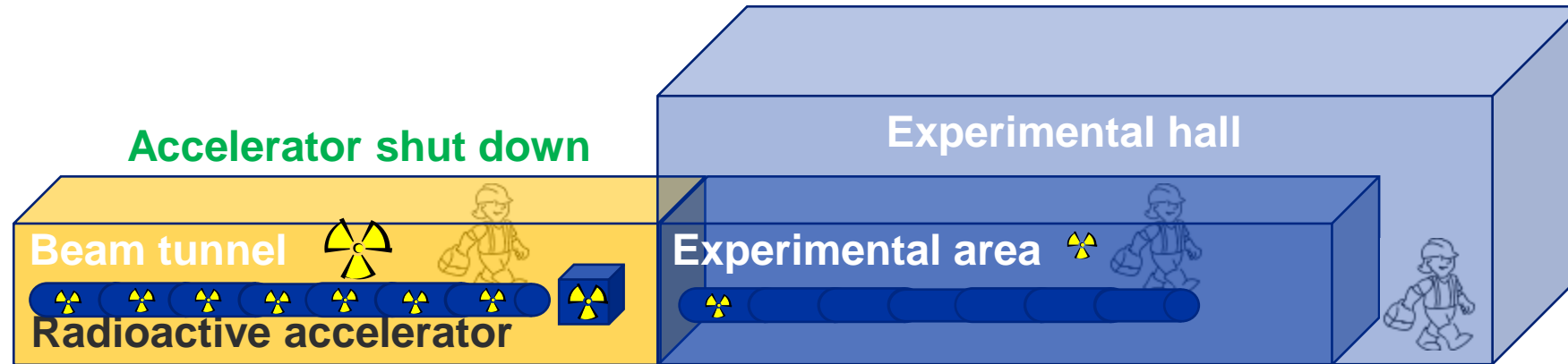
The interaction of the beam with matter has produced radioactivity (activation)



Ionising radiation in and around accelerators



Ionising radiation in and around accelerators

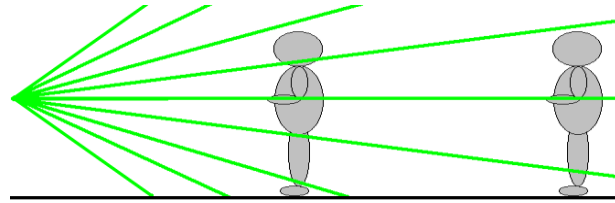


Radiation protection - How to protect yourself



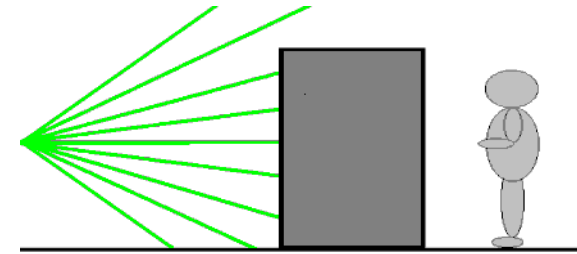
TIME

If you **reduce** the exposure time, you reduce the dose.



DISTANCE

The further you **move away** from the source, the less the radiation you will receive.



SHIELDING

Adequate **shielding** will reduce the dose received. Specific material is necessary against each type of radiation. Concrete is effective against all types. Lead is very effective against low energy gamma radiation.

Radiation Areas at CERN

Areas with increased risk of ionizing radiation are classified as "Radiation Areas".

Radiation Areas at CERN are clearly marked with signs. Corresponding to the risk level, Radiation Areas are subdivided into:

	Supervised Area	Simple Controlled Area	Limited Stay Controlled Area	High Radiation Controlled Area	Prohibited Controlled Area
RADIATION					
RADIATION / CONTAMINATION					



The East Experimental Area is classified as Supervised Radiation Area (<math><15 \mu\text{Sv/h}</math>)

Radiation Protection – General rules

Do not perform activities which are not directly relevant to the work



In a Radiation Area it is forbidden to drink, eat or smoke.

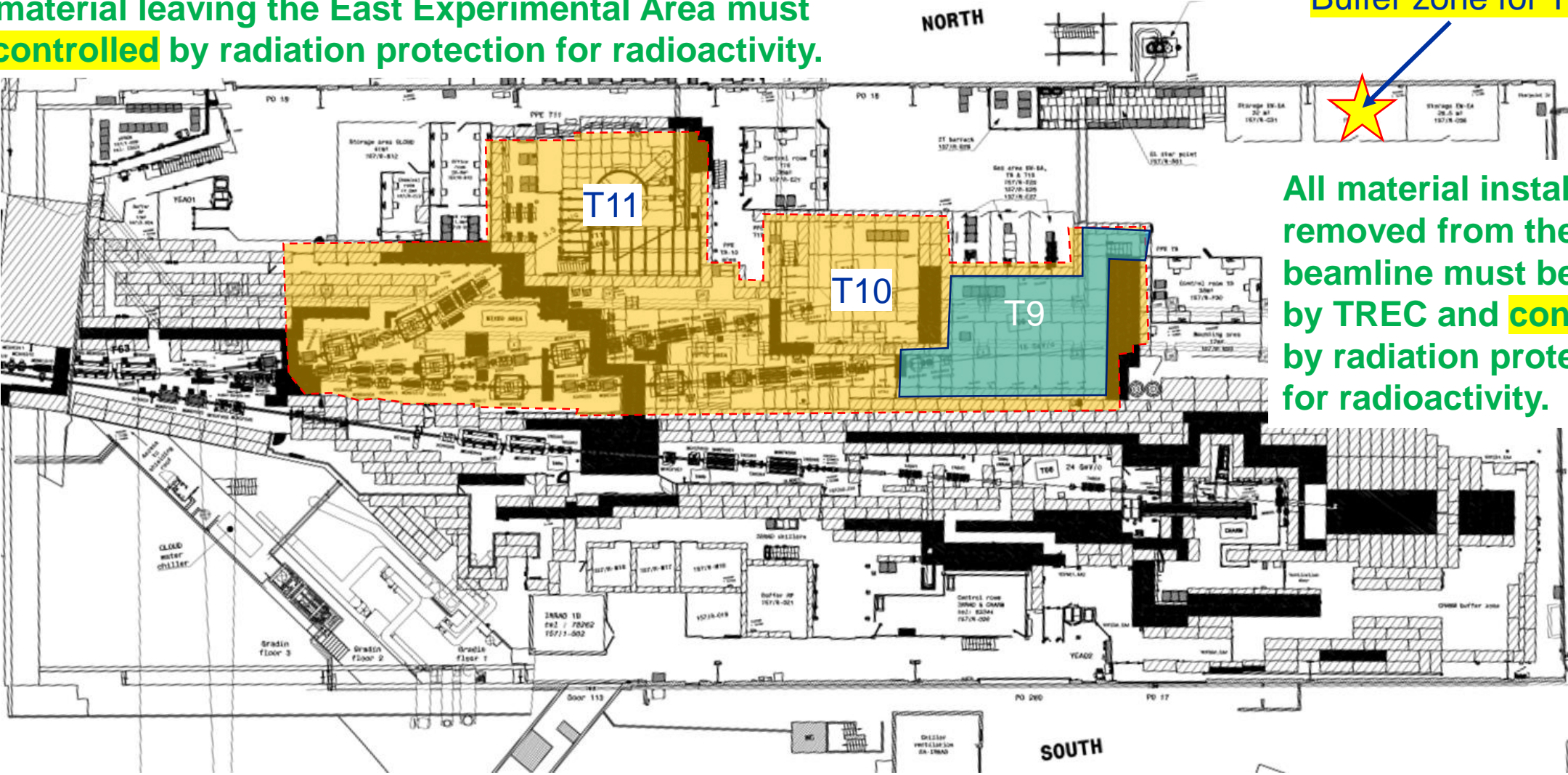


Respect delimitations, markings and information given on signs

Secondary beam lines T9, T10 & T11

All material leaving the East Experimental Area must be **controlled** by radiation protection for radioactivity.

Buffer zone for T9



All material installed and removed from the beamline must be **traced** by TREC and **controlled** by radiation protection for radioactivity.

CERN Personal Dosimeter

The personal dosimeter at CERN:

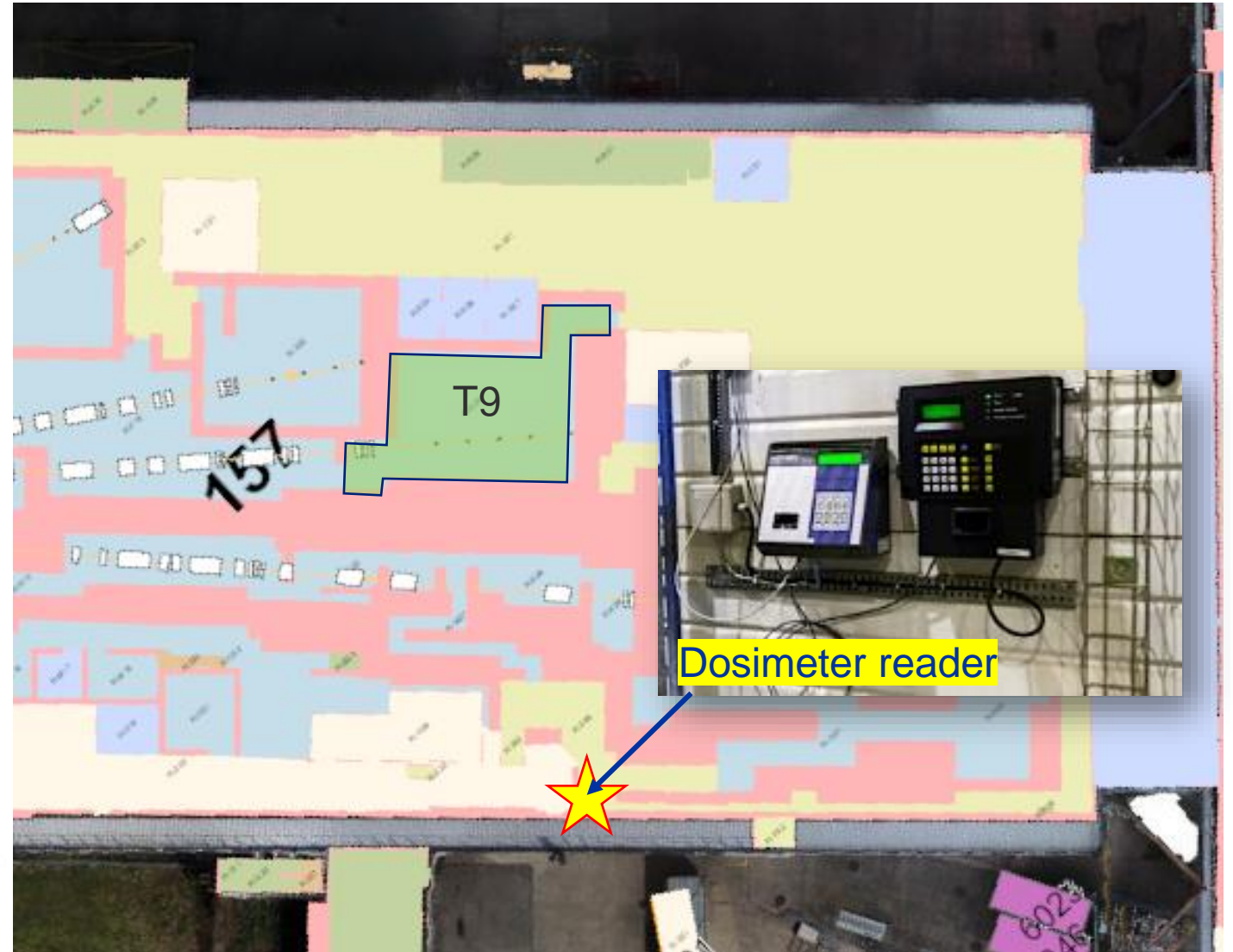
- Mandatory in Radiation Areas
- Assigned to a person
- Non-transmittable
- Dosimeters will be handed out after successful radiation protection training
- Dosimeters can be read out by yourself using dosimeter readers

Dosimeter provide a measure for the energy deposited in the body by ionising radiation.

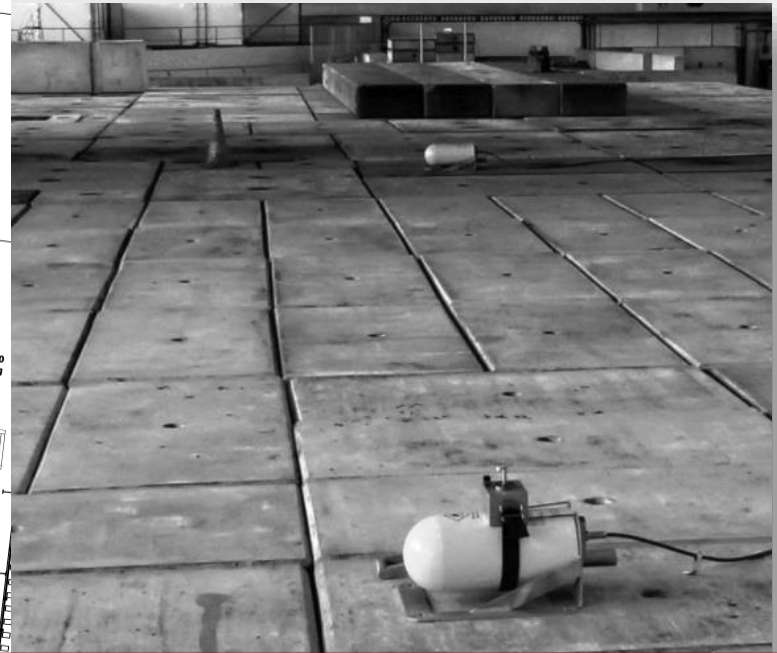
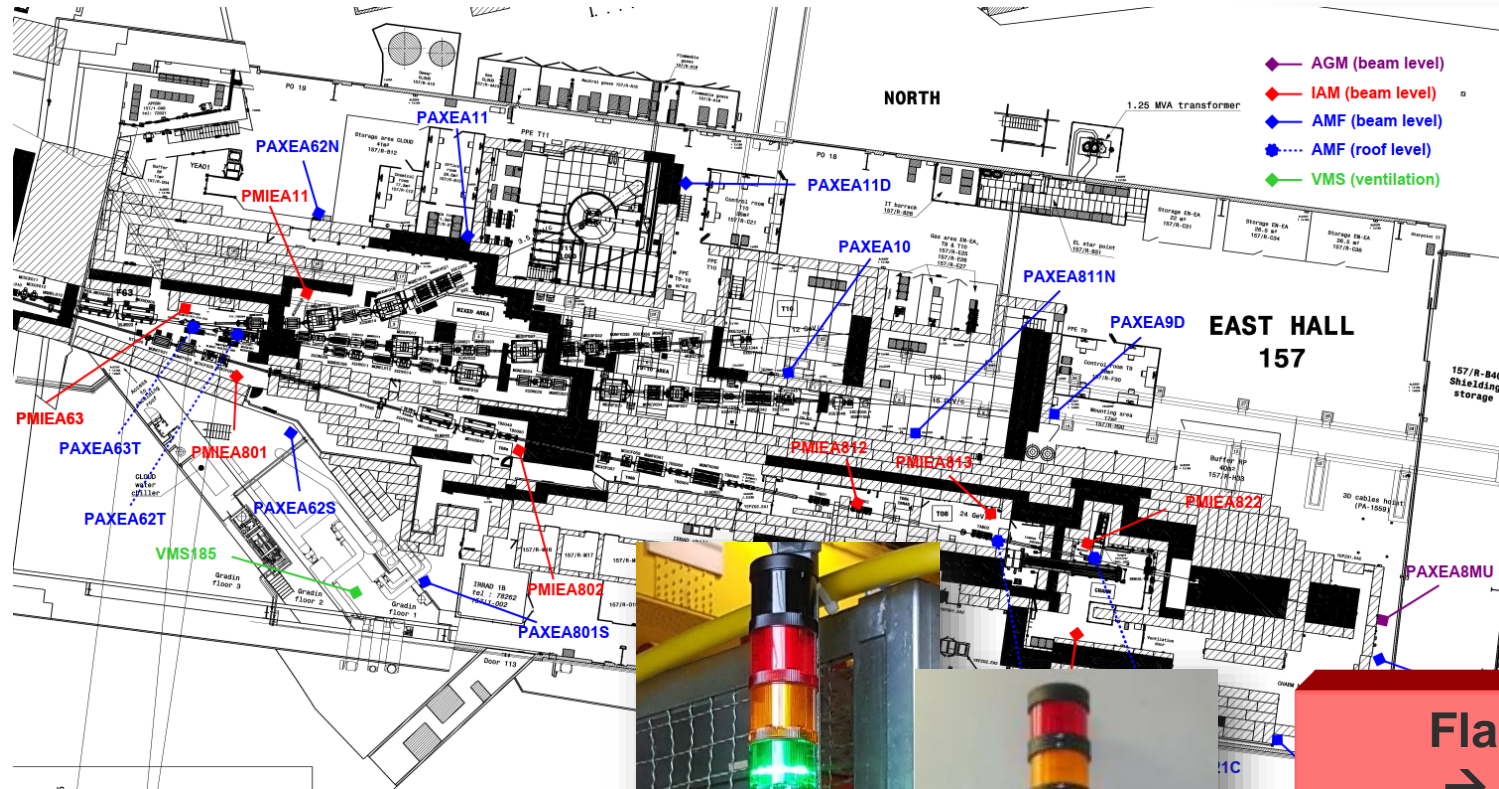
RFID Chip

Neutron dosimeter
(PADC CR39 detector)

β/γ dosimeter
(DIS detector)



Radiation monitoring and alarm displays



- Flashing RED light + Audible ALARM
→ Leave the concerned area calmly
- Flashing ORANGE light + WARNING SOUND
→ Limit your stay in the concerned area
- Continuous green light = NORMAL situation
(low radiation levels, system OK)

Summary

- **All under control !**
 - Limit your time inside the radiation area
 - Wear your personal dosimeter at all time
 - All material leaving the experimental area must be measured by the radiation protection service
- **Any questions ?**
- **Enjoy your time at CERN and have a successful experiment !**



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