



HSE

Occupational Health & Safety
and Environmental Protection unit



TREC in experimental areas & Radiation Monitoring System in experimental areas

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Guidelines

- Every material **leaving a beamline** has to be **traced in TREC** and **controlled by RP**
- Every material **leaving a radiologically classified building** has to be **controlled by RP**

Workflow



- Identify the material (traceability stickers) **before** installing in the beamline. **Trace reasonably** (i.e. do not use one code per screw)
- Do the request **well in advance**, with indication of the time when the material will be available for the measurement (measurement deadline). Use comments in TREC if needed
- Deposit the material in the Buffer Zone, if possible. Otherwise, call the RP Officer (**Meyrin: 72504, Prévessin: 75252**)
- **Sign the EDH** created by TREC, and **wait for the RPO signature** before leaving the building
- **Update the location** of your equipment when it has been transported

Information for radiological clearance

- To be able to accurately and efficiently classify your equipment, we need to know:
 - The type of beam
 - Particle type (e.g. protons, Pb ions, pions, muons, electrons, etc.)
 - Maximum particle energy (e.g. 400 GeV)
 - Maximum intensity (e.g. $5 \cdot 10^5$ particles per spill)
 - Duration of beam operation (e.g. 4 days)
 - Target type (thin (~ 1 cm) or thick ($\gg 1$ cm), if applicable)
 - The type of material
 - Material composition (e.g. steel, aluminum, copper, tungsten, PCB, etc.)
 - The location of the material
 - Approximate distance of beamline to equipment
 - Presence of in-beam material (yes / no)

Layout of the areas – North Area

North Area

- 2 Buffer Zones available
- TREC mandatory for equipment in beam lines*



* As depicted by red areas

RP Contacts

- RP contact available at: <https://espace.cern.ch/RP-LHC/DivDocs/RP-AS-ContactsLastUpdate.pdf>
- Do not hesitate to contact the RPO of the concerned area
- Meyrin: +41227672504
- Prévessin: +41227675252

HSE-RP-AS (January 2022) Revision: 10/01/2022
CONTACT PERSONS

	Responsible / studies	Operational RP
LHC complex		
LHC – accelerator	Angelo Infantino Heinz Vincke	Christophe Tromel Safouane El Idrissi, (Angelito Herve)
LHC – experiments	Robert Froeschl	Isabel Brunner Christelle Saury
SPS complex		
SPS – accelerator, T12/T18	Helmut Vincke	Angelito Herve Florent Philippon (Christophe Tromel)
SPS – target areas	Helmut Vincke	Yann Pira Frederic Aberle
AWAKE	Claudia Ahdida	Christelle Saury (Renaud Mouret)
HIRadMat	Helmut Vincke	Florent Philippon (Angelito Herve)
North experimental area	Claudia Ahdida	Frederic Aberle, Florent Philippon, Yann Pira
PS Complex		
Linac2, Linac3, LEIR	Markus Wadorski	Jean-Francois Gruber Mathieu Marcandella
Linac4	Markus Wadorski	Jean-Francois Gruber Mathieu Marcandella
PS Booster	Fabio Pozzi	Mathieu Marcandella Nadine Conan, (Fabien Cullier)
Isolde / Medicis	Fabio Pozzi	Alexandre Dorsival Elodie Aubert
PS - accelerator	Robert Froeschl	Nadine Conan Jean-Francois Gruber
East experimental area	Arnaud Devienne Robert Froeschl	Jean-Francois Gruber Nadine Conan
AD / GBAR	Claudia Ahdida	Mathieu Marcandella Jean-Francois Gruber, (Fabien Cullier)
n_TOF	Fabio Pozzi	Jean-Francois Gruber Nadine Conan (Mathieu Marcandella)
CTF3 / CLEAR	Markus Wadorski	Mathieu Marcandella, Fabien Cullier

(Names) in parenthesis are responsible only during absence periods

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CONTACT PERSONS

	Responsible / studies	Operational RP	
Other sites and facilities			
LIGHT	Markus Wadorski	Renaud Mouret (Isabel Brunner)	
Radioactive workshops	Markus Wadorski	Angelito Herve (PREVESSIN) Safouane El Idrissi (PREVESSIN) (Yann Pira) (PREVESSIN) Nadine Conan (MEYRIN)	
Radioactive storage		Yann Pira (PREVESSIN) Frederic Aberle (PREVESSIN) Jean-Francois Gruber (MEYRIN)	
Operational dosimetry	Frederic Aberle	Jean-Francois Gruber (MEYRIN) Christophe Tromel (PREVESSIN)	
Portiques	Markus Wadorski	Didier Alberto (PREVESSIN) Fabien Cullier, Jean-Francois Gruber (MEYRIN)	
RF tests areas (SM18, XBOX)	Markus Wadorski	Florent Philippon Renaud Mouret	
Central contact:		PS complex 72504 SPS/LHC complexes 75252	
Frederic Aberle	161607	Angelito Herve	163168
Claudia Ahdida	164145	Angelo Infantino	165173
Didier Alberto	160649	Mathieu Marcandella	168926
Elodie Aubert	169097	Renaud Mouret	166612
Isabel Brunner	164401	Yann Pira	166071
Nadine Conan	160641	Florent Philippon	167992
Fabien Cullier	169589	Fabio Pozzi	166258
Arnaud Devienne	165550	Christelle Saury	162238
Alexandre Dorsival	164834	Christophe Tromel	163199
Safouane El Idrissi	168638	Heinz Vincke	165456
Robert Froeschl	160058	Helmut Vincke	163701
Jean-Francois Gruber	169144	Markus Wadorski	163758

(Names) in parenthesis are responsible only during absence periods

Reminders (often forgotten)

- The TREC code follows the equipment part until the end of his life
- Record your request in TREC
- Indicate a responsible person who is at CERN and available to sign in EDH
- Sign your EDH
- Wait until RPO signature before leaving
- In case of urgency, contact the RPO
- For specific cases, contact the RPO

Questions?

Content

- TREC

- Guidelines
- Flow
- Layout of the areas
- RP Contacts
- Reminders

- **Radiation monitoring**

- **Radiation monitoring system**
- **Possible sources of radiation alarms**
- **Recommended actions in case of radiation alarms**
- **Q&A**

Radiation monitoring system

- Radiation monitoring system
 - ensures that radiation levels are compliant with the Radiological Area Classification
 - detect (and, if needed, terminate) degraded operation conditions
- Ambient dose equivalent rate averaged over a predefined time window
 - Typical time window length $\geq 90\text{s}$ (~ 2 PS super-cycles)
- Two alarm thresholds
 - Alert \rightarrow visible and audible alert and sent to CCC
 - Alarm \rightarrow visible and audible alarm and sent to CCC + interlock beam
- The actual alarm threshold settings are derived from the Radiological Area Classification Limits
 - Supervised Radiation Area – Low Occupancy: $15/30 \mu\text{Sv/h}$
 - Supervised Radiation Area – Permanent Workplace: $3/6 \mu\text{Sv/h}$

Radiation monitoring system in EHN1

- In EHN1, the system primarily monitors prompt radiation
- Alarm acts on the corresponding safety chain automatically
- This removes the source of the prompt radiation
- Exception: radiation monitor on roof of H6-CERF (muons from upstream areas)
- Radiation monitoring system in EHN1 has been upgraded from ARCON to CROME in LS2

Radiation alarm displays

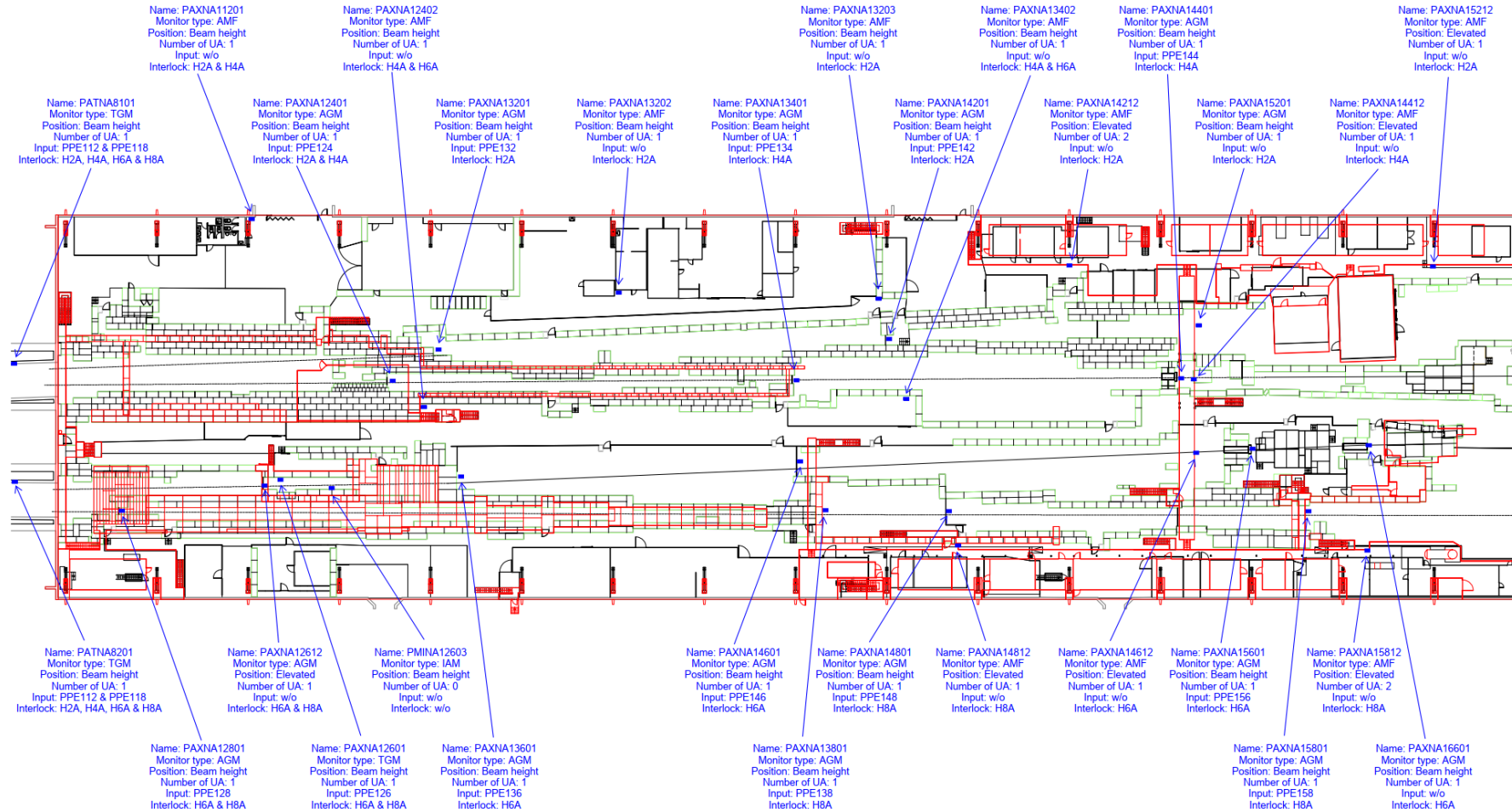
Flashing RED light + Audible ALARM
→ Leave the concerned area calmly

Flashing ORANGE light + WARNING SOUND
→ Limit your stay in the **concerned area**

Continuous green light = NORMAL situation
(low radiation levels, system OK)



Radiation monitoring system in EHN1



Possible sources of EHN1 radiation alarms

- Beam transport and steering
 - In the NA Target area
 - In the transfer lines upstream and around EHN1
 - In the beam lines in EHN1
- Beam intensity
 - **Collimator settings** are a major source of alerts/alarms
- Beam particle type
- Status of beam intercepting devices
 - Including their surrounding

Recommended actions in case of radiation alarms in EHN1

- In case of **any alarm** in a zone under your responsibility
 - **Understand & remove the source of the alarm**
 - CCC, beam line physicists, radiation monitoring data
- EHN1 is a very large building
 - You can safely stay in EHN1 if there is no radiation alarm in your vicinity
 - In case of doubt, please contact the responsible of the zone where the alarm occurs (via the CCC)

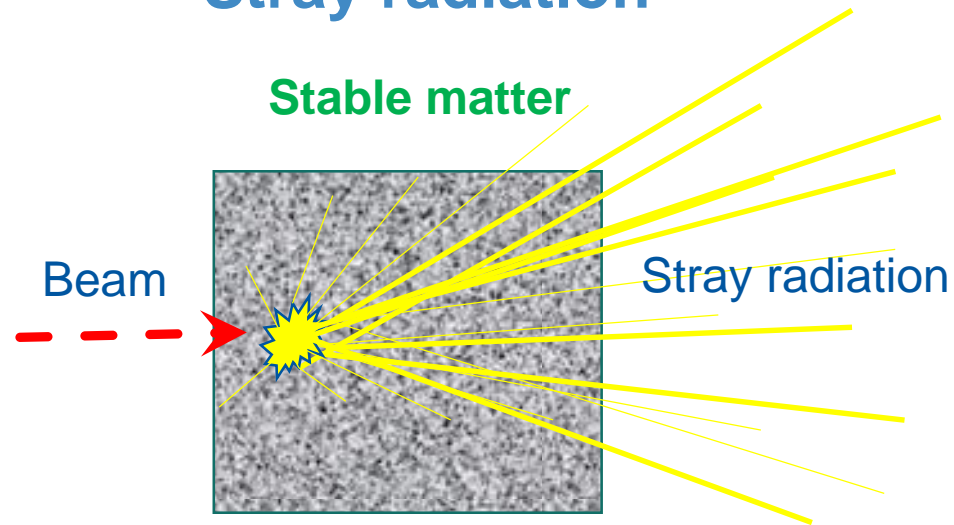
Questions?

Radiation at CERN

Accelerator in operation:

The interaction beam-matter generates stray radiation

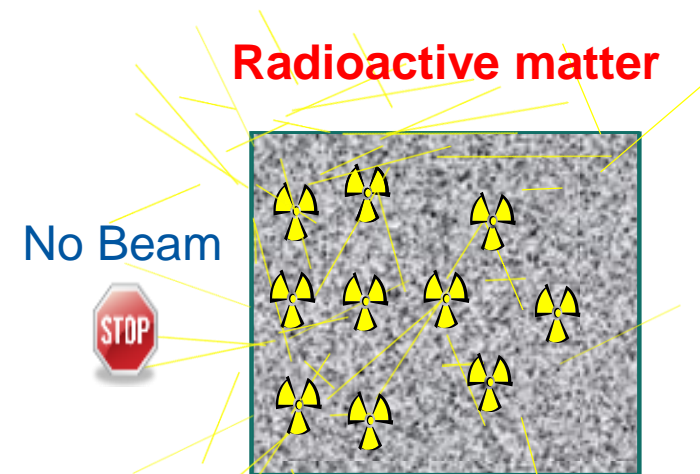
Stray radiation



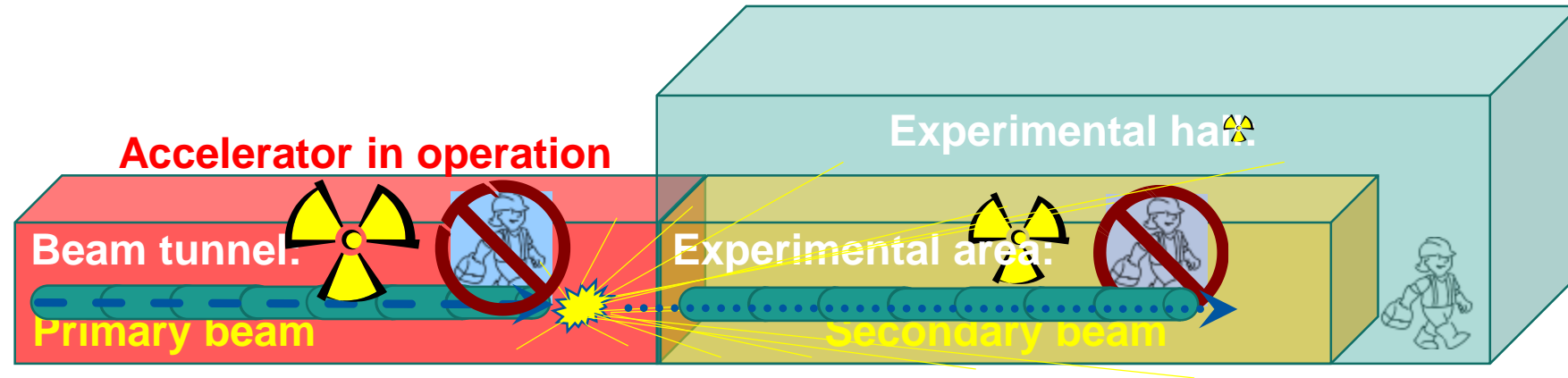
Accelerator stopped:

The interaction beam-matter has made the matter radioactive (activation)

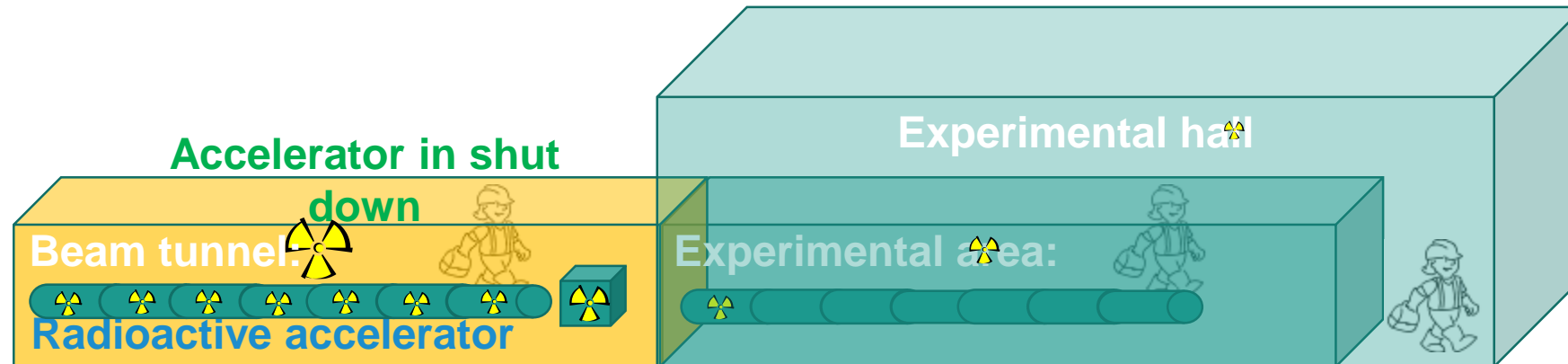
Residual radioactivity (resulting)



Ionising radiation in/around the accelerators



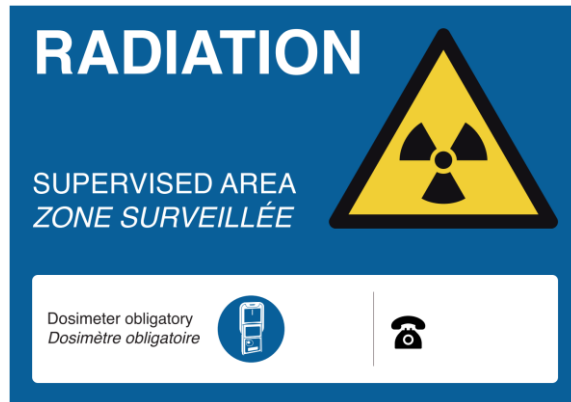
Ionising radiation in/around the accelerators



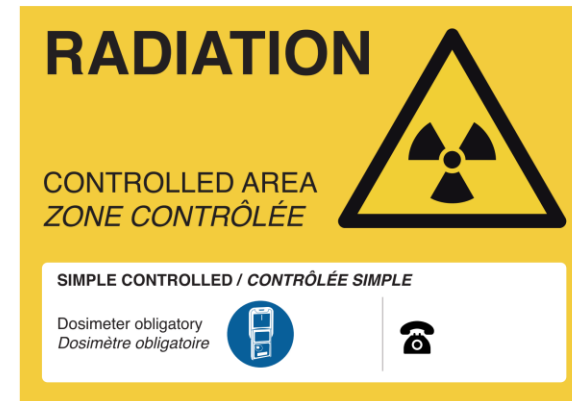
Radiation Areas at CERN

Areas with risks due to ionizing radiation are classified as "Radiation Areas". Radiation Areas at CERN are clearly marked with yellow panels. Corresponding to the risk level, Radiation Areas are subdivided into:

"Supervised Radiation Areas"
($<15 \mu\text{Sv/h}$ - low risks)



"Controlled Radiation Areas"
(elevated risks)

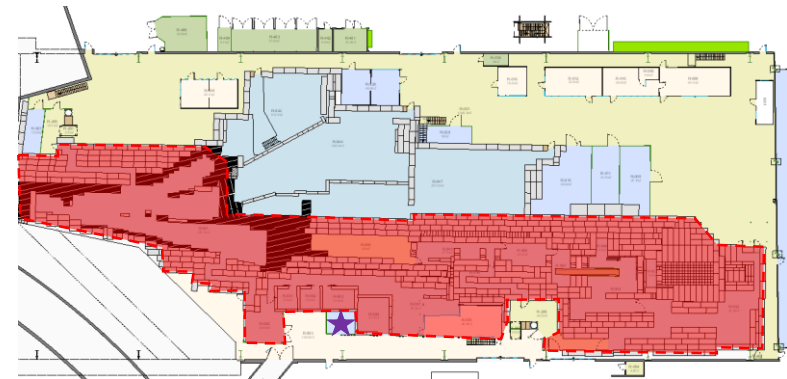
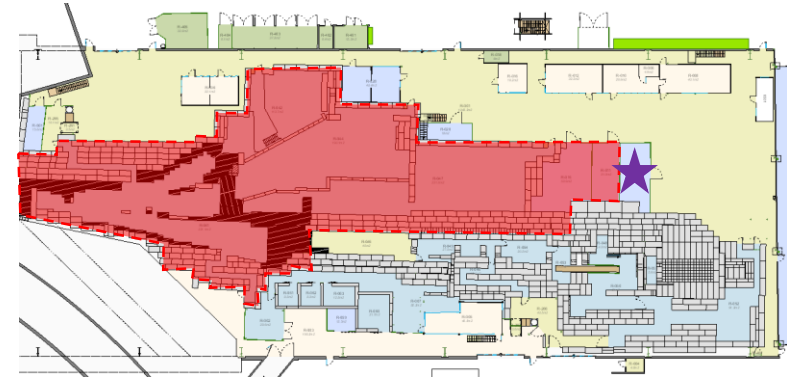


EHN1 is generally a Supervised Radiation Area due to prompt radiation levels

Layout of the areas – East Area

- East Area
 - 1 Buffer Zone available
 - TREC mandatory for equipment in beam lines*

- CHARM/IRRAD
 - 1 Buffer Zone available
 - TREC mandatory for equipment in beam lines*

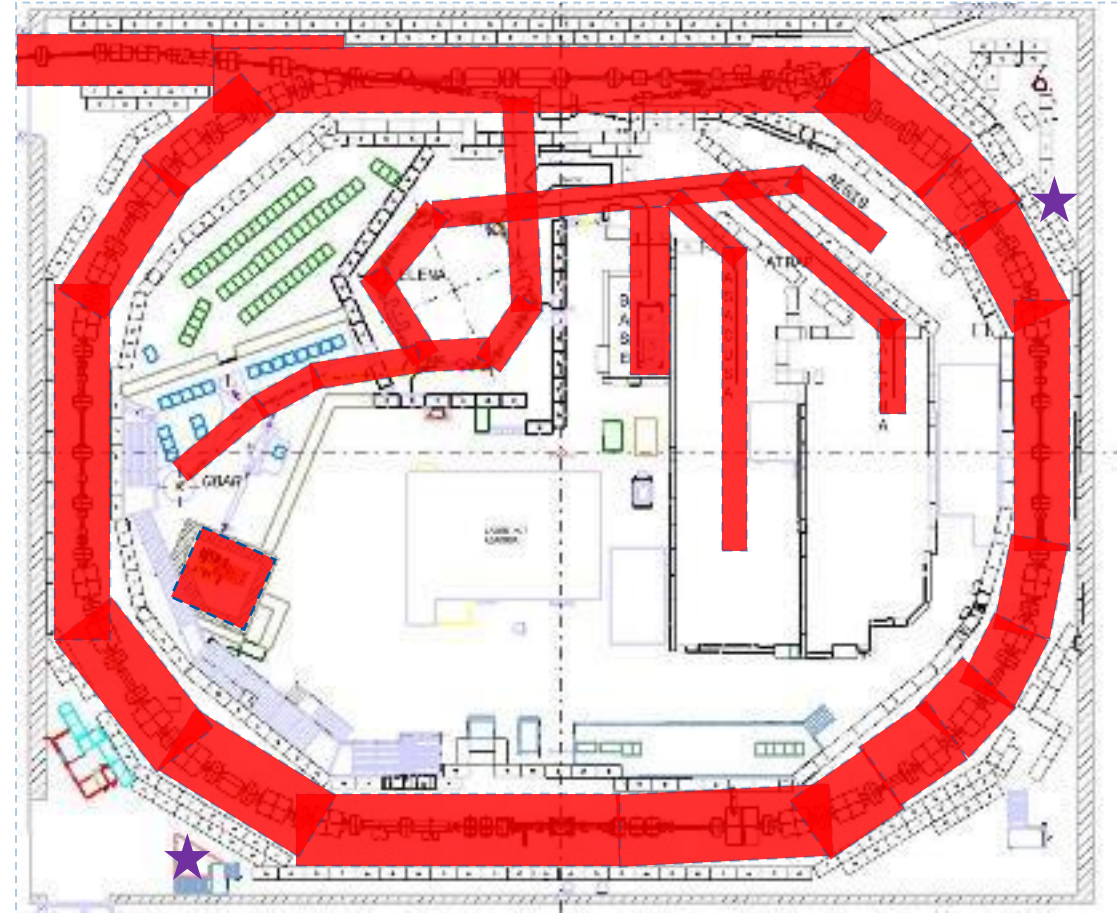


* As depicted by red areas

Layout of the areas – AD Hall

AD Hall

- 2 Buffer Zones available
- TREC mandatory for equipment leaving AD ring*
- TREC mandatory for beam equipment and experimental setup*
- TREC not mandatory if 60 cm away from the beam line*. RP control still needed



* As depicted by red areas