

*East Hall under construction - 1962*

# Safety Matters for the East Area Renovation Project

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Project Safety Officer – EDMS [2269106](#) – INDICO [863399](#)



ENGINEERING  
DEPARTMENT



**EAST AREA RENOVATION**



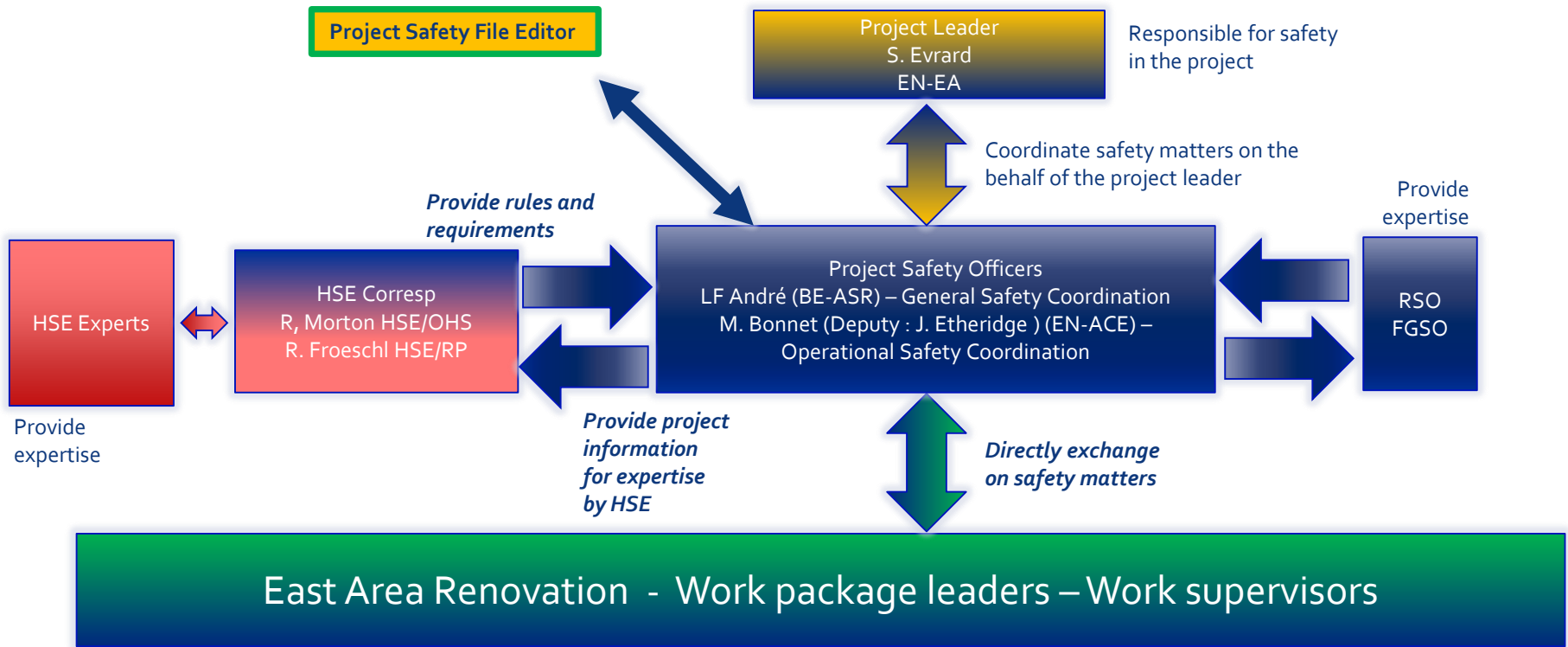
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# Project safety organization



- Safety documentation related to the project is stored on EDMS :  
<https://edms.cern.ch/project/CERN-0000171683>  
(Launch Safety Agreement (LSA), minutes of Risk Analysis (RA) meetings, ...)

# Safety challenges

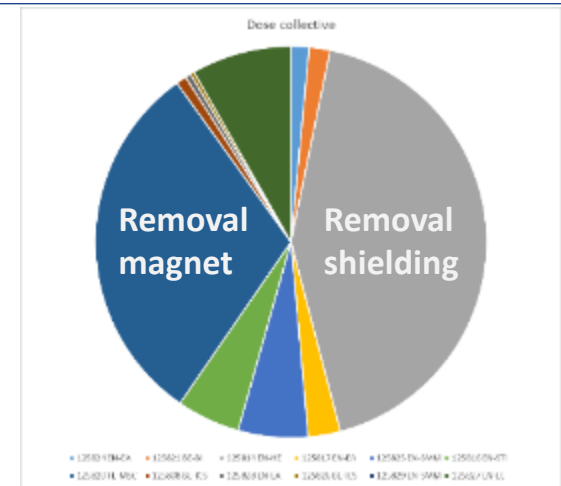
- B157 :

- Dismantling primary area => ALARA Level 3 intervention
  - Actual collective dose: 3015 H.uSv (60% of estimate) and Individual max : 262 uSv (82% of estimate)
  - Primary area is now declassified as supervised area (from limited stay).
  - Managing coactivity between civil engineering activities and dismantling activities (October 2018 – October 2019)
  - Managing coactivity between renovation activities and CLOUD run (September to December 3, 24/7)

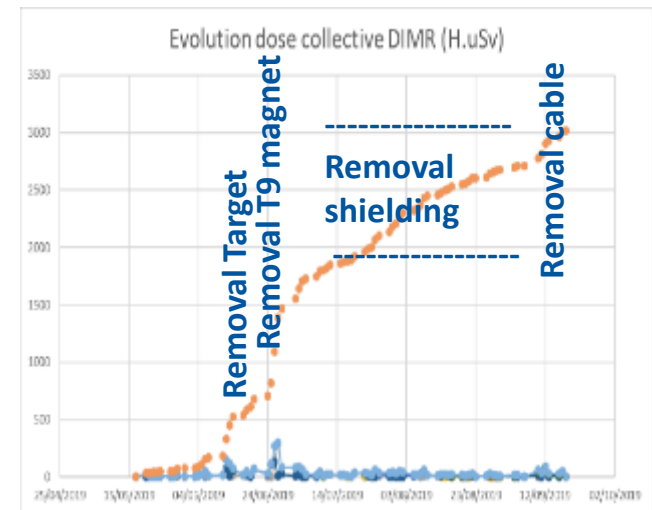
- B251 :

- Maintaining 18 kV loop in operation while dismantling power converters and associated cabling

Dose breakdown



Dose evolution



Courtesy of R. Froeschl

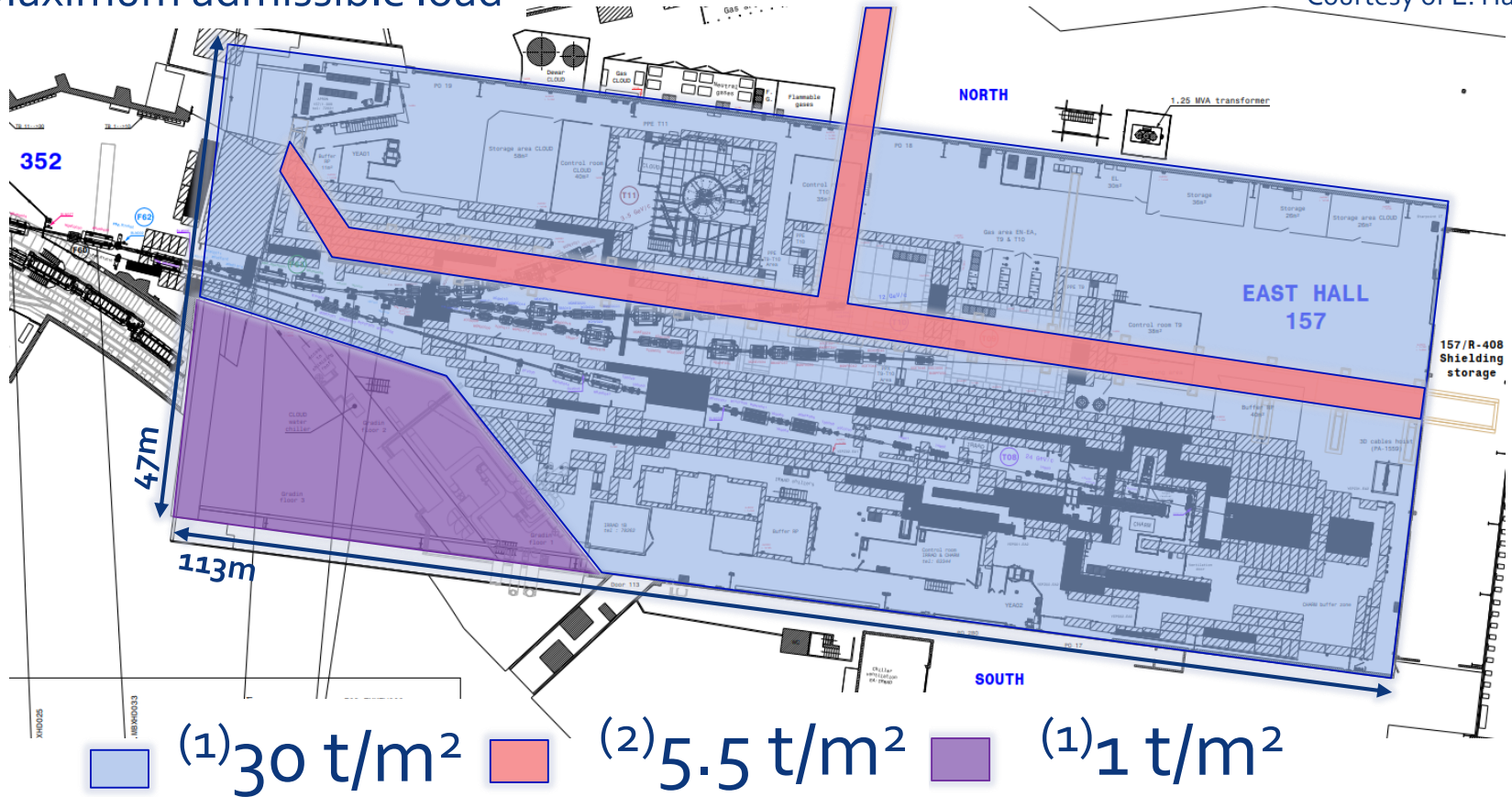
# Safety events

- 11 safety events since Nov. 2018
  - 1 Occupational accident : injury of one finger while using a hammer (B251)
  - 3 Incidents :
    - Work performed in presence of asbestos (without prior identification) (B251)
    - Crane collision (B157)
    - Dismantling of an earthing bar still in use (B251)
  - 1 Near miss : smoke release in underground technical galleries (B817)
  - 6 Hazardous situations :
    - 2 waterleaks during the renovation of the roof (B157)
    - 1 waterleak in B251 (heating system)
    - Lead found in existing metallic structure painting (B251)
    - No compliance with the safety visit recommendations (B251)
    - Cut of an IT cable (B251)
- Each safety event is systematically analysed and compulsory measures are implemented
- Some situations led to extra delays, dismantling a 60-year old facility holds a few surprises

# Safety studies on going : B157 Ground Load (1/7)

Maximum admissible load

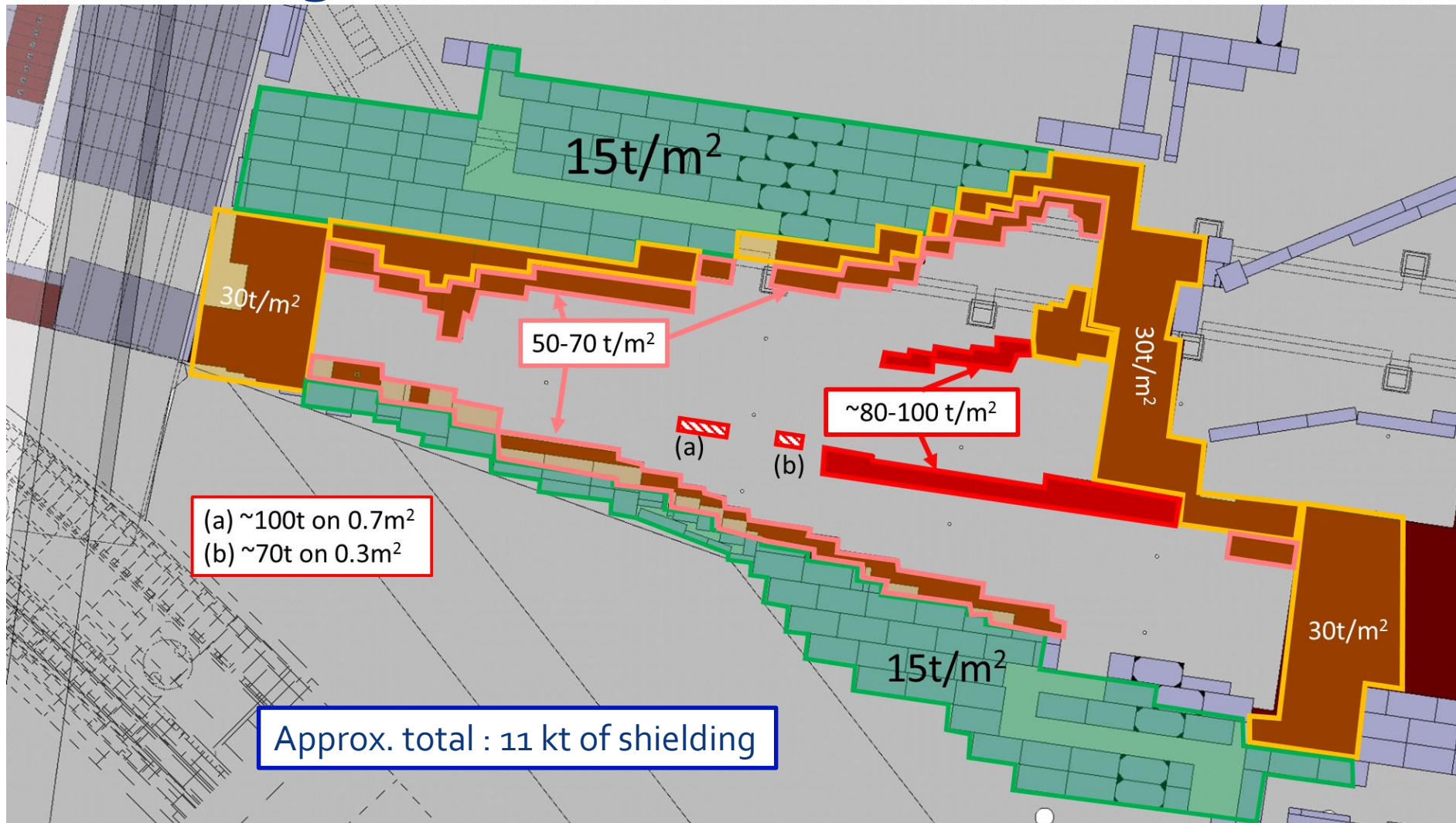
Courtesy of E. Harrouch



(1) From the construction drawings

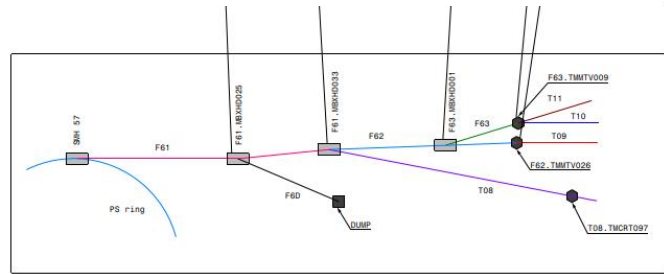
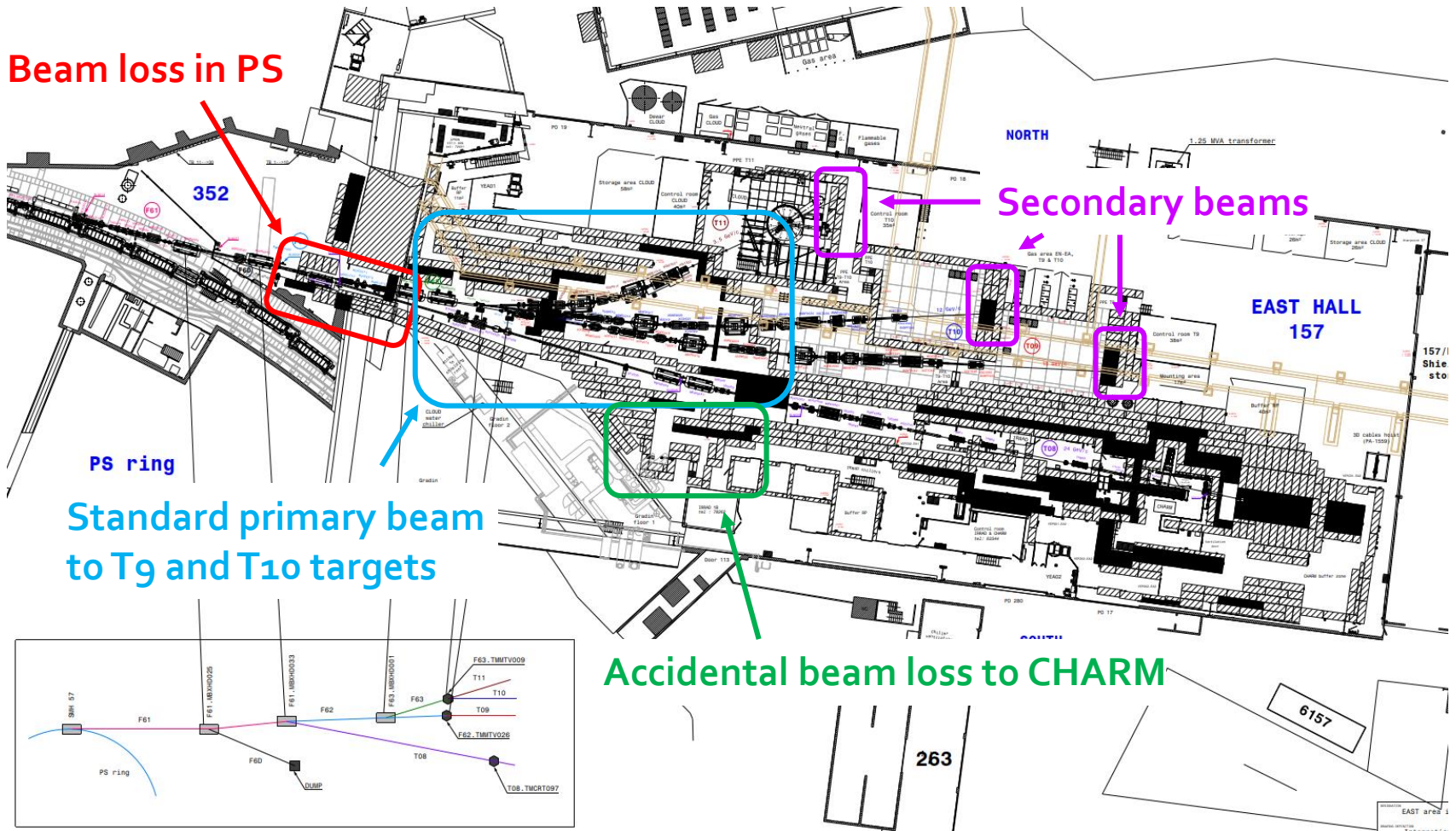
(2) From Raul Fernandez (SMB-SE) calculations

# B157 Ground Load (2/7) : Shielding before renovation



Courtesy of E. Harrouch

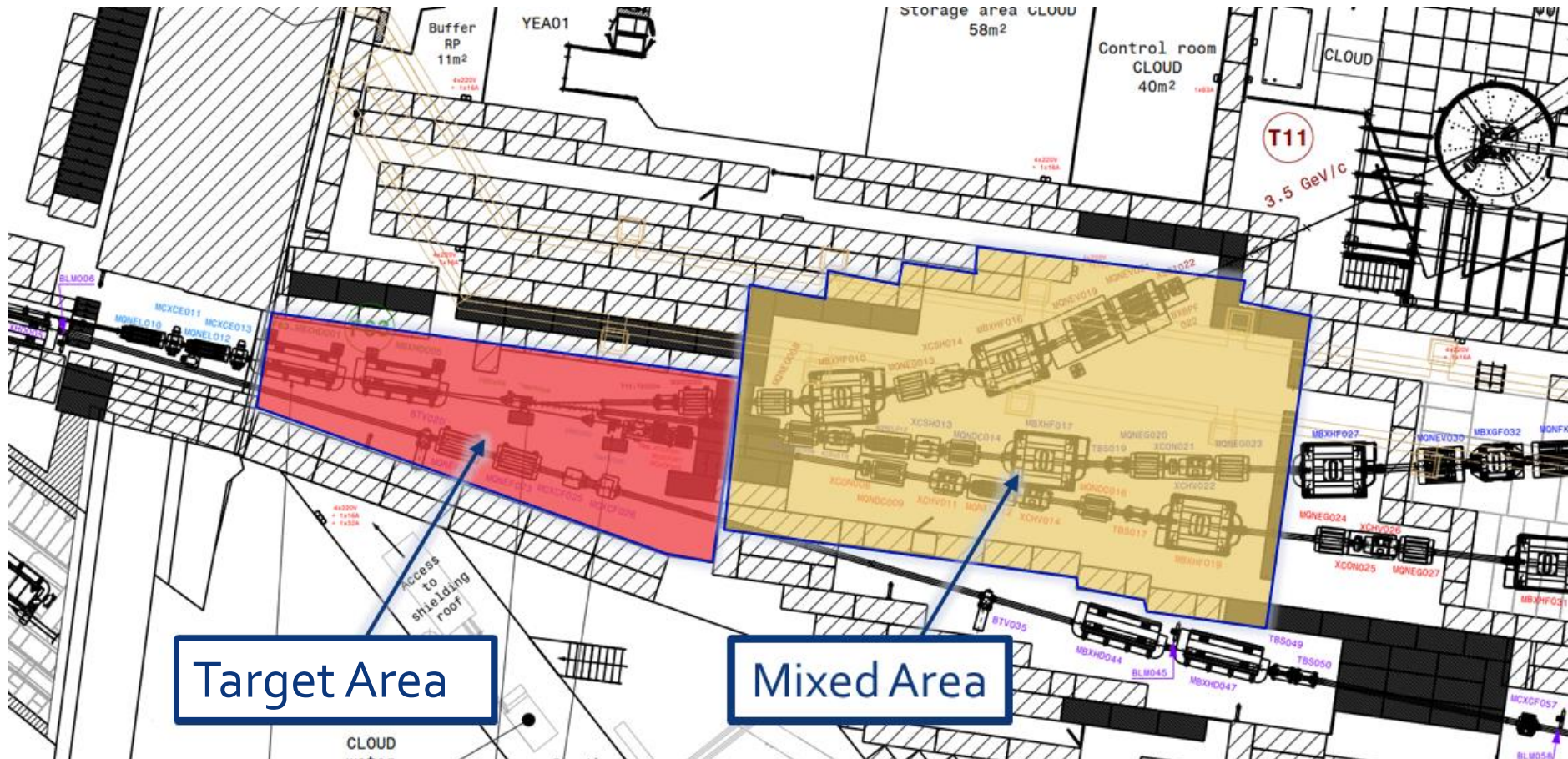
# B157 Ground Load (3/7) : RP Design shielding driver



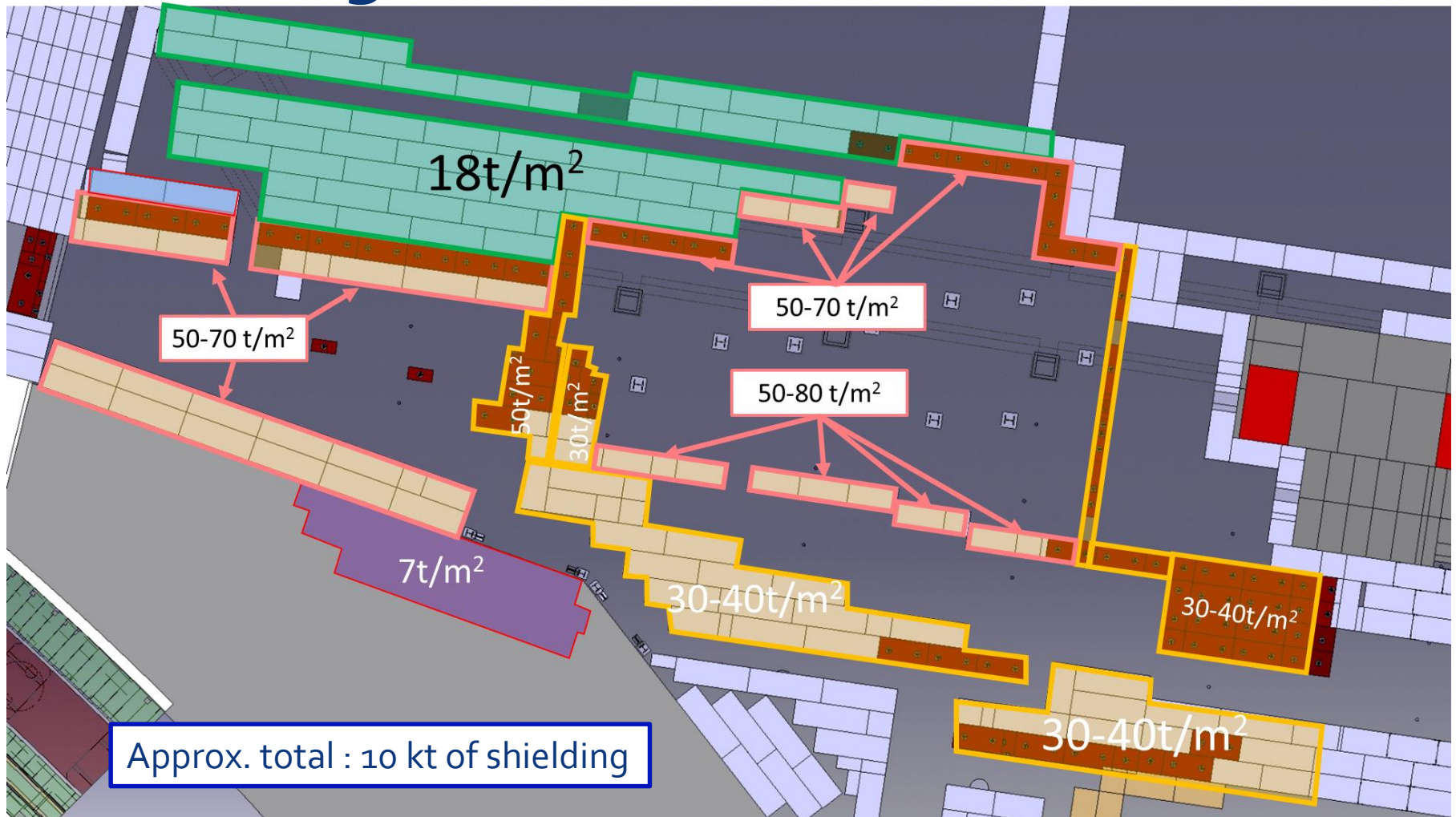
Courtesy of E. Iliopoulou and R. Froeschl (HSE-RP)  
Cost & Schedule #3



# B157 Ground Load (4/7) : Shielding after renovation



# B157 Ground Load (5/7) : Shielding after renovation



Courtesy to D. Brethoux and E. Harrouch

# B157 Ground Load (6/7) : Shielding before vs after

	Max load above the gallery	Max load above b.157's slab	Max load above the gradins
Max load permissible	5.5 t/m <sup>2</sup>	30 t/m <sup>2</sup>	1 t/m <sup>2</sup>
Max load before renovation	70 t/m <sup>2</sup>	100 t/m <sup>2</sup>	0 t/m <sup>2</sup>
Max load after renovation	60 t/m <sup>2</sup>	80 t/m <sup>2</sup>	7 t/m <sup>2</sup>

=> Situation tends to be better than before the renovation but remains **largely above the permissible load**

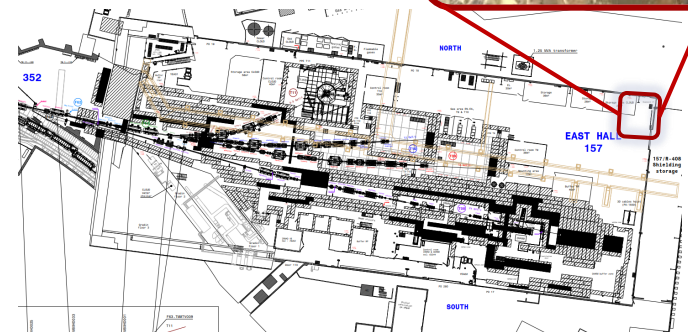
In addition :

- On-site visits by Richard Morton (HSE/OHS) showed no degradation of the concrete in the underground gallery.

# B157 Ground Load (7/7)

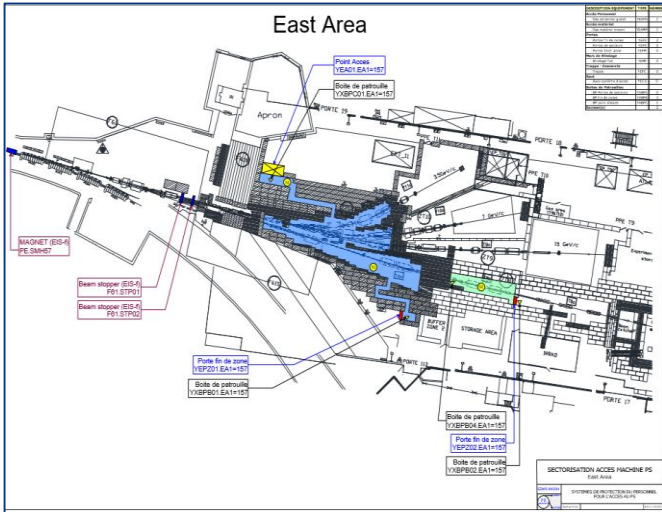
- A safety & technical review held to address the issue (June 27<sup>th</sup>, INDICO [830680](#))
- A plan has been defined with all stakeholders and is ongoing with a view to solving the problem :
  - Identify critical areas, optimize load distribution
  - Optimize mixed area shielding (include magnets and beam stoppers in RP simulations)
  - Assess concrete composition
    - A coring has been performed in the concrete slab
    - A specific laboratory will assess the concrete and the steel
    - SMB and HSE will update the maximum admissible load with the new data
  - Assess the seismic response

Coring location

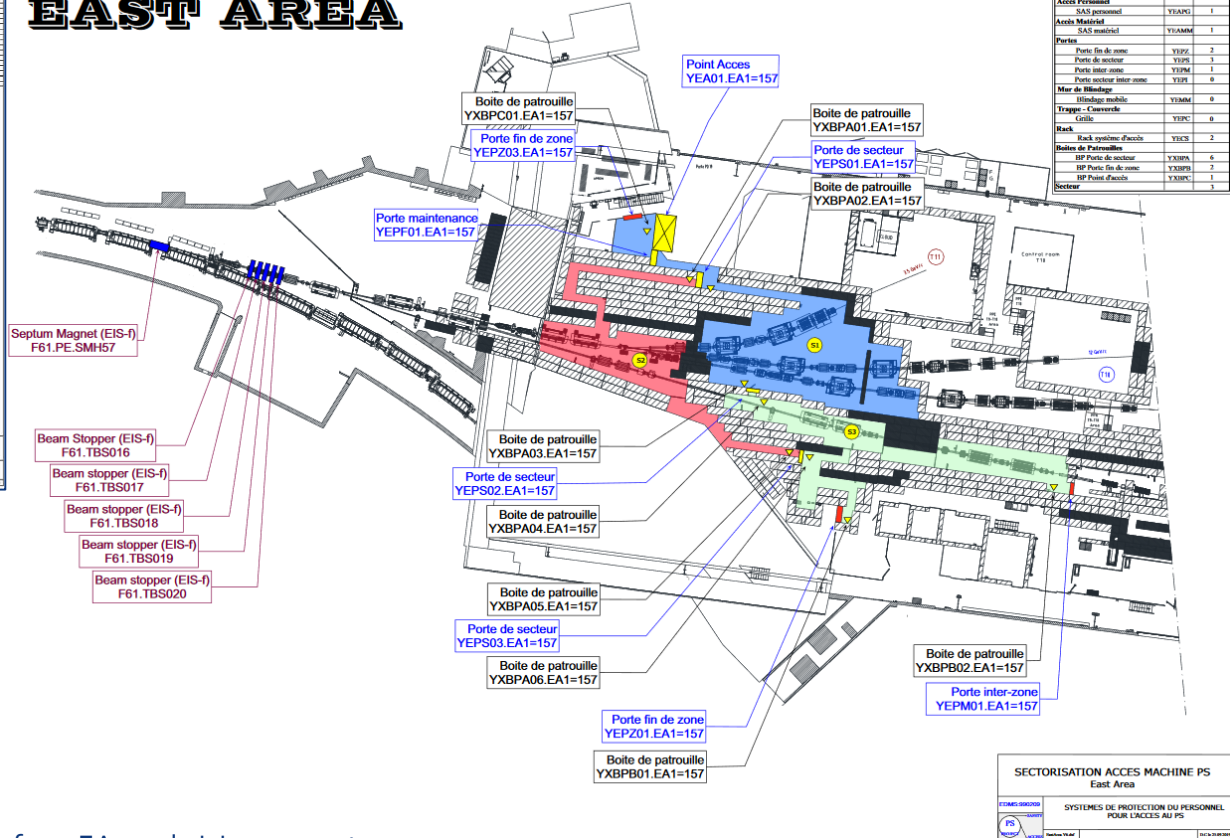


# Safety studies ongoing

## Access sectorisation (1/3)



## EAST AREA



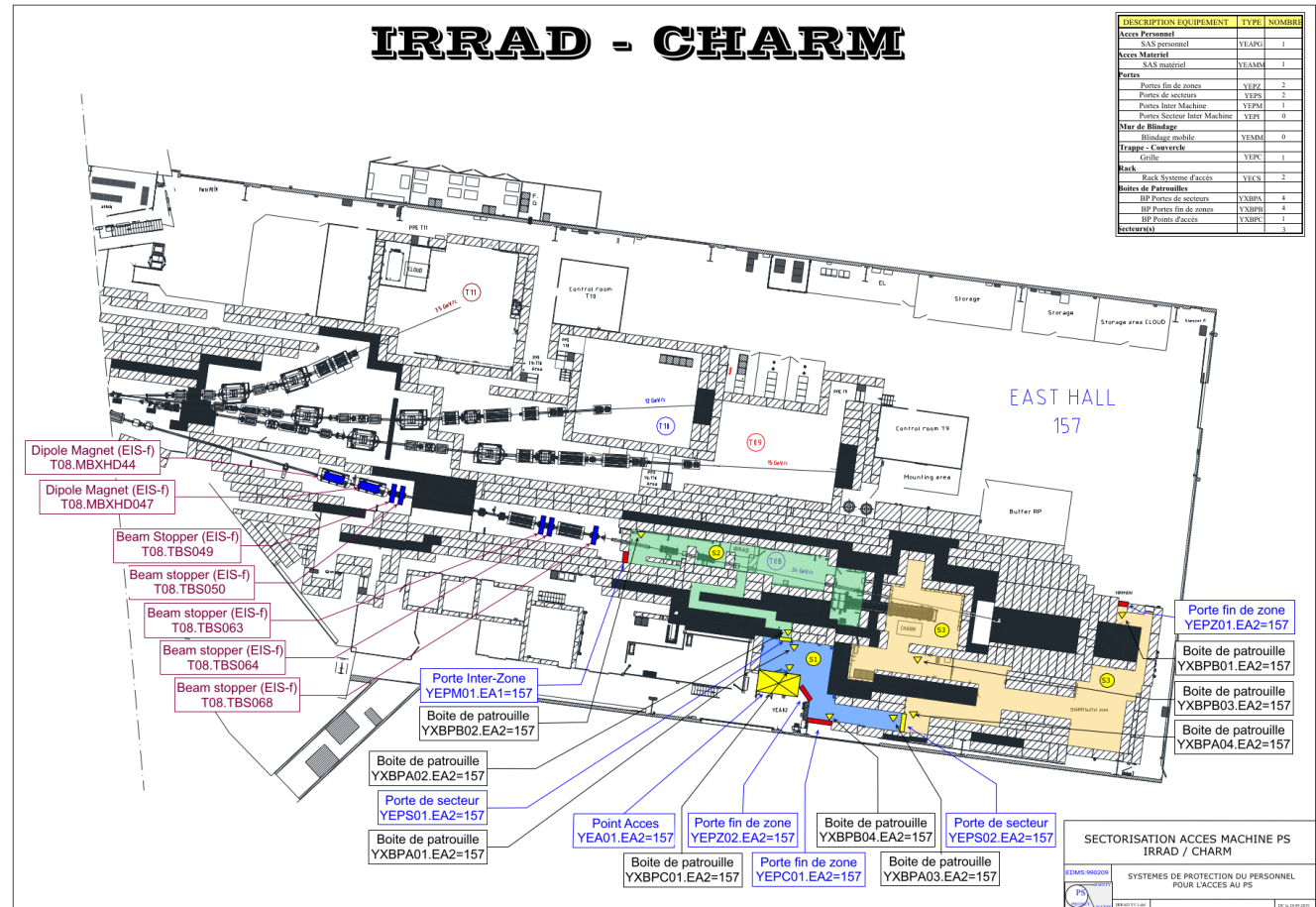
DESCRIPTION EQUIPEMENT	TYP	NOMBRE
Accès Personnel		
SAS personnel	YEAPS	1
Accès Matériel		
SAS matériel	YIAMAM	1
Portes		
Porte fin de zone	YEPF	2
Porte de secteur	YEPS	1
Porte inter-zone	YIPM	1
Porte secteur inter zone	YEPS	0
Mur de Blindage		
Widening mobile	YISM	0
Trappe - Couverte	YISM	0
Grille	YISG	0
Rack		
Rack système d'accès	YISR	2
Boite de Patrouille		
HP Porte de secteur	YXBP	6
HP Porte fin de zone	YXBP	2
HP Point d'accès	YXBP	1
Secteur		

- **Before renovation :** 1 single access sector (S<sub>1</sub>) accessible from the Access Point, 1 blind sector (S<sub>2</sub>) only accessible from EA<sub>2</sub> via the end zone door
- **After renovation:**
  - 3 access sectors (S<sub>2</sub> mixed area, S<sub>1</sub> & S<sub>3</sub>)
    - no longer a blind sector as shielding opening from EA<sub>1</sub> and giving access to EA<sub>2</sub> external envelope -> End zone door converted into an inter-machine door -> EA<sub>1</sub>-EA<sub>2</sub> emergency exit
  - EIS-Beam: 5 Beam Stoppers and 1 Septum Magnet
  - New external interface with ventilation system

Courtesy to BE/ICS Team

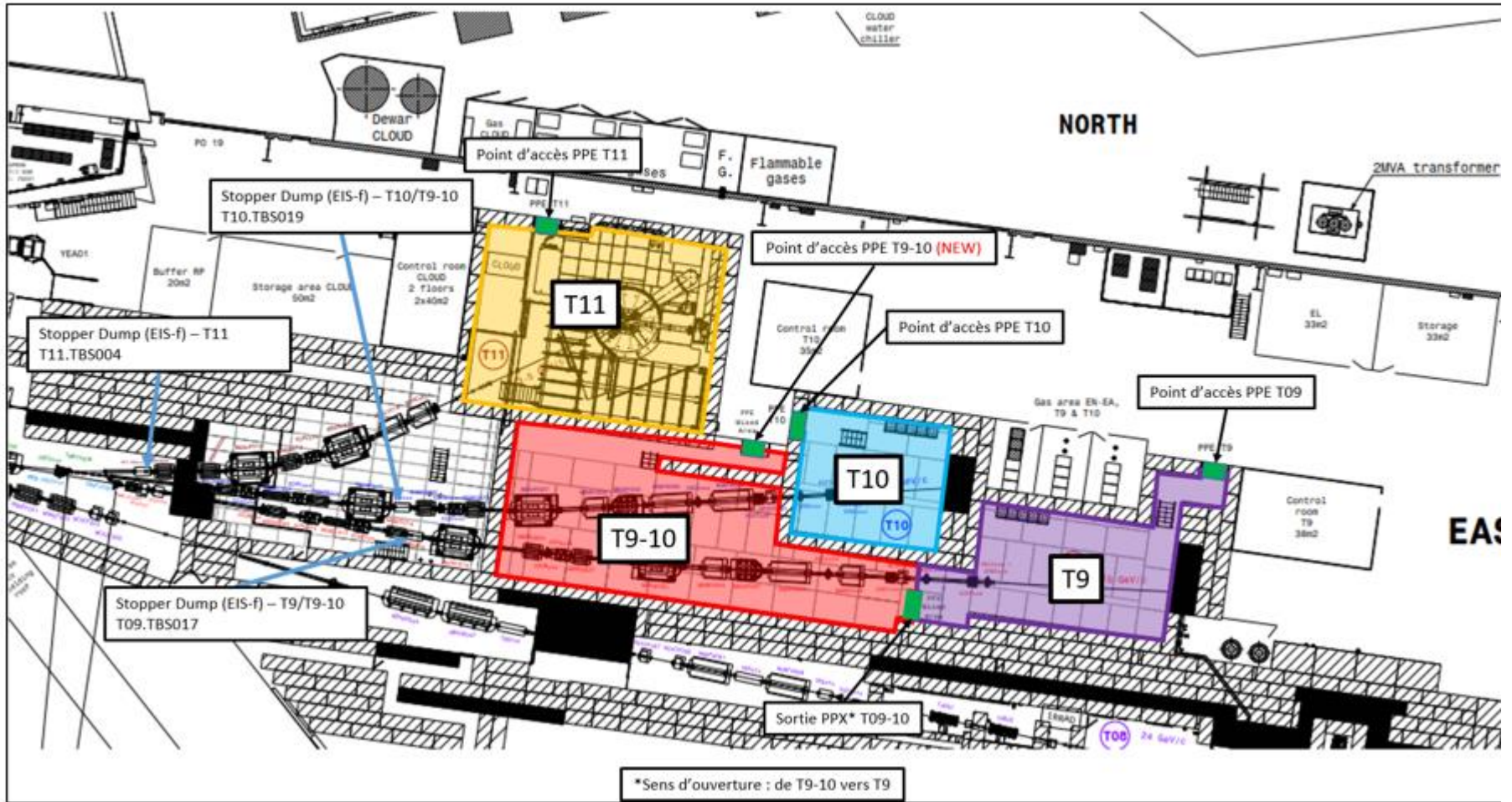
# Access sectorisation (2/3)

- EIS-Beam:
  - 5 Beam Stoppers
  - 2 Magnets
- EA1-EA2 inter-machine door provides emergency exit between EA1 and EA2



Courtesy to BE/ICS Team

# Access sectorisation (3/3)



Courtesy to BE/ICS Team

# Safety documentation

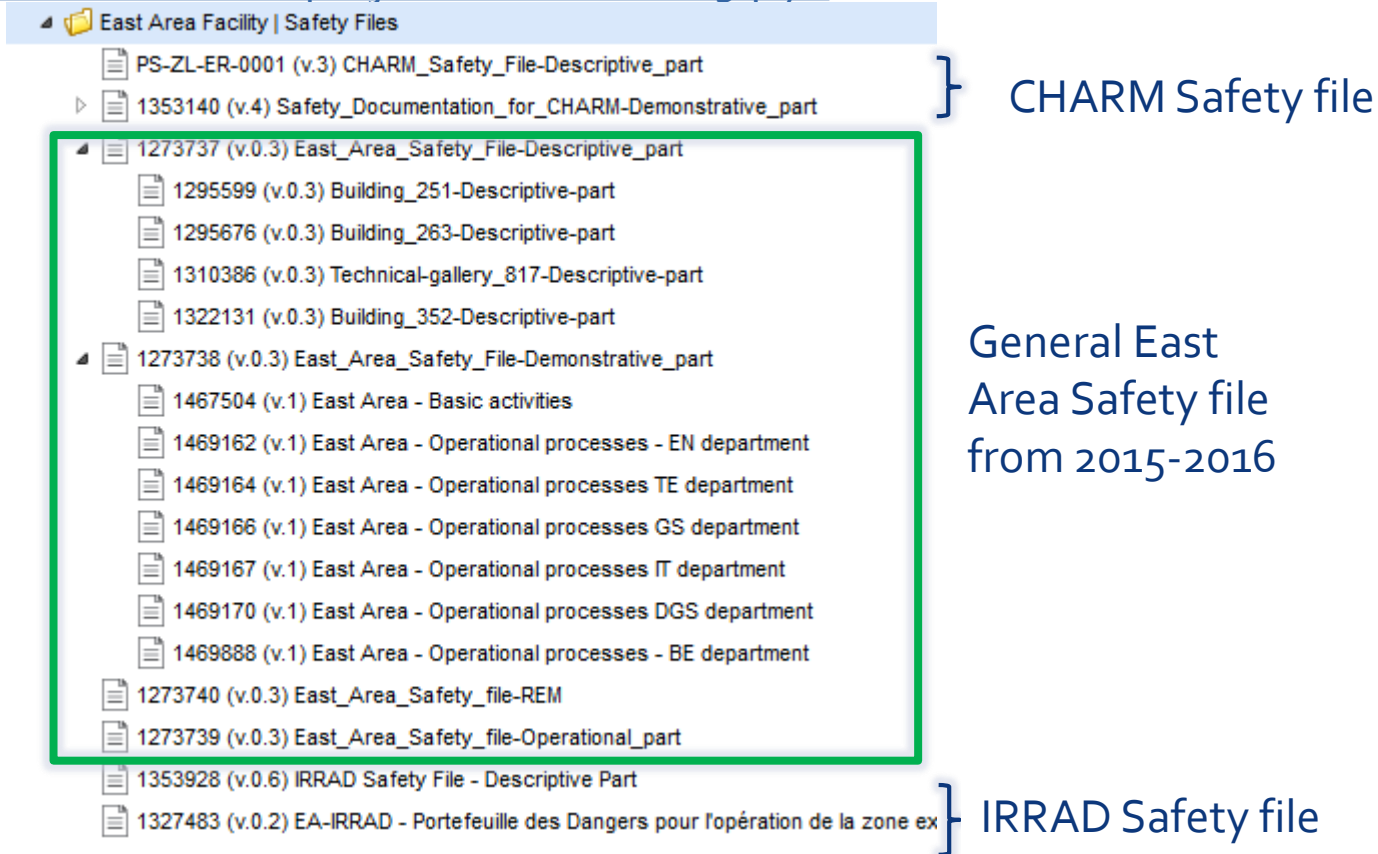
- Launch Safety Agreement (LSA) available on [EDMS 1731887](#).
- HSE will
  - Perform regular checks through the different phases of the project (A memorandum of safety Checks has been issued by HSE, [EDMS 1808030](#))
  - Give a safety clearance before operating the facility.
- The project carries out detailed safety studies:
  - ✧ Suspended scaffolding: calculation note (Completed) ([EDMS 1892068](#) & [EDMS 1892063](#))
  - ✧ APR – “Analyse préliminaire de risque” (Completed) ([EDMS 990209](#) & [EDMS 990210](#))
  - ✧ Radio protection - Air activation- Ventilation system, P&ID (In Progress)
  - ✧ Flammable gas - ATEX zones (In Progress) – User requirement document Released ([EDMS 1907012](#)), ATEX Extraction system being design by EN-CV
  - ✧ Capacitors & energy storage (In Progress) – Tests done, safety validation to be finalized,
  - ✧ Shielding Blocks: calculation note (In Progress)



# Safety Files (1/2)

East Area Safety files :

- <https://edms.cern.ch/project/CERN-0000094170>



East Area Facility | Safety Files

- PS-ZL-ER-0001 (v.3) CHARM\_Safety\_File-Descriptive\_part
- 1353140 (v.4) Safety\_Documentation\_for\_CHARM-Demonstrative\_part
- 1273737 (v.0.3) East\_Area\_Safety\_File-Descriptive\_part
  - 1295599 (v.0.3) Building\_251-Descriptive-part
  - 1295676 (v.0.3) Building\_263-Descriptive-part
  - 1310386 (v.0.3) Technical-gallery\_817-Descriptive-part
  - 1322131 (v.0.3) Building\_352-Descriptive-part
  - 1273738 (v.0.3) East\_Area\_Safety\_File-Demonstrative\_part
    - 1467504 (v.1) East Area - Basic activities
    - 1469162 (v.1) East Area - Operational processes - EN department
    - 1469164 (v.1) East Area - Operational processes TE department
    - 1469166 (v.1) East Area - Operational processes GS department
    - 1469167 (v.1) East Area - Operational processes IT department
    - 1469170 (v.1) East Area - Operational processes DGS department
    - 1469888 (v.1) East Area - Operational processes - BE department
  - 1273740 (v.0.3) East\_Area\_Safety\_file-REM
  - 1273739 (v.0.3) East\_Area\_Safety\_file-Operational\_part
- 1353928 (v.0.6) IRRAD Safety File - Descriptive Part
- 1327483 (v.0.2) EA-IRRAD - Portefeuille des Dangers pour l'opération de la zone ex

CHARM Safety file

General East Area Safety file from 2015-2016

IRRAD Safety file

# Safety Files status (2/2)

- Current situation :
  - Descriptive part : First draft completed, still needed a few updates on specific subject (shielding...)
  - Demonstrative part : Completely new version ongoing based on the hazards list
  - Operational part : No update started yet
- Objectives :
  - Descriptive part : circulation for comment => May 2020
  - Demonstrative part : circulation for comment => October 2020
  - Operational part : circulation for comment => December 2020

# Safety authorities

- Project regularly reports to the PS-CSAP (last presentation held on 10/10/2019)
- Project presented at Tripartite meetings (CERN, ASN, OFSP) in 2017 :
  - From the meeting minutes: « [...] il est convenu de se concentrer sur les installations où le risque radiologique est prédominant et que ce projet n'implique pas de modification du scénario enveloppe, le processus de validation suivra la procédure habituelle au CERN par une validation du directeur des accélérateurs sans passer par les autorités. Il est convenu que la note de surveillance récapitulative sera envoyée avec les résultats radiologiques. [...] »
- Final approval will be given by ATS director and HSE through Safety Clearance

# Acknowledgements



- Many thanks to the project team members:

Henric Wilkens, Lau Gatignon, Marco Polenghi, Roberto Lopez, Jaime Renedo, Sebastien Evrard, Elpida Iliopoulou, Robert Froeschl, Edouard Grenier-Boley, Christophe Brouard, Stewart McIlwraith, Francisco Dragoni, Leszek Borakiewick, Caterina Bertone, Antti Onnela, Michael Lazzaroni, Jerome Lendaro, Konstantinos Papastergiou, Aboubakr Ebn Rahmoun, Damien Brethoux, Vincent Clerc, Jocelyn Tan, Denis Cotte, Richard Morton, Erwan Harrouch, Marco Calviani, Johannes Bernard, Eva Montbarbon, Richard Morton, Maarten Van Dijk, Silvia Grau, Eva Sanchez-Corral Mena, Pawel Burdelski.

# Thanks for your attention !



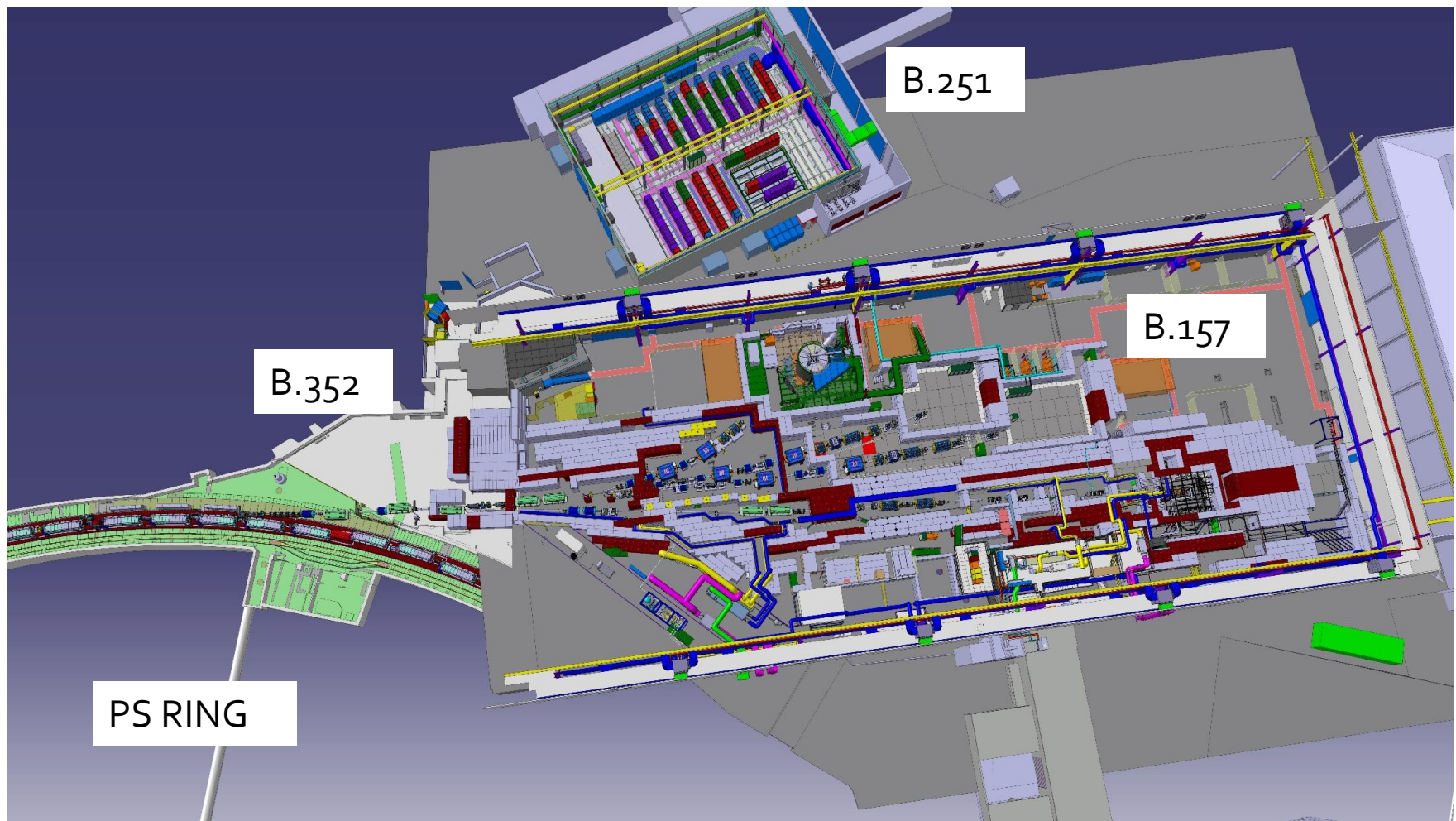
## EAST AREA RENOVATION

# Back up slides



## EAST AREA RENOVATION

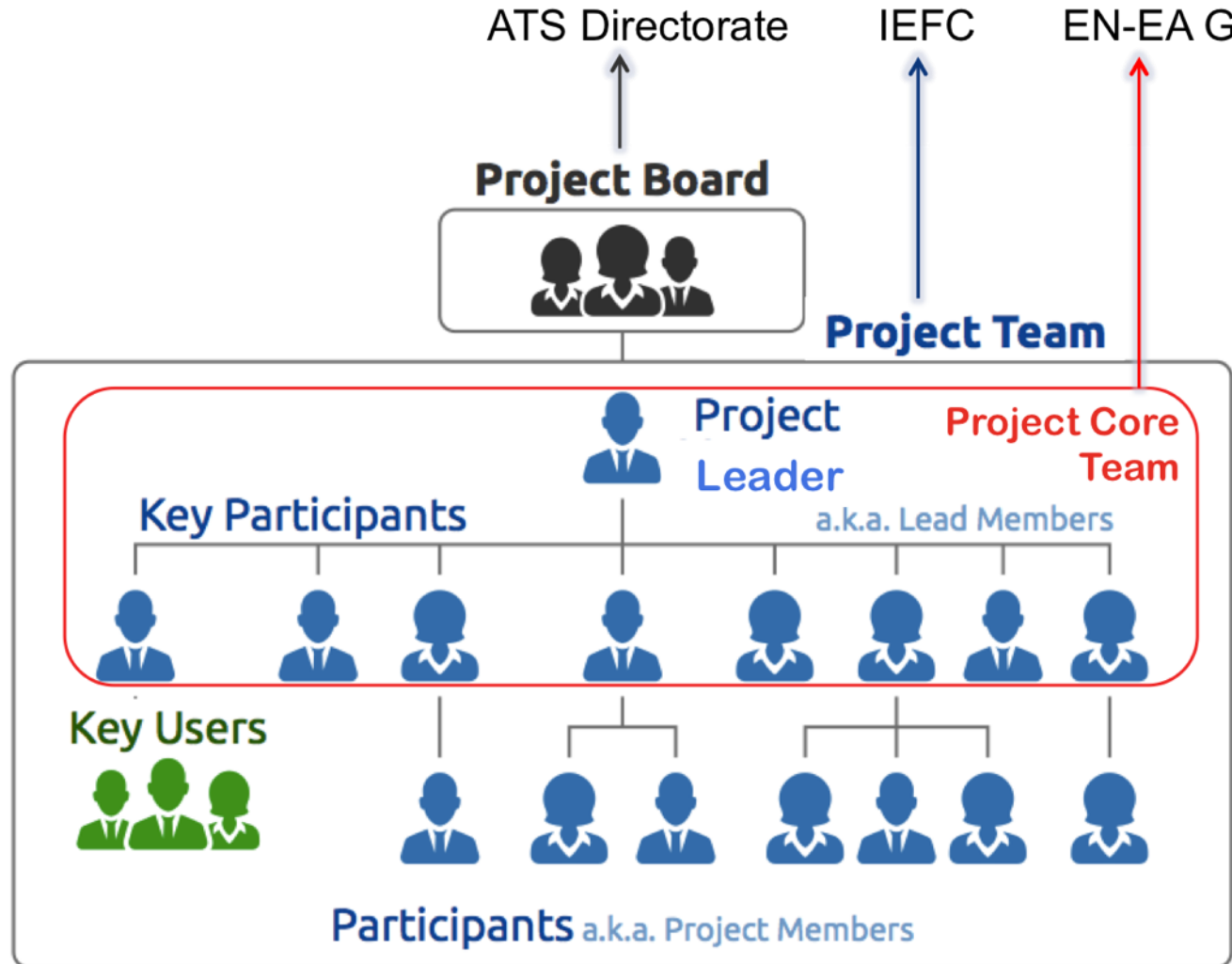
# New facility layout



Courtesy of M. Lazzaroni & D. Brethoux

# Project Organization

- Project management document (EDMS 1716531v1.1)
- Conceptual Design Report (EDMS 1471844)
- Roadmap document (EDMS 1608373)



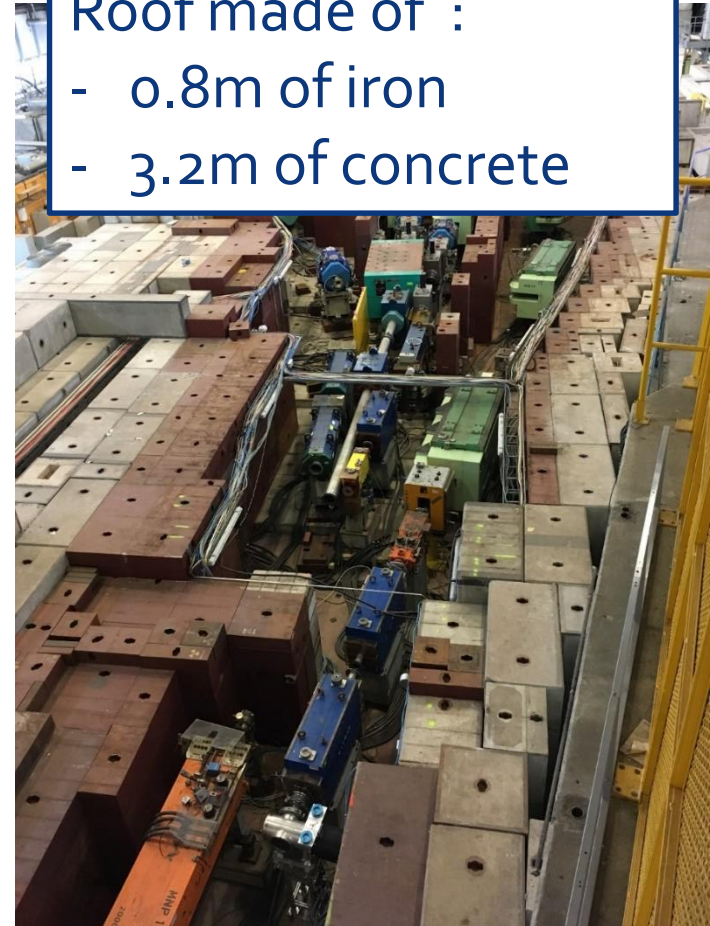


# B157 Ground Load : Shielding before renovation

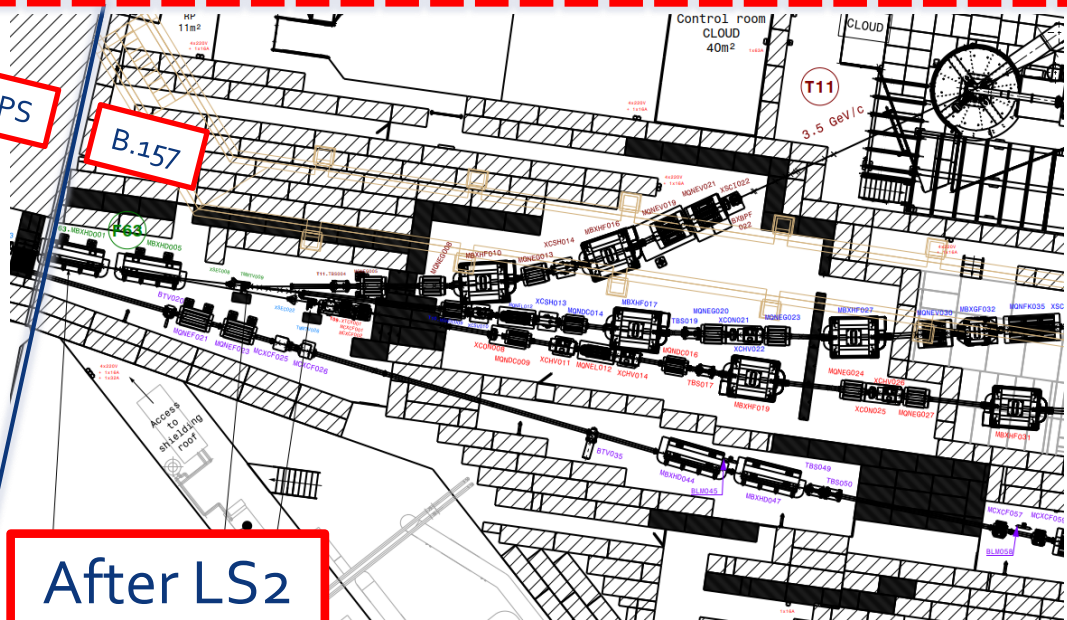
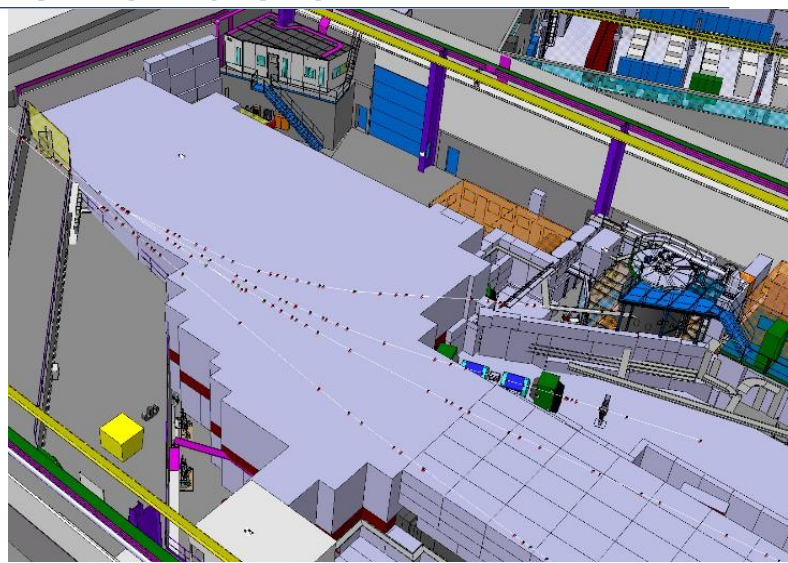


Roof made of :

- 0.8m of iron
- 3.2m of concrete

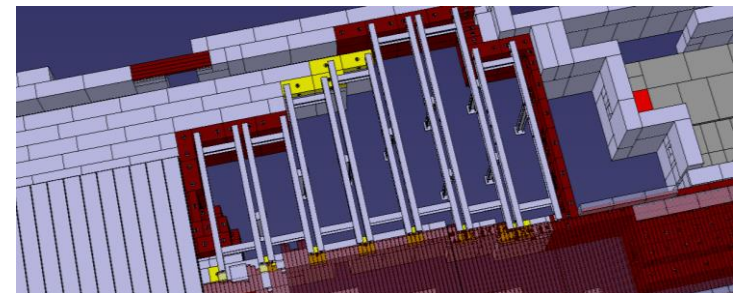
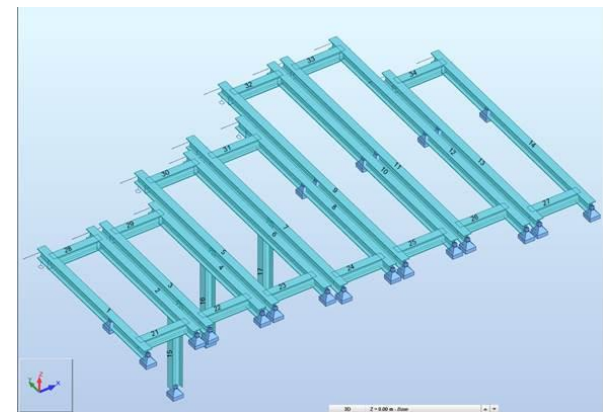
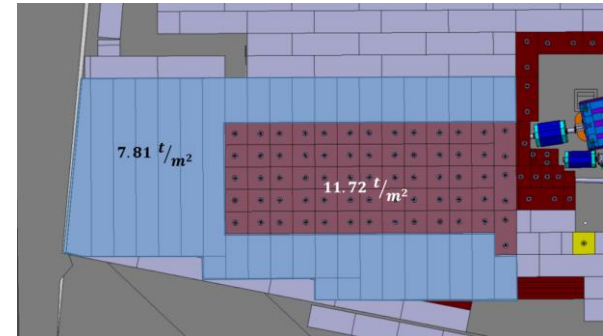


# B157 Ground Load : Shielding before and after renovation



# B157 Ground Load : Shielding after renovation

- **Primary area:**
  - Material: concrete beams;
  - Quantity: 19 beams 80 x 80 cm (L from 6.4m to 9.4 m);
  - Planning installation: December 2020.
- **Mixed area:**
  - 1<sup>st</sup> Study based on metallic structure;
    - Need to compare with concrete beams solution. Needs of 22 beams 80 x 80 cm->comparable with primary area solution
  - Planning installation: beginning of 2021.

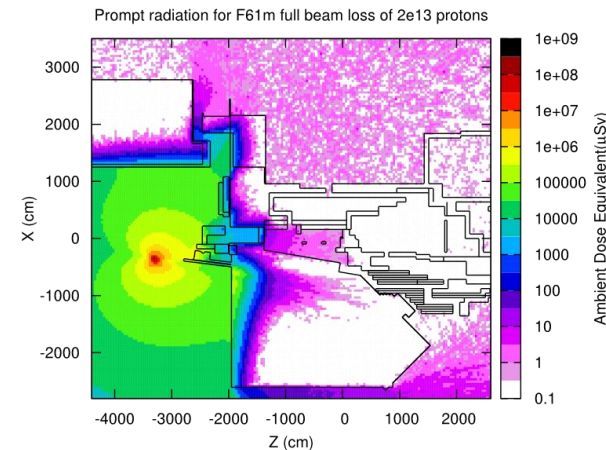
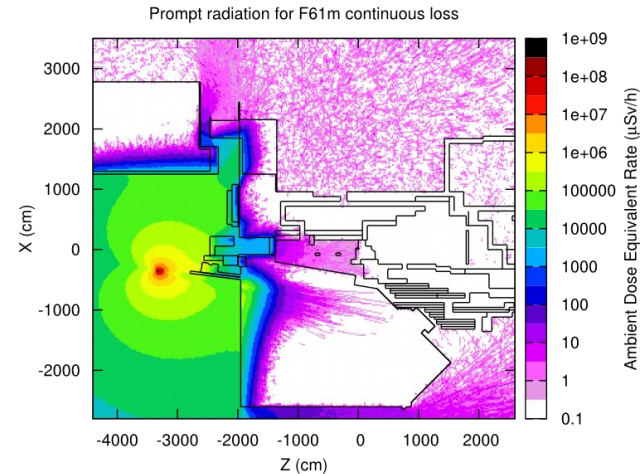


Courtesy to M. Lazzaroni

# RP : Shielding Design – F61

## EDMS 2175579

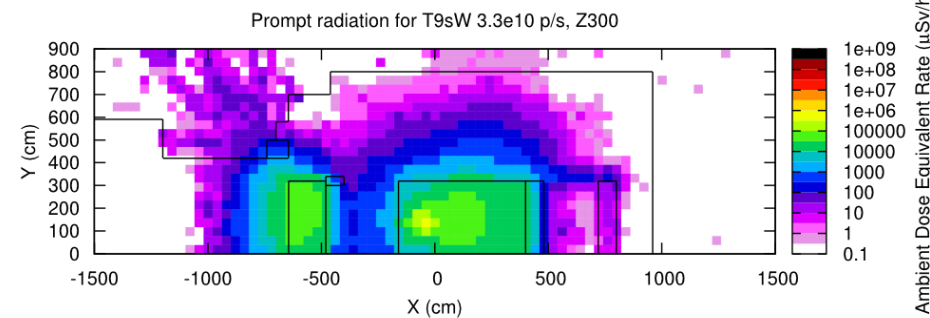
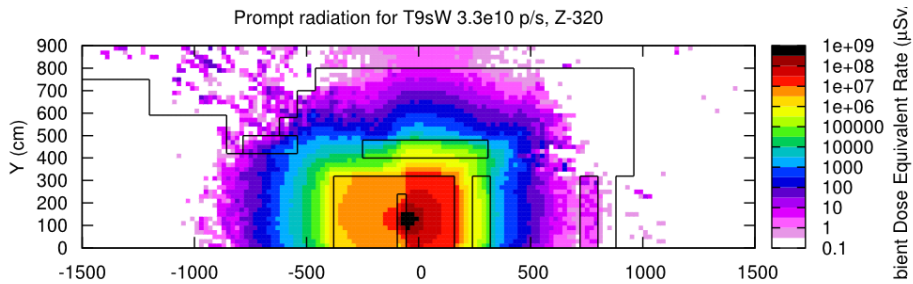
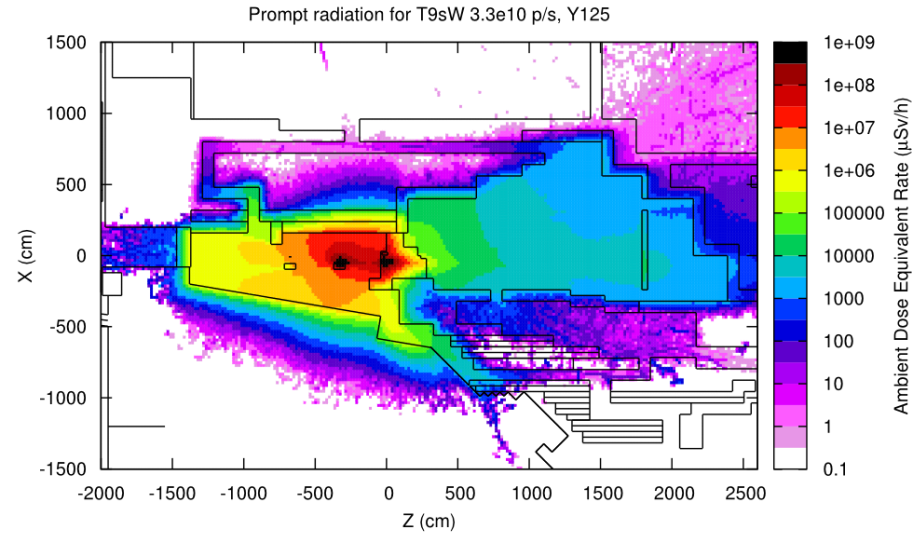
- Persons can be present in EA primary zone while beam circulates in the PS
- 3 loss point locations studied for 2 beam loss scenarios
  - Continuous loss in the PS
    - Estimated loss rate  $5E9$  p/s
  - Full beam loss in the PS
    - $2E13$  protons (SFTPRO)



Courtesy of E. Iliopoulou and R. Froeschl (HSE-RP)

# RP : Shielding Design – T9 Target

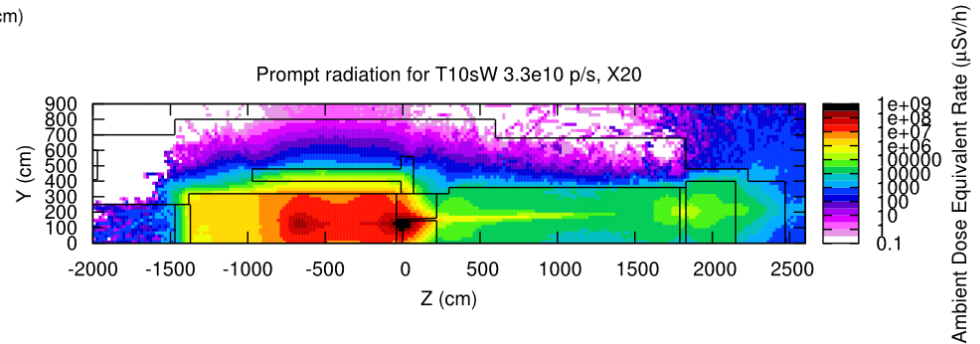
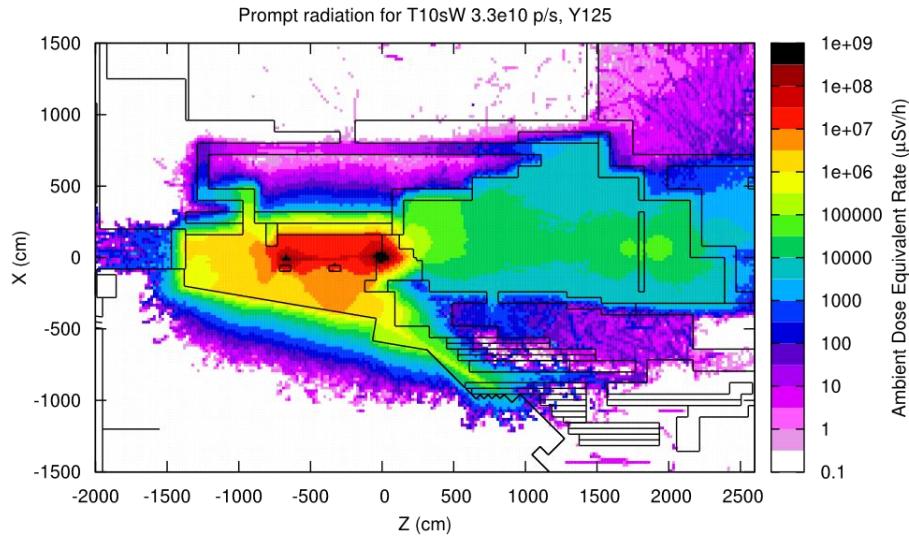
## EDMS 2175579



Courtesy of E. Iliopoulou and R. Froeschl  
(HSE-RP)

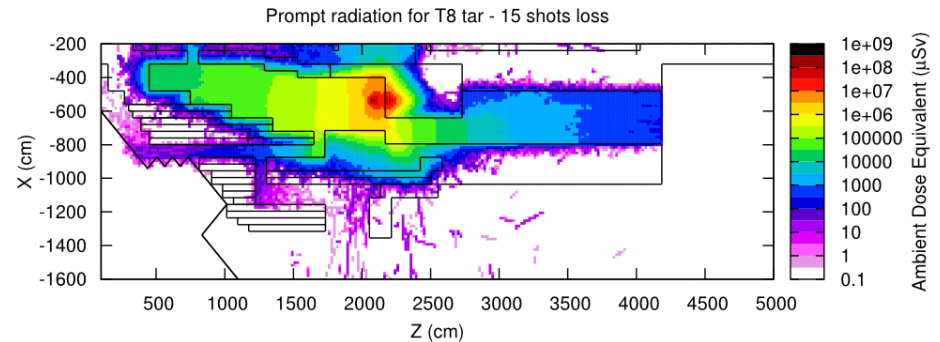
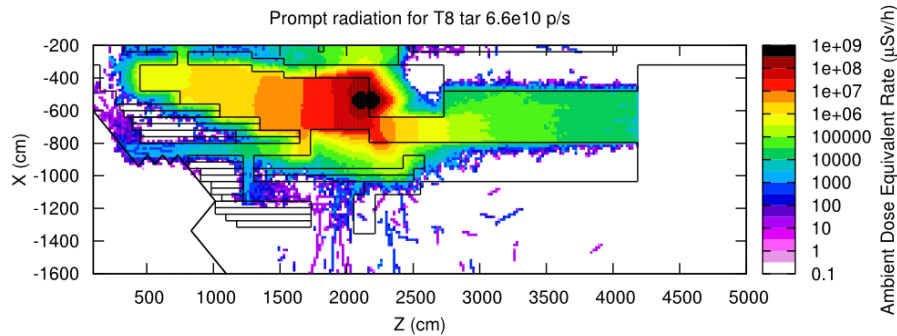
# RP : Shielding Design – T<sub>10</sub> Target

## EDMS 2175579



Courtesy of E. Iliopoulou and R. Froeschl  
(HSE-RP)

# RP : Shielding Design – T8 Beam Stopper - EDMS 2175579



Courtesy of E. Iliopoulou and R. Froeschl  
(HSE-RP)