



# ISOLDE Beam Dumps Replacement and Sustainability (IBDRS), a step to 2 GeV and 6 uA at ISOLDE

ISOLDE Workshop and Users meeting

Ana-Paula Bernardes (IBDRS project leader) on behalf of IBDRS team

# Outline

- Introduction to IBDRS project
- Status
- Summary

# Introduction



## ATS update (Council week/MTP perspective)

Mike, Malika, Katy, Brennan, Miguel, Rhodri  
Acknowledgements: Sylvie Prodon,  
24<sup>th</sup> June 2024

Thanks to Alessia and Giulia!

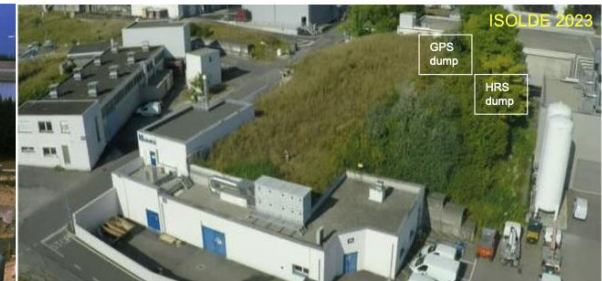
## Diversity

### ISOLDE

- As part of ongoing consolidation programme: **replacement of both beam dumps in LS3** ► 13 M (2024-2028)
- Following planned upgrade of transfer lines from Booster to ISOLDE, new beam dumps will allow operation with higher energy (1.4 to 2 GeV) and intensity beams from upgraded Booster.

### ECN3 upgrade and SHiP

- **Facility upgrade during LS3** (target complex, beam line, technical infrastructure, etc.) ► 60 M (2025-2029)
- Contribution to SHiP detector (R&D, construction of muon spectrometer magnet, hostlab, etc.) ► 5 M (2024-2030)



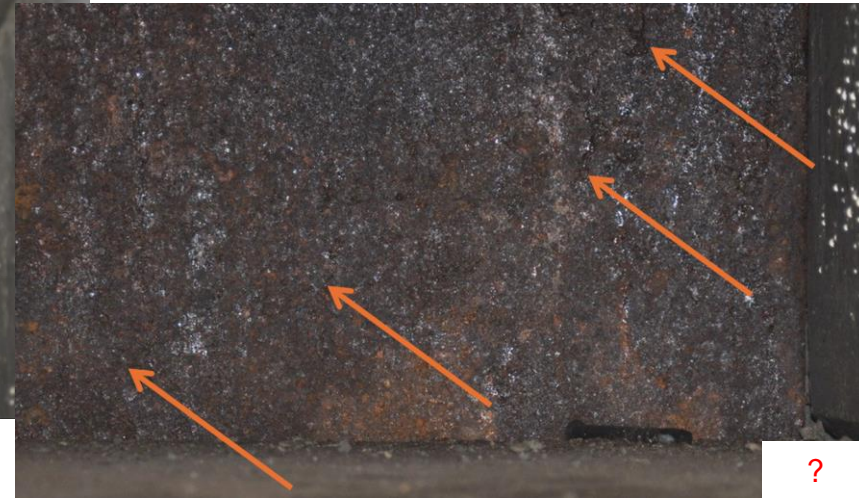
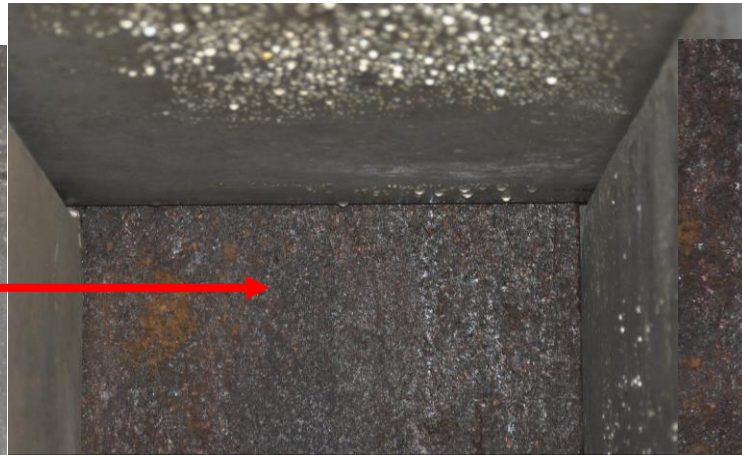
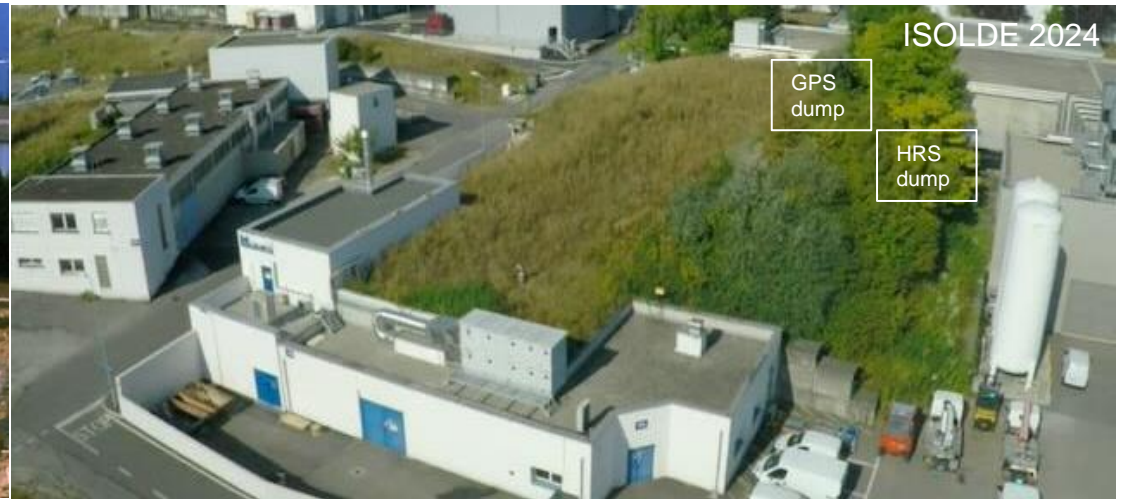
Extract from Accelerators and technology sector - June 2024 (Mike Lamont DG-DI-ATS)

<https://indico.cern.ch/event/1422391/>

# IBDRS project approved in MTP2024 – 13 MCHF



# Why?

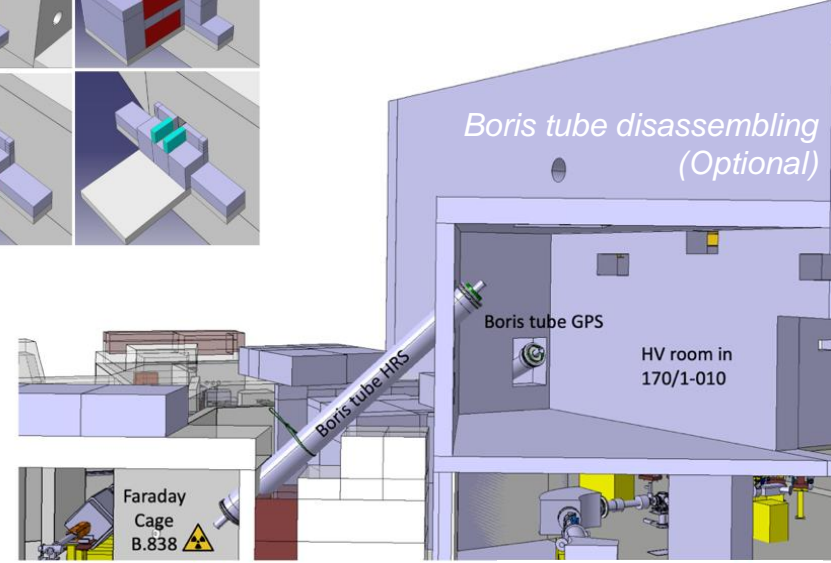
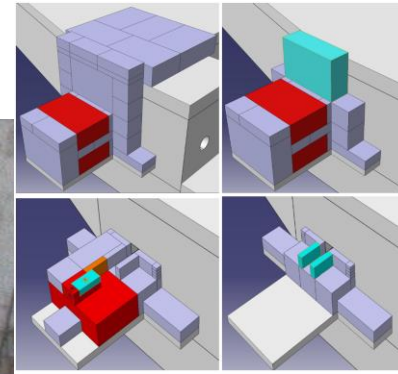
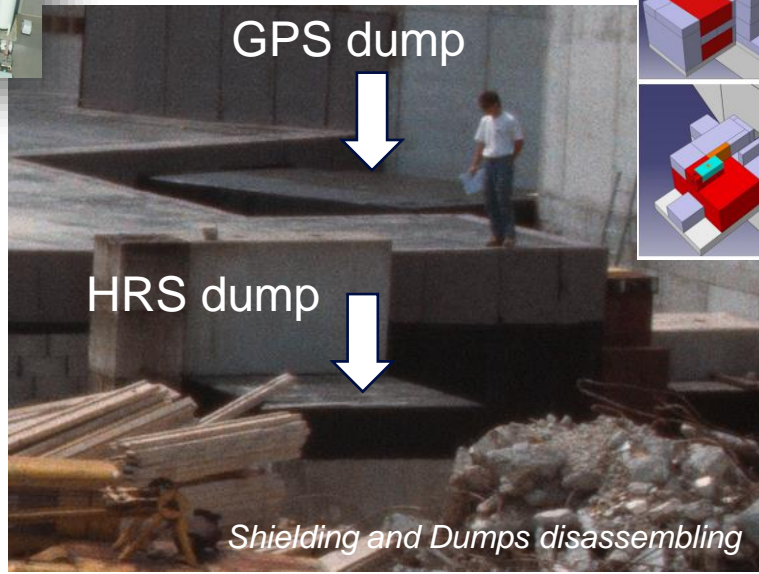


**Current dumps risks limiting intensity and energy increase in ISOLDE**

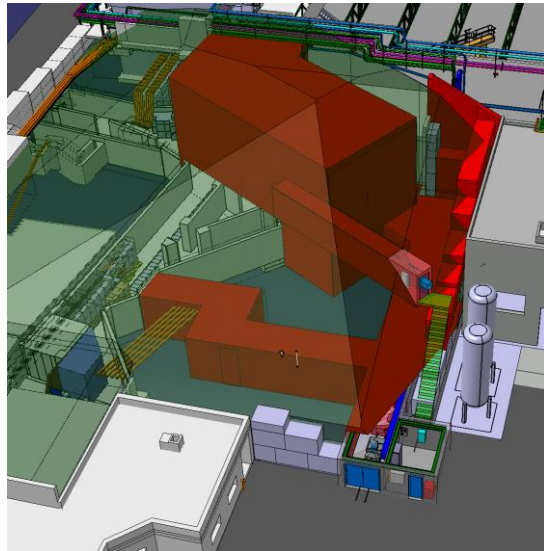


# How?

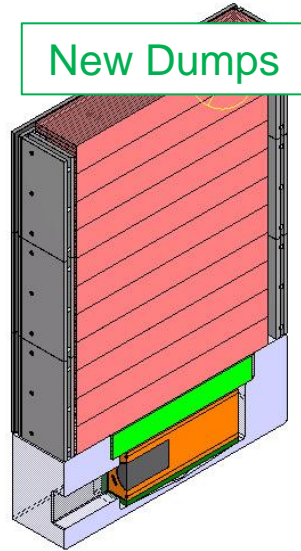
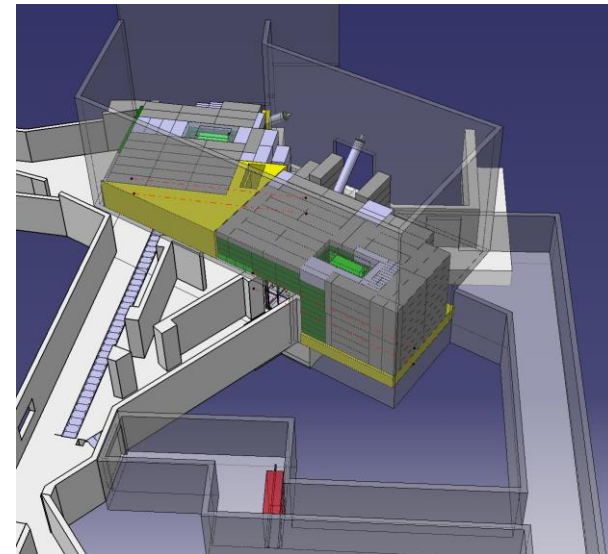
## PHASE 1: Dismantling



## PHASE 2: Building



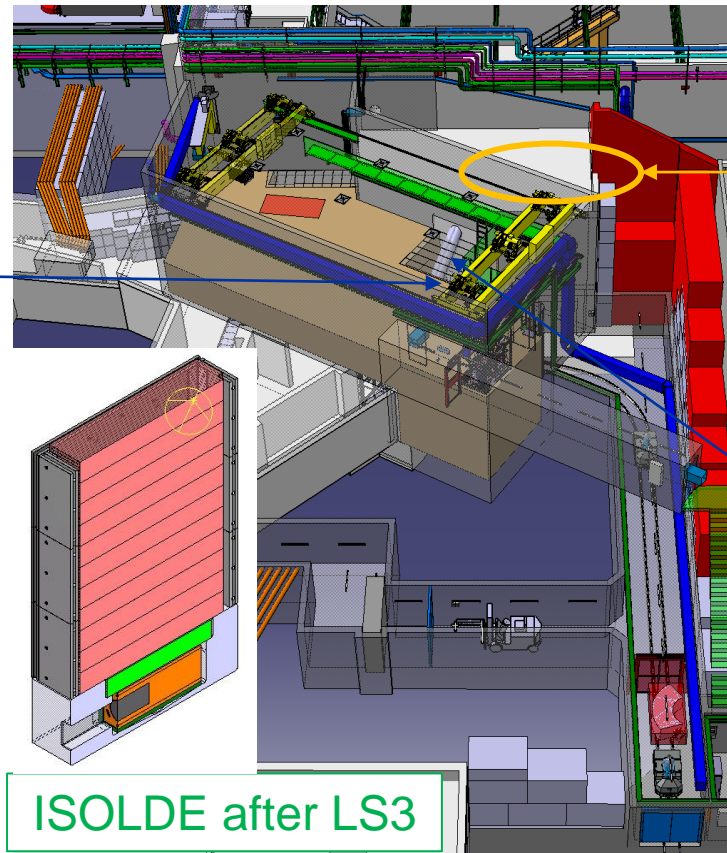
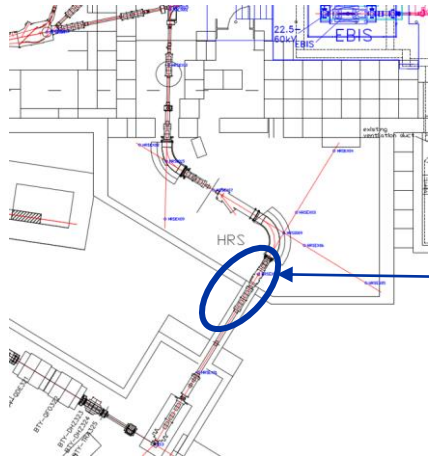
## PHASE 3: New Dumps and Shielding



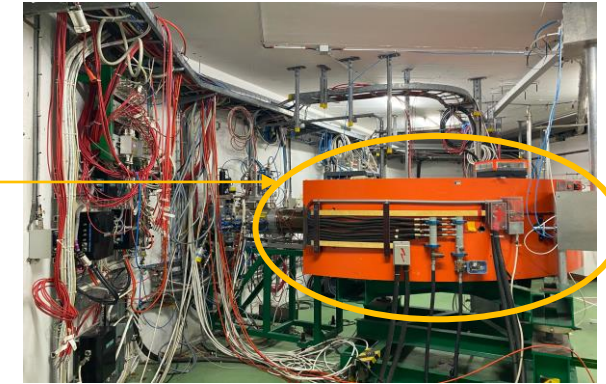


# What? Benefits of selected solution

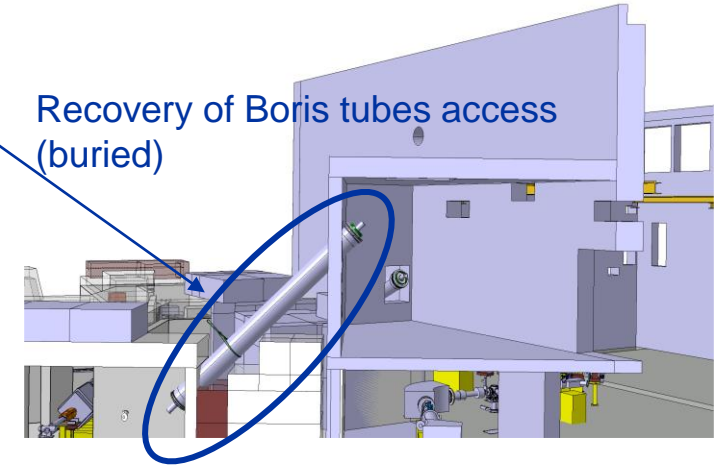
Recovery of electrostatic elements access  
(YHRS.QP.170&180)



Accessibility for HRS separator magnets exchange (if needed)



Recovery of Boris tubes access  
(buried)



Goal: 80 % of iron bocks used already radioactive

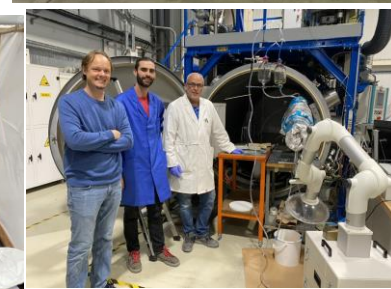
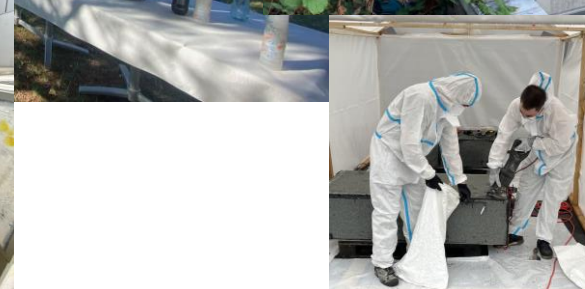
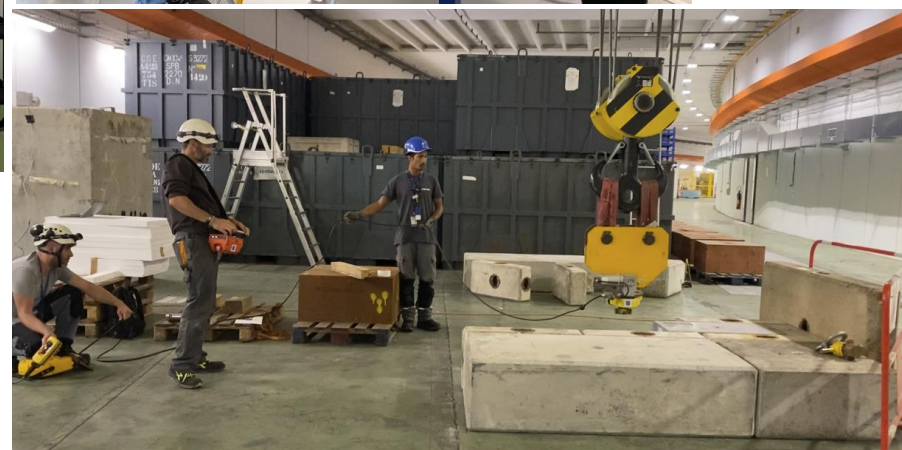
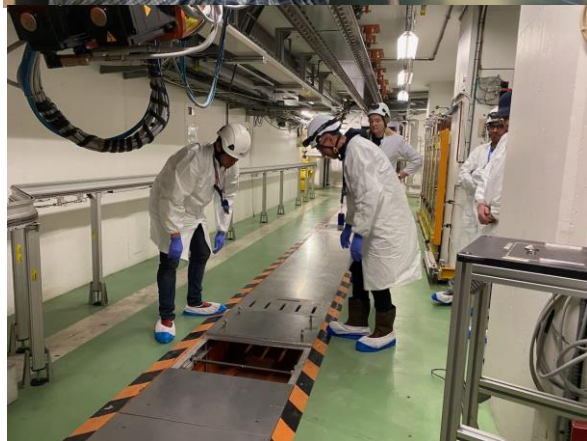
ISOLDE after LS3

## Improve ISOLDE Sustainability



# Who? IBDRS Team

[EDMS 3126700](#)





# STEPS to 2GeV and 6uA



**STEP 1** 2GeV – 6uA under conditions

**IBDRS Project**  
New dumps  
New shielding

**STEP 2**

**LS4 concept**

**Front-end improvement**  
New Front-end (LS4 concept)  
New Building B.738 (IBDRS)

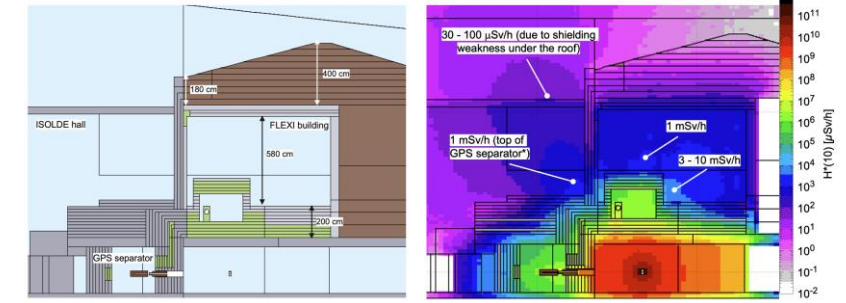
## 2GeV – 6uA standard operation



Results given for 2 GeV and 6 μA proton beam onto UCx target

## Shielding study: example for GPS

\*The area on top of the GPS separator would require further consolidation (at least!) not to exceed current dose rates: 180 μSv/h (exclusion zone!)



**170 shielding improvement**

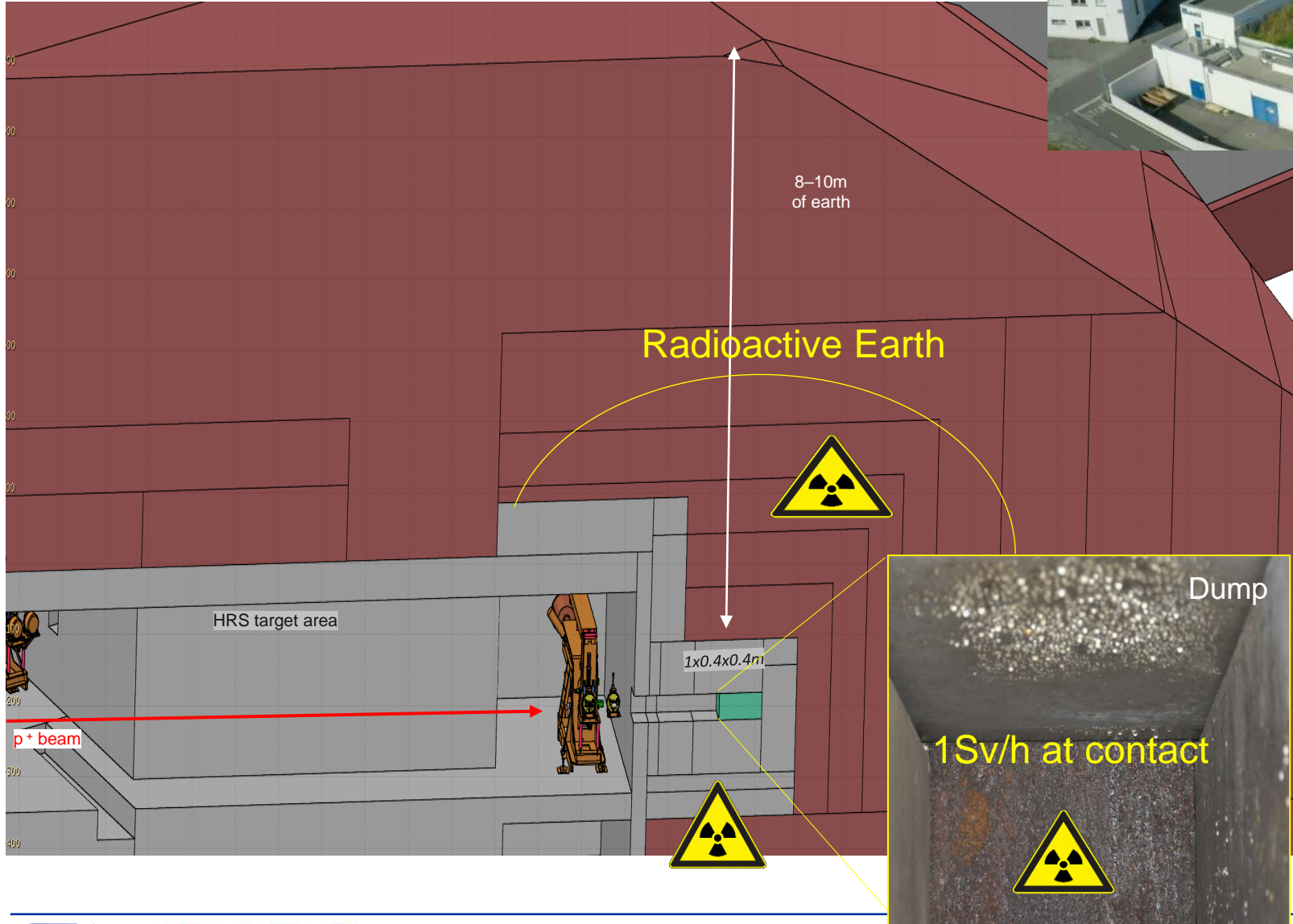
**BTY line upgrade**



# Outline

- Introduction to IBDRS project
- **Status**
- Summary

# Excavation Phase

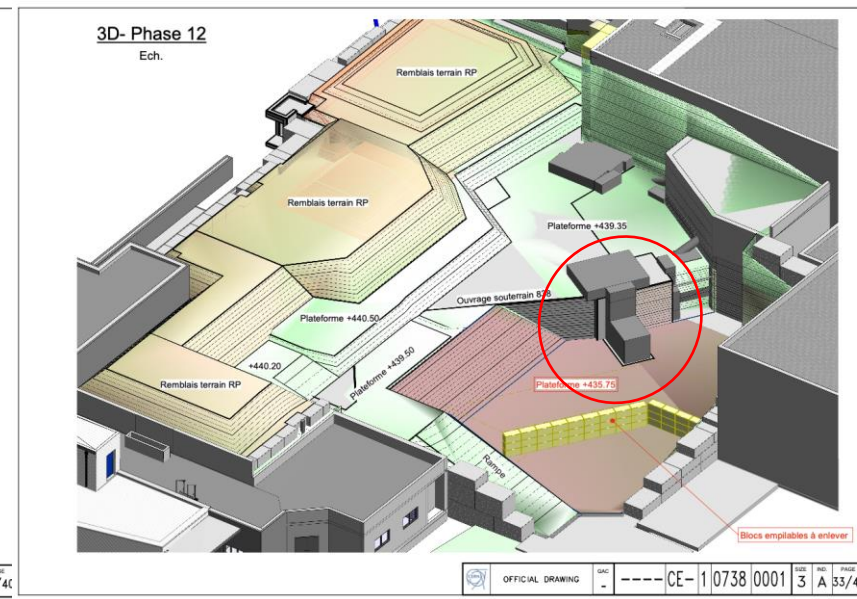
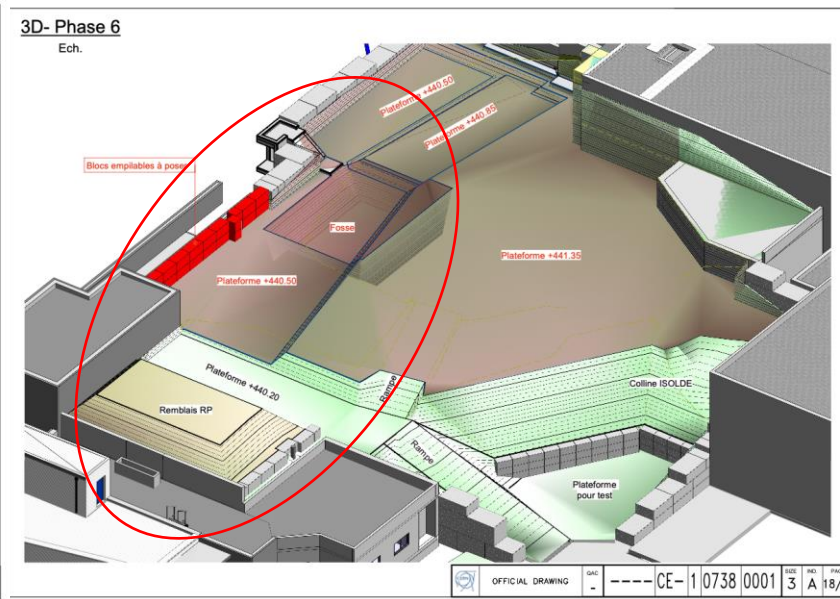
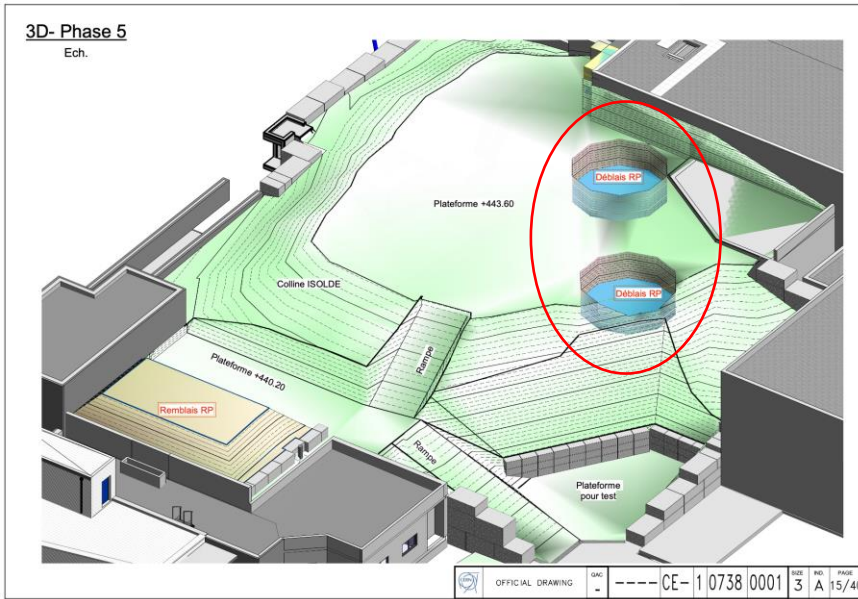




# Excavation Status

## Earth excavation strategy

Acknowledgements: JP.Dauge, ZA.Arenas, M.Manfredi SCE-PPM



HRS and GPS excavation well identified

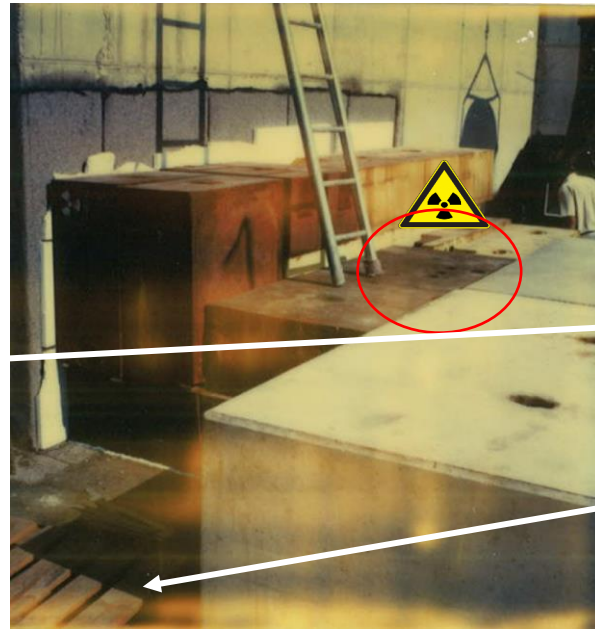
Radioactive earth storage on site

Start with HRS dump dismantling (smaller and less complex)

**Earth excavation staggung under preparation in close collaboration with HSE-RP to control contamination**

# Excavation Status

- Old radioactive waste may have been buried in the mound to free space on radioactive storage
- We will know only when we will start excavation!



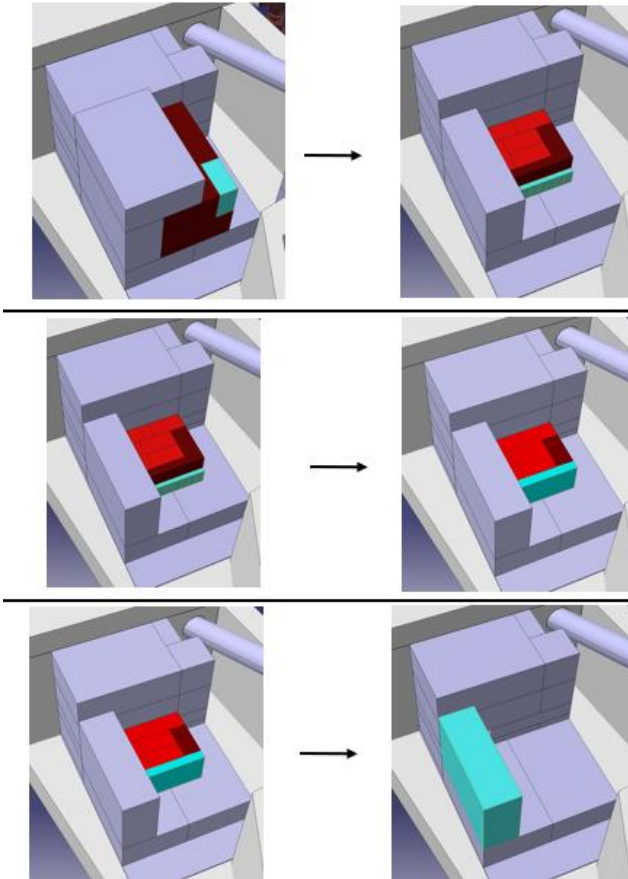
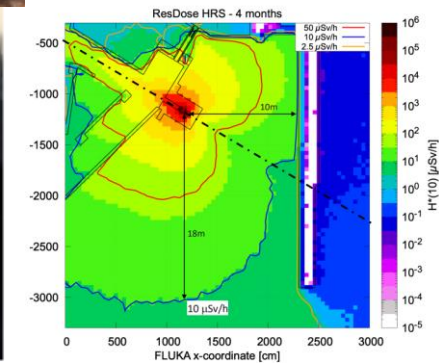
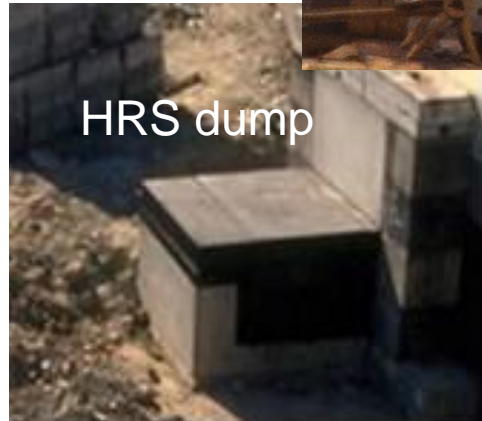
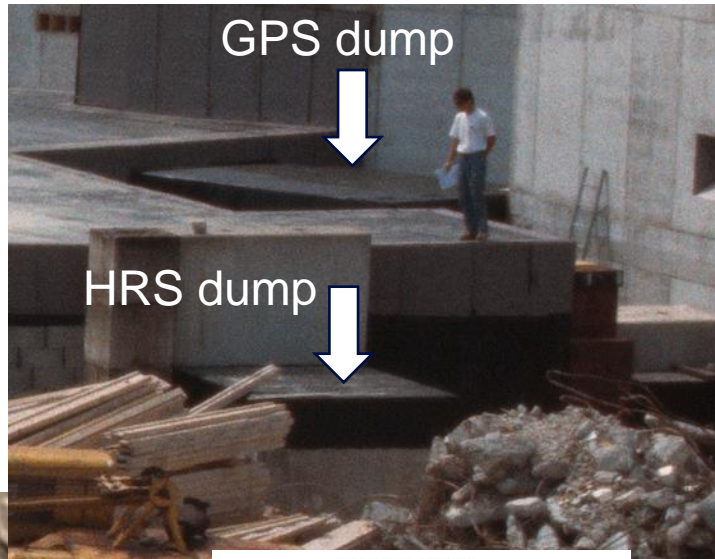
*Radioactive storage in 1991*

Uncertainties on what and how much has been buried in earth  
Earth excavation strategy needs to be flexible → SCE Blanket contract



# Dump Dismantling status

Acknowledgements: N.Quinquis SY-STI, C.Bertone, L.Quain Solis, Y.Seraphin EN-HE, L.Buonocore, E.Romagnoli BE-CEM

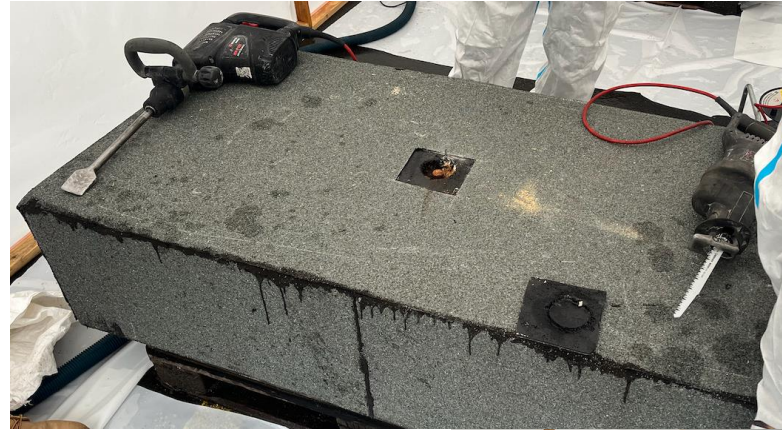


Detailed Dump dismantling sequencing under preparation and tests



# Dump Dismantling status

Acknowledgements: N.Quinquis SY-STI, D.Pazem SCE-SAM, M.Lemetayer HSE-OHS



Handling core cleaning



Block cleaning for waste release

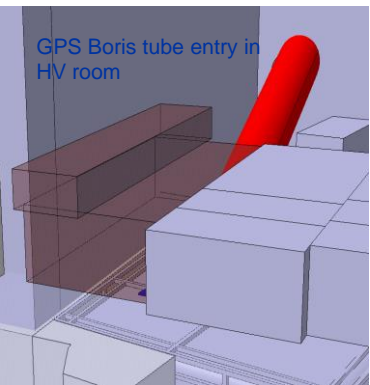
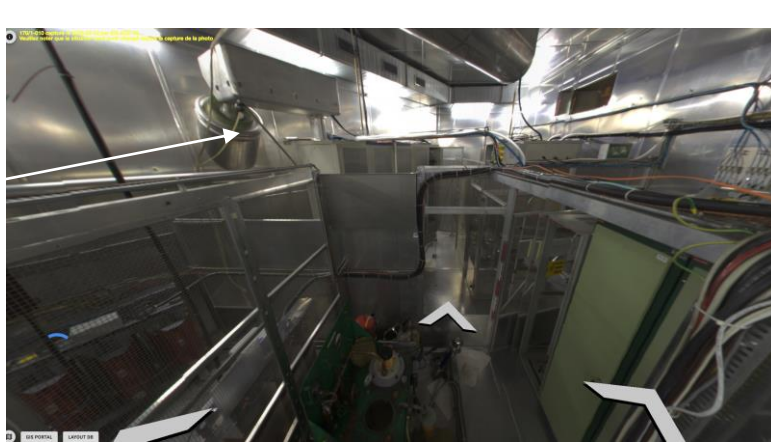
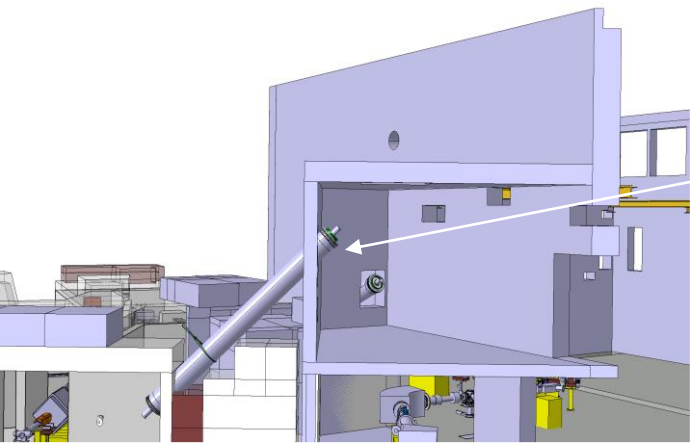
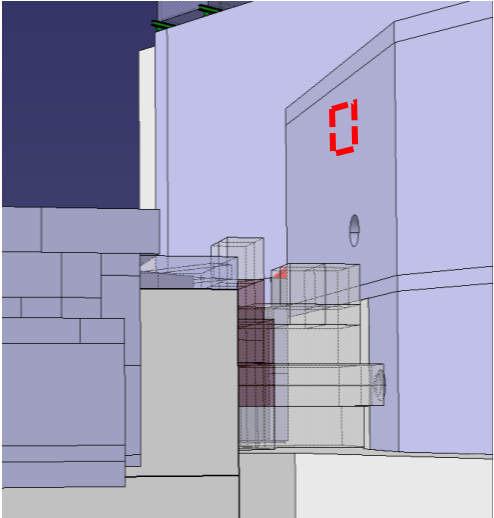
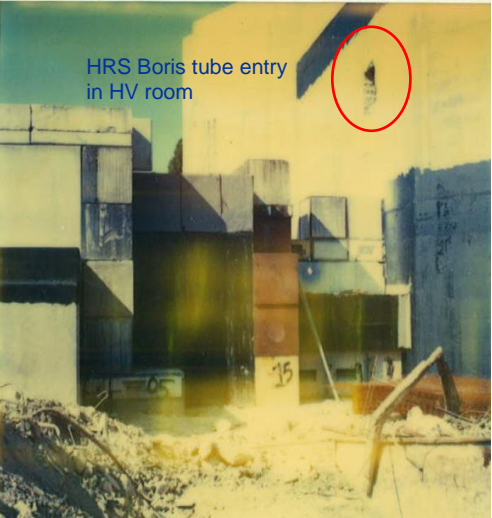


Hazardous radioactive substances destruction process  
(Hydrocarbures Aromatiques Polycycliques (HAP) and Asbestos)



# Boris tube status (Option)

Acknowledgements: S.Marzari SY-STI, J.Parra-Lopez,



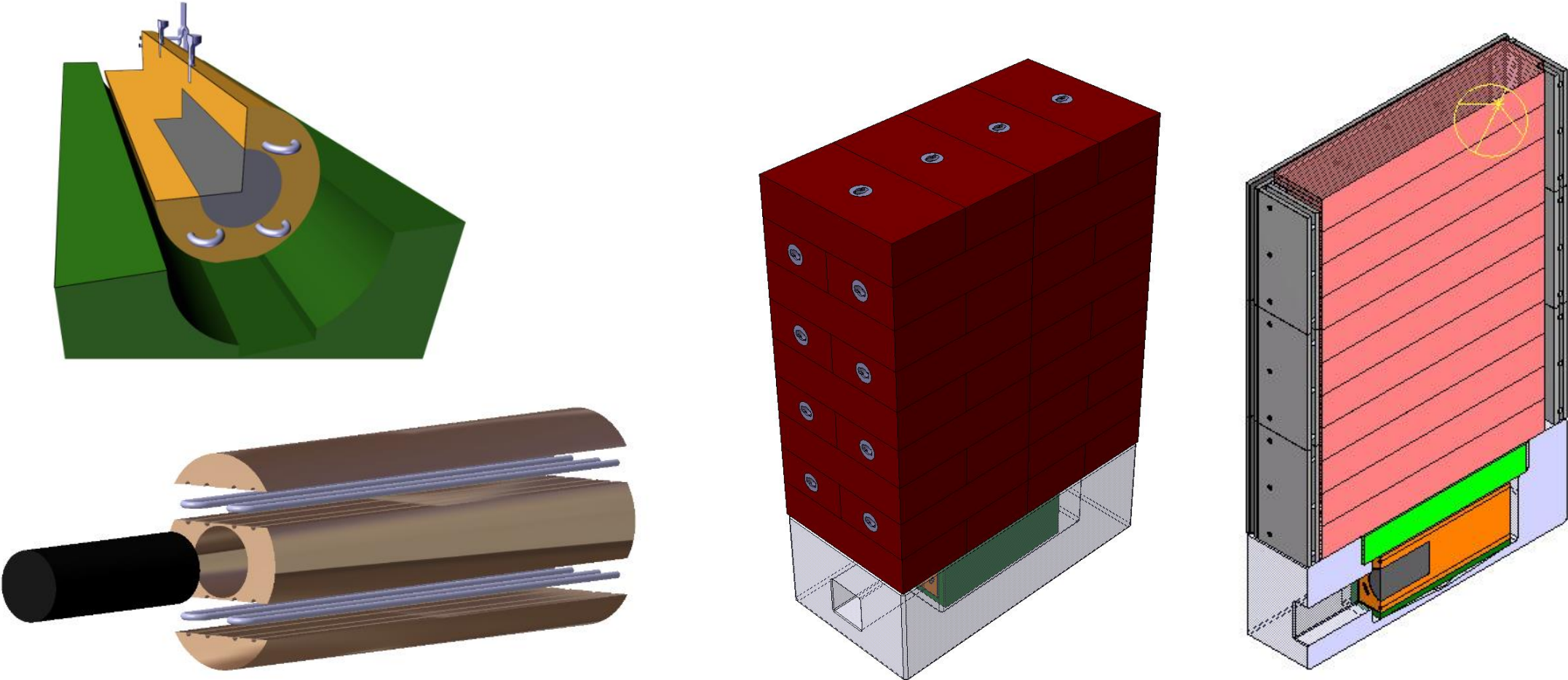
**Boris tube replacement is an option (if damaged)**  
Several possibilities under study





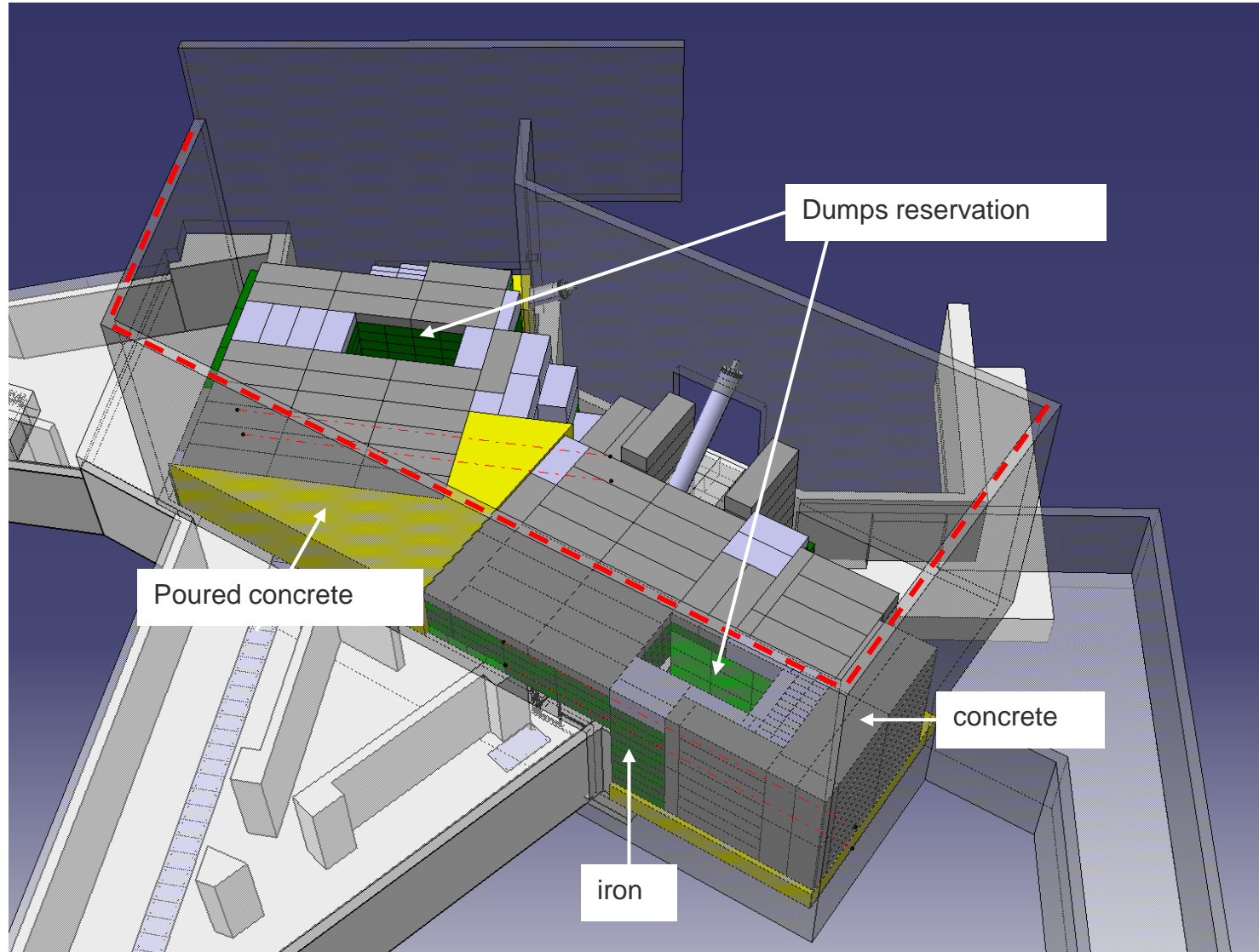
# Beam Dumps

Acknowledgements: E.Grenier-Boley, I.Johansen, S.Sorlut, JM.Martin Ruiz

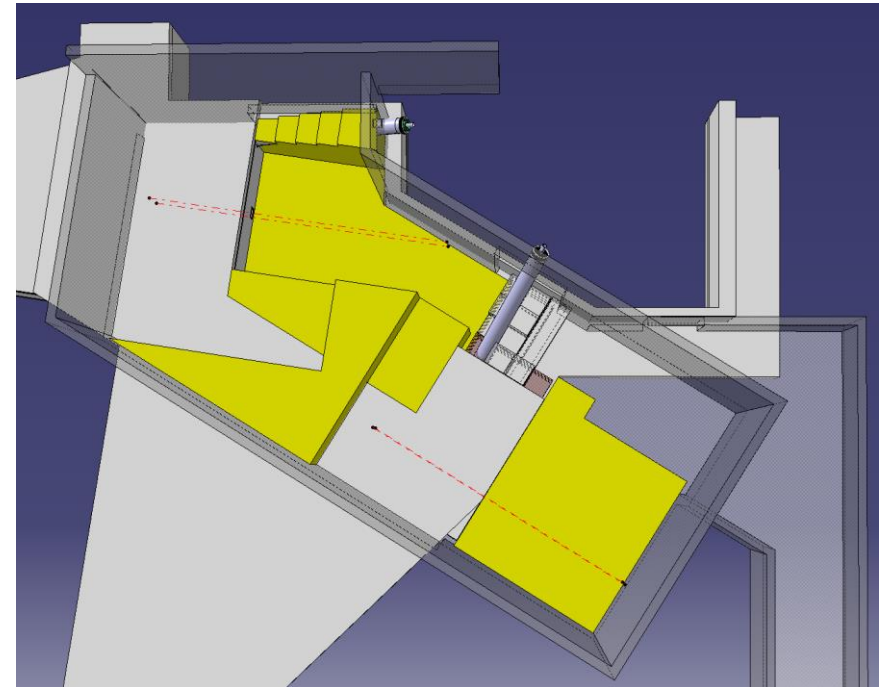


Pre-design for beam dumps and dump enclosures ongoing

# Shielding Status



Shielding requires:  
407 m<sup>3</sup> of concrete  
276 m<sup>3</sup> of cast Iron





# Shielding Status

Acknowledgements: G.Dumont, H.Siri, A.Formento, R.Charouset, R.Mouret HSE-RP-RWM



State of the blocks may require painting before reuse



80% of iron recovery of radioactive blocks is IBDRS baseline (to be confirmed in 2025)  
Concrete to be recovered from CNGS dismantling (to be confirmed in 2025)

# Summary

- IBDRS is the **first step** to guarantee long-term operability of ISOLDE as well as to higher energy and intensity (2GeV and 6uA)
- After LS3, 2 GeV beam can be routinely delivered to the two target stations if available. **Operation with higher intensity will require further improvements on the Frontends side**
- **IBDRS team fully committed** with studies, Mock-up tests...

A big thanks to all contributors of IBDRS project and to ISOLDE physics community for their support !



# Acknowledgements

BE-EA: M.Lazzaroni, C.Benmehdi

BE-OP: S.Mataguez, E.Siesling, A.Rodriguez Rodriguez

BE-CEM: L.Buonocore, C.Mitifiot, E.Romagnoli

BE-GM: A.Behrens, A.Beynel

EN-AA: D.Chapuis, B.Morand, D.Raffourt

EN-ACE: V.Barozier, J.Coupard, J.Etheridge

EN-EL: JP.Billon-Grand, P.Gallay

EN-HE: C.Bertone, S.Pelletier, L.Quain Solis, Y.Seraphin, R.Rinaldesi

EN-CV:M.Archambault, R.Bozzi,N.Szczepanik-Scislo

IT-CS: MA.Denis, JR.Rendon Molina

HSE-ENV: JP.Bergoieing, S.Schadegg

HSE-OHS: F.Corsanego, J.Cuadrado, S.Hansen, O.Prouteau, O.Rios, D.Tshilumba

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F.Malacrida, G.Michet, R.Mouret, F.Pozzi, S.Roesler

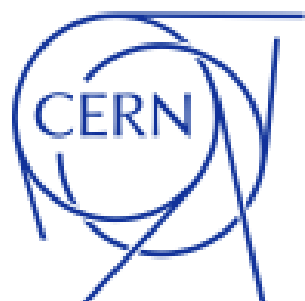
SCE-PPM: Z.Arenas, L.A.Lopez-Hernandez, M.Manfredi

SCE-SAM: S.Adam, J.Dauge, J.Osborne, D.Pazem

SY-STI: F.Abbasi, M.Averna, M.Calviani, S.De Man, S.Gilardoni, E.Grenier-Boley, S.Marzari, A.Perillo Marcone,

N.Quinquis, J.Vollaire

WP Leaders



ABRS

