n_TOF Technical Report at the 78th Meeting of the INTC

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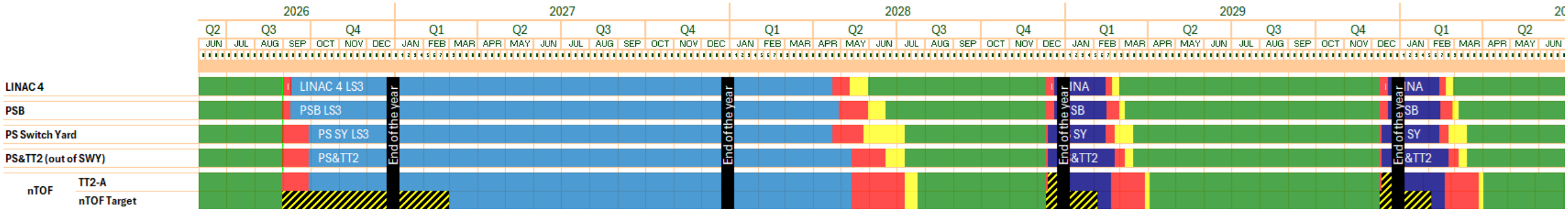
05/02/2025

Restart 2025 -> 2026

- ***Dates:***
  - *Beam stop: 25/11/2024 - 6h00*
  - *Beam back: 17/03/2025*
  - *Beam for physics: 19/03/2025*
  - *TS: 24/06/2025 – 24h*
  - *End of run: 08/12/2025 - 6h00 all machines*
  - *End of 2025 run for all machines and facilities on Mon. 8 December at 06:00*
    - *No additional RP cool-down by stopping ISOLDE and n_TOF 1 or 2 weeks earlier*
    - *No major work in the machine tunnels foreseen (desired) due to short YETS and need for quick restart in 2026*

- **TT2A**
  - Only standard maintenance (this and next YETS)
- **Target**
  - Cooling station **safety improvement** (extend under pressure confinement to the entire station + additional retention vessels for the moderator skids, as requested by the tripartite) implemented, new suggestions for EAR1
  - n_TOF Target #2 autopsy and waste packaging Project in the ISR8
  - NEAR activities during 2025

n_TOF for LS3

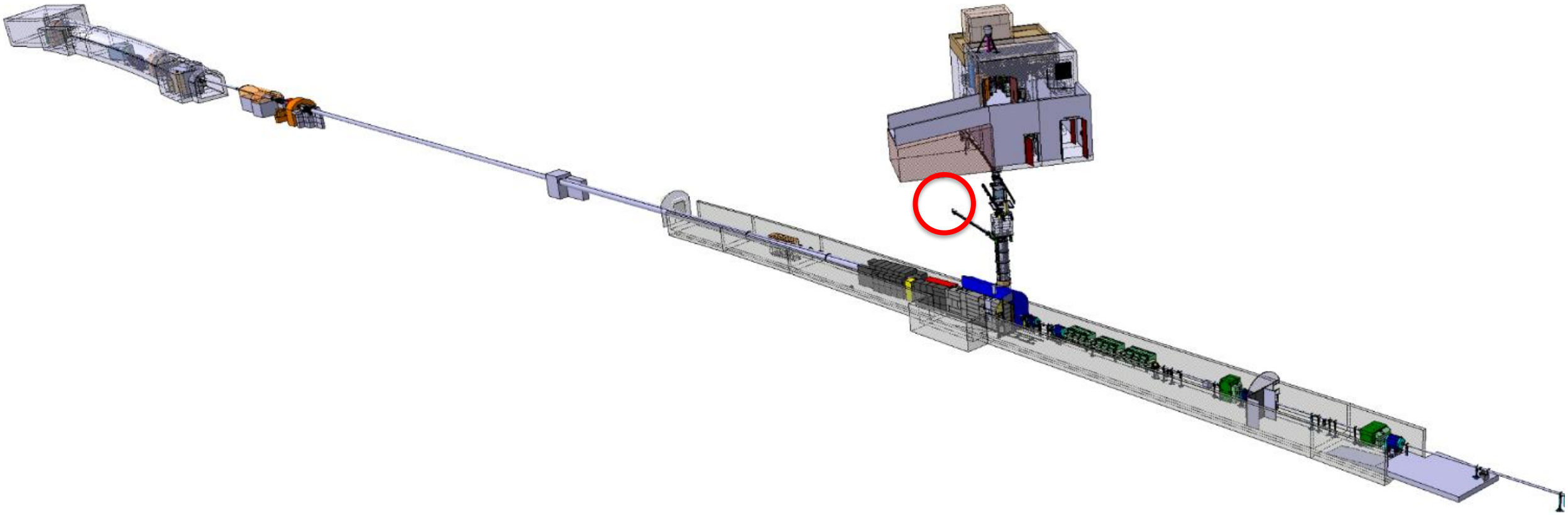


- During the LS3 period a few activities are planned in the n_TOF Facility, but there are no major changes foreseen:
  - Installation of a new moderator on the target (requires target shielding opening and remote handling)
  - Potential installation of five beam position monitors in FTN + vacuum modifications if budget request granted.
  - Long Shutdown maintenances (SEM, magnets vacuum in the FTN, revision of the target cooling and moderator stations, ventilation station on TT2A and both type A labs)
  - Tripartite requirements implementation
  - Commissioning for restart will be very similar to a YETS commissioning, no major changes foreseen

- The n_TOF Facility is ready to take beam and start its beam commissioning as soon as the PS can deliver beam after LS3 (even if anticipated with respect to the actual planning)

courtesy F. Pedroso

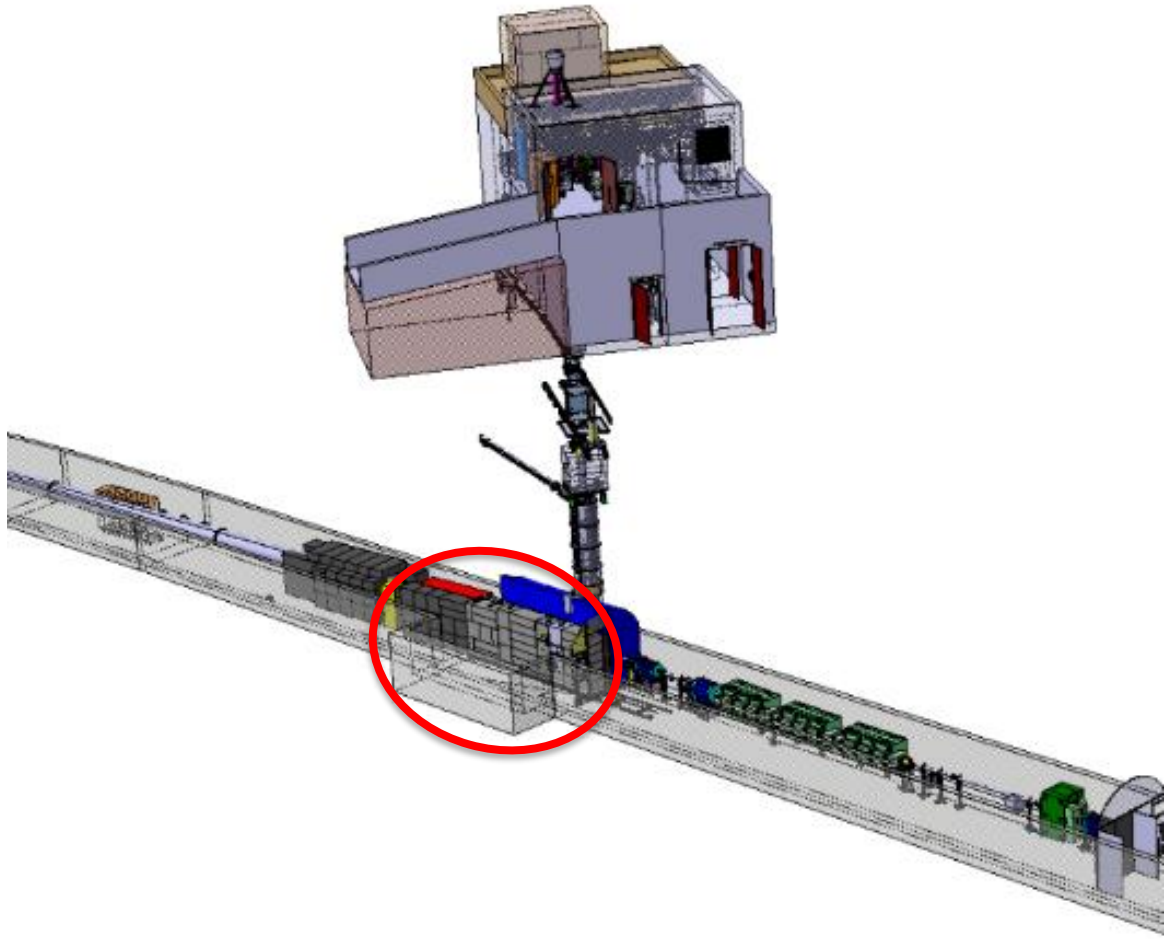
n_TOF target cooling station



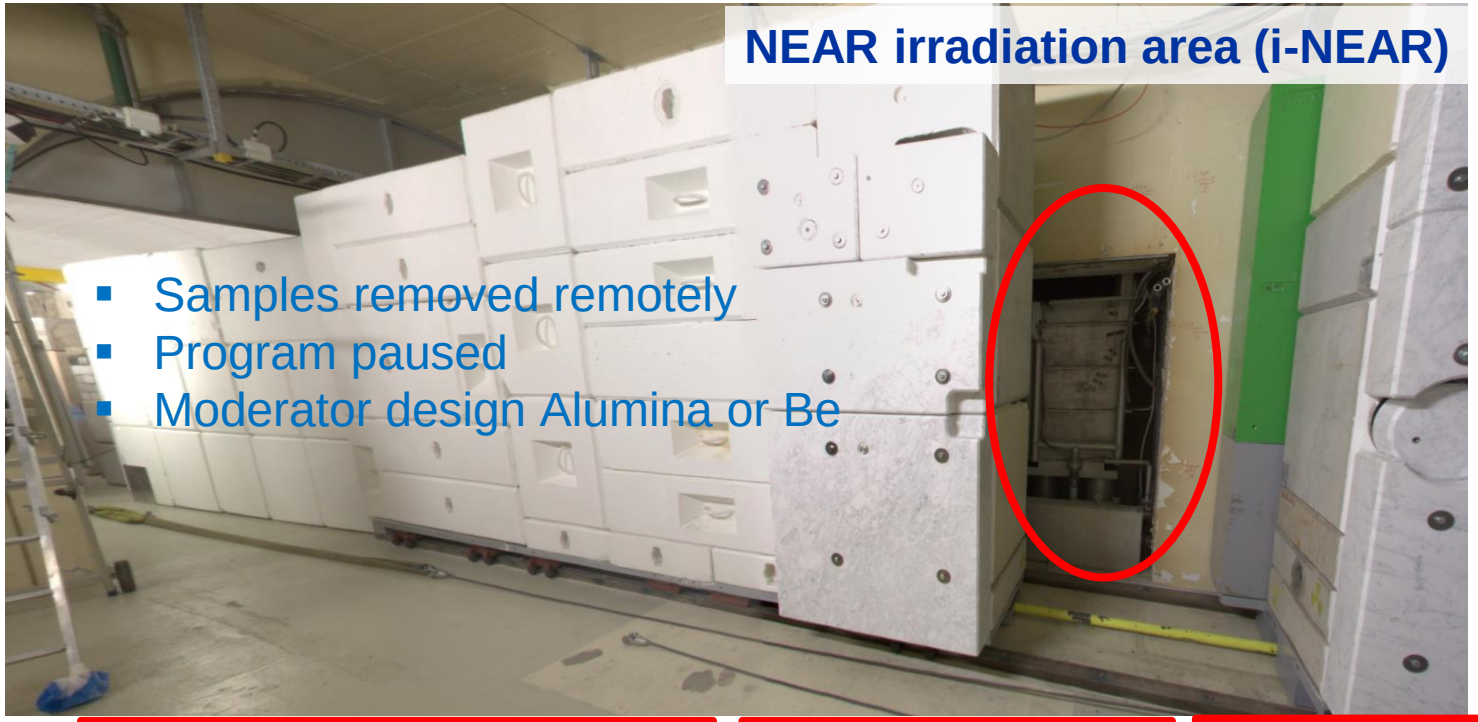
n_TOF target cooling station

- Cooling station annual leak test (air/nitrogen) on circuits and confinement rooms
- Leak on moderator (boric acid)
- RP-sampling of fluids

n_TOF target shielding - NEAR

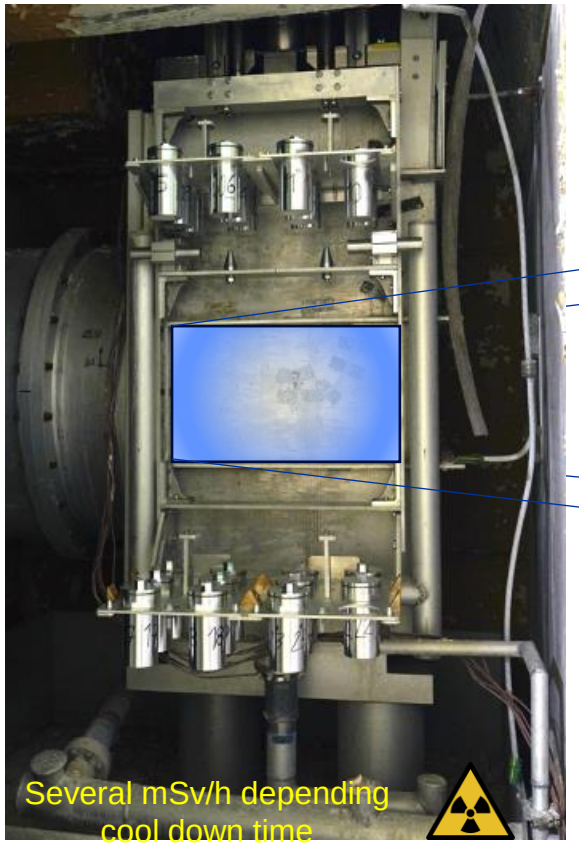


i-NEAR at n_TOF (R2M)

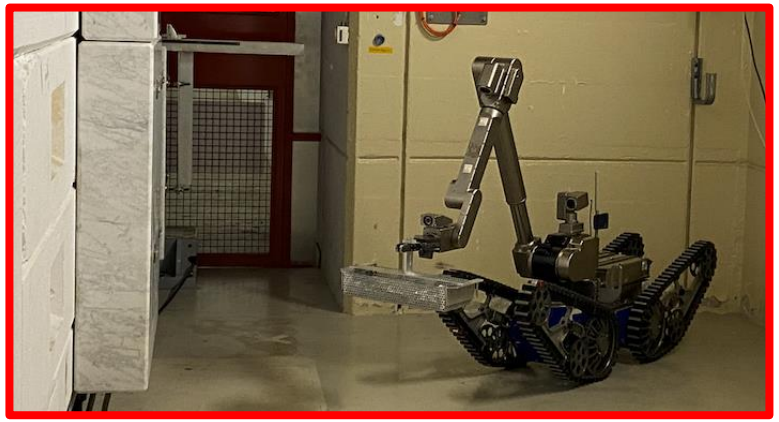


NEAR irradiation area (i-NEAR)

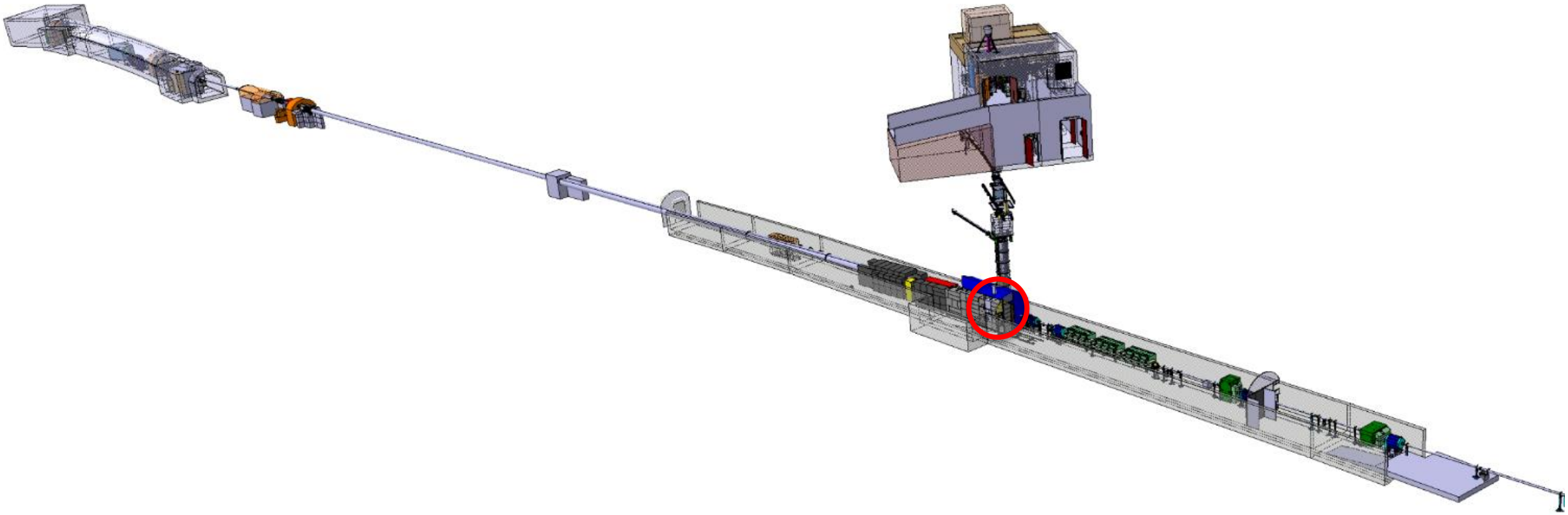
- Samples removed remotely
- Program paused
- Moderator design Alumina or Be



Space reservation for moderator

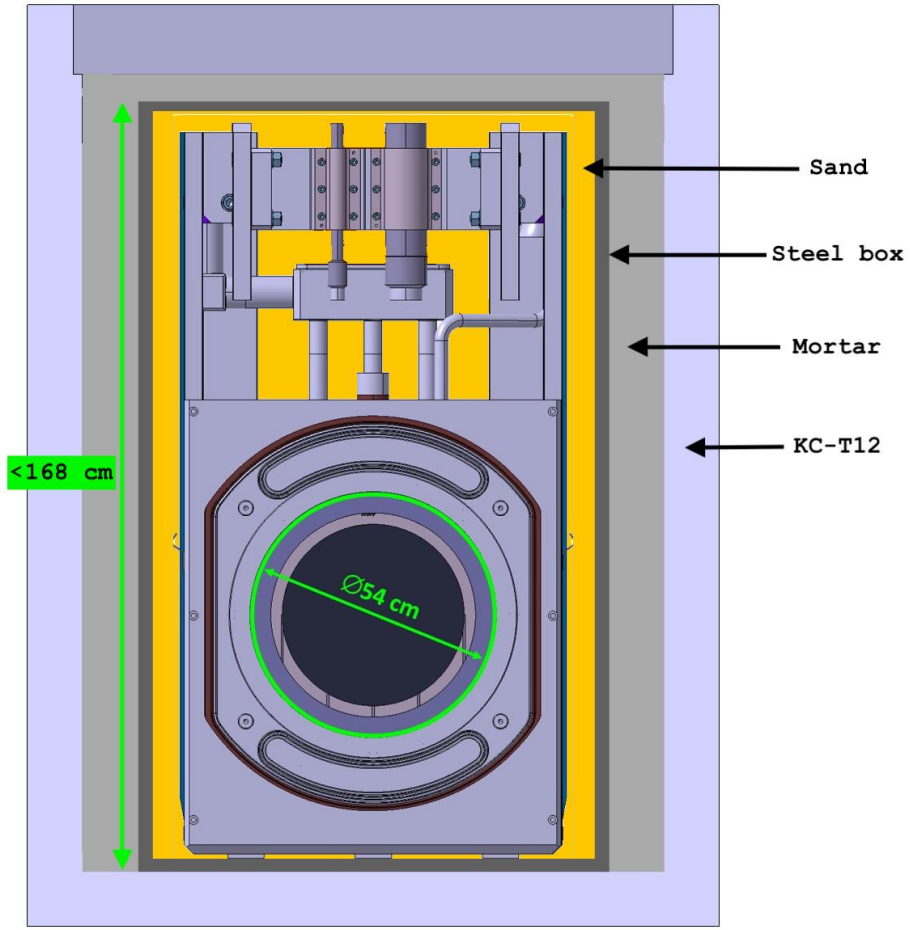


n_TOF target



n_TOF spallation Target #2
Autopsy and Waste Packaging (T2AWP)

- A **specific conditioning solution** has been developed for n_TOF Target #2.
- Cutting for waste packaging completed. Sand filling, closing and mortar filling planned for 2026.
- Autopsy to inspect the lead core by cutting open both windows (proton and neutron side)
- Verification of lead creep and erosion/corrosion effects due to cooling water and moderator (borated water)



Courtesy P. G. Pisano, L. Bruno
On the behalf of HSE-RP-RWM

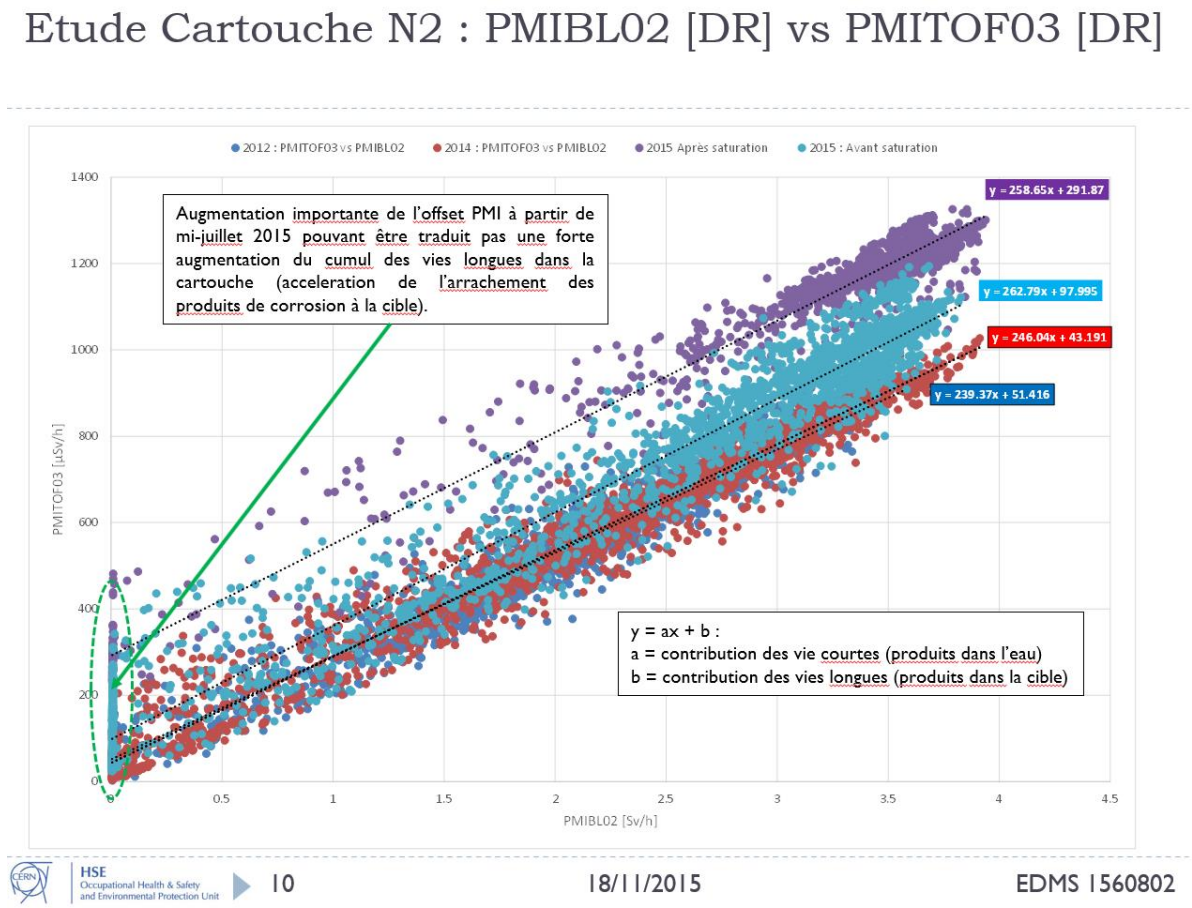
n_TOF spallation Target #2 Autopsy and Waste Packaging

courtesy S. Di Giovannantonio

Visual inspection – Proton side (2/3)

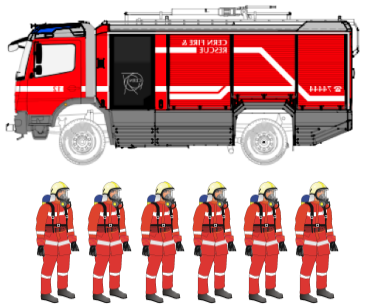
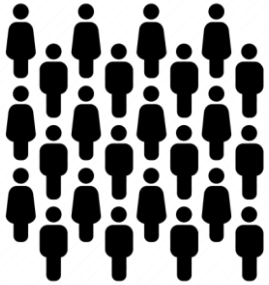
n_TOF spallation Target #2 Autopsy and Waste Packaging

- Autopsy on samples taken (particles and oxides, lead piece, window discs) to come
- Correlation with beam evolution during lifetime
- Thermomechanical simulations to estimate beam conditions
- Review on Target #2 autopsy analysis and consequences for Target #3
  https://indico.cern.ch/event/1474847
- Lessons for target #3 and target#4
- Modify interlock (Brightness vs Intensity)



FIRIA Fire Induced Radiological Integrated Assessment

Assess the **safety outcome** in case of **fire** of a facility with a given fire protection concept including **radiological impact on first responders, environment and public**

Fire Service	Public	Environment
		

Life
- occupants
- victims
- first responders

Environment

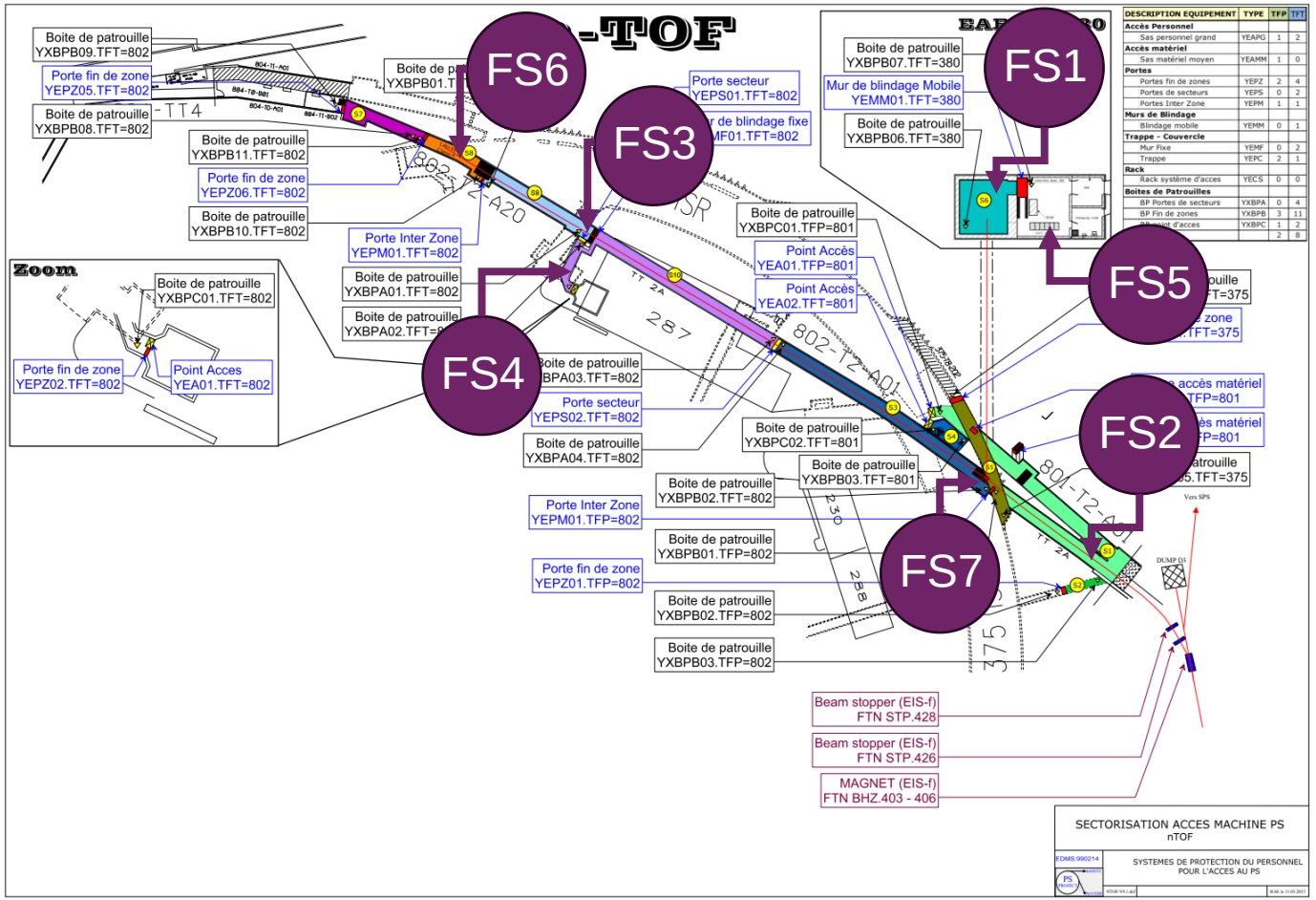
Property

Continuity of operation

FIRIA study Scenarios – fire at n_TOF

7 scenarios identified:

- EAR2
- S1
- Connection to B.287
- EAR1
- Target

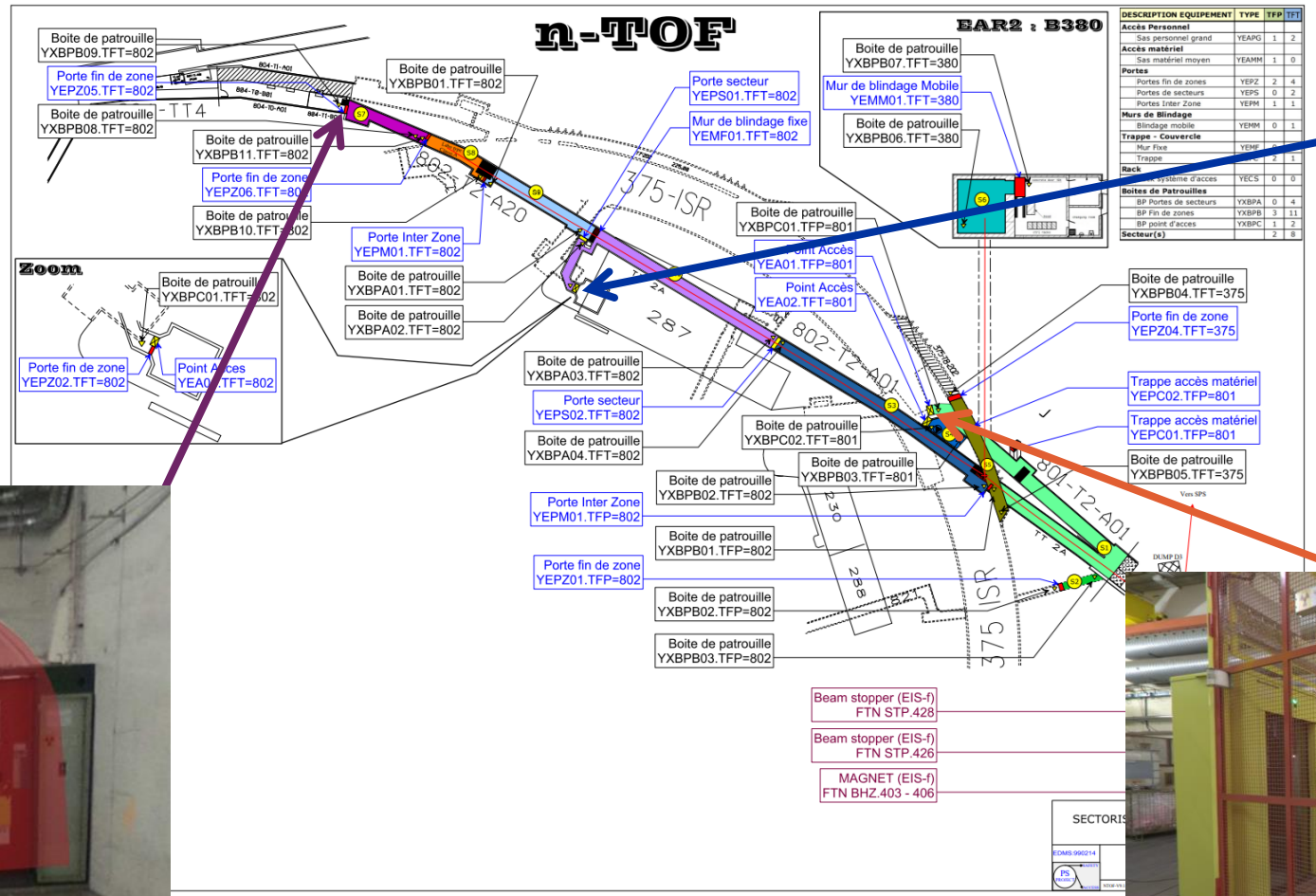


courtesy B. Debrouwere

FIRIA conclusions

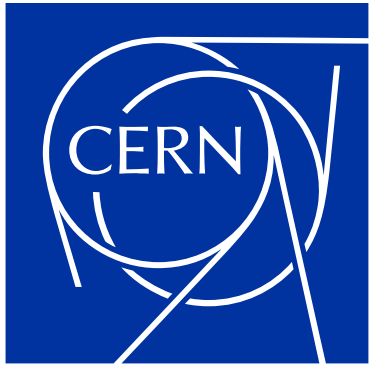
Conclusions

- All results are based on FRP
  90% certainty intervals.
- Current situation:
  - Handling of samples is by far t
  - Residual radiation in building r
    occupants.
  - General lack of compartmenta
    throughout and complex interv



Summary

- Target performance without limitations to design specification, but based on the target#2 autopsy we will adapt the interlocking chain and improve beam diagnostics
- Excellent performances and availability of the facility during 2024!
- New ASN-OFSP safety recommendations for EAR1
- FIRIA results suggest more compartmentalization



Thank you!

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