



# n\_TOF-target and AD-target activities during LS2

M. Calviani (EN/STI)

for the n\_TOF target #3 WG

for the AD-target consolidation project

# Outline

- Target areas of the PS complex
- n\_TOF spallation target replacement during LS2 (target #2 → #3)
- Antiproton production area and equipment renovation in LS2
- Conclusions

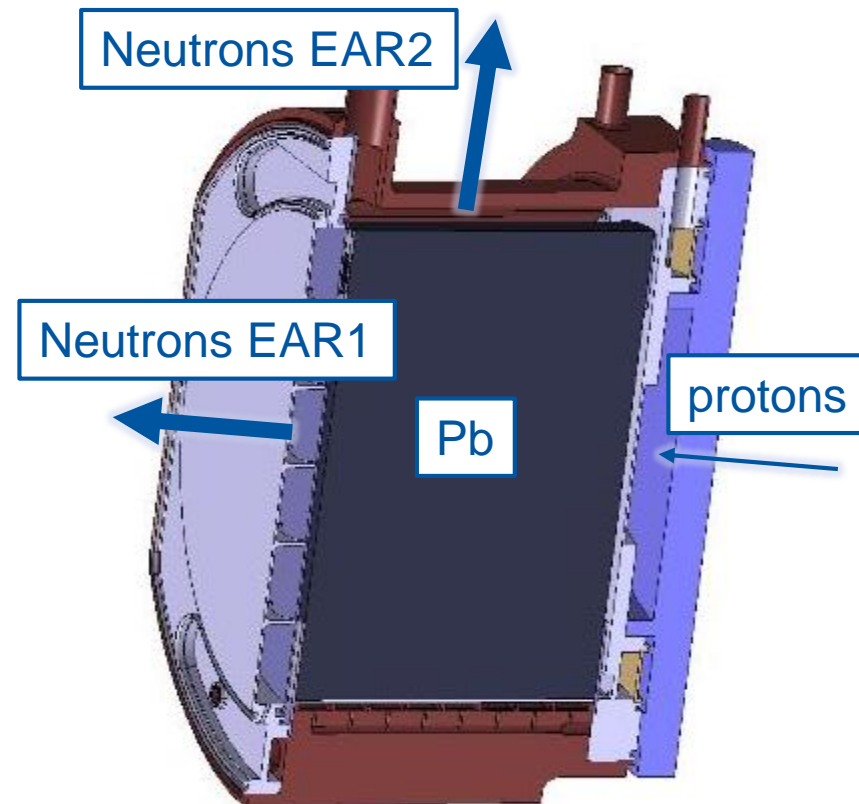


# n\_TOF target #3

## *PLAN #10020*

# n\_TOF and current target

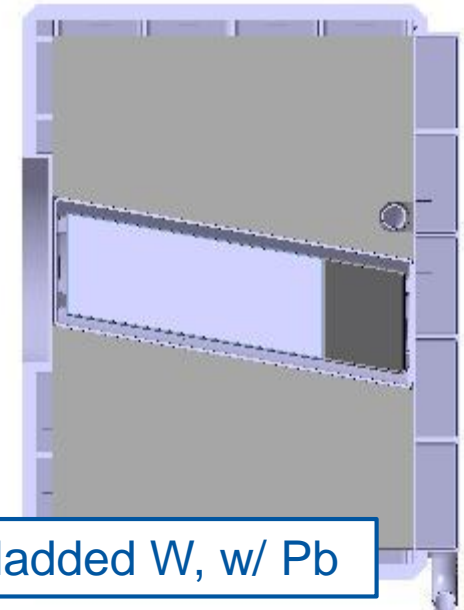
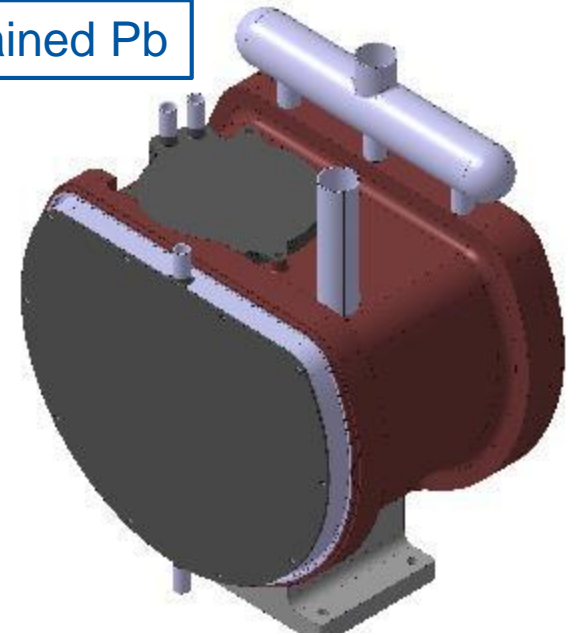
- The n\_TOF facility operates with a water-cooled bare Pb spallation target producing neutrons
- 2<sup>nd</sup> generation target operating since 2009
- Very thin (500  $\mu\text{m}$ ) Al windows (required for physics) required an exchange of the target every 8-10 years max



Ti64-contained Pb

# Target #3

- A new spallation target (3<sup>rd</sup> generation) is being designed for installation in LS2
- “cladded” target baseline
  - Avoid reducing too much the excellent physics performances
  - Limit water contamination in the cooling loop and reduce radioactive waste (ion exchanger resins)
  - Improve radioactive waste acceptance at external sites (FR/CH)



Ta-cladded W, w/ Pb

# Challenges target #2 dismantling

- Target installed at the bottom of a 10-m deep pit – contaminated pipes will have to be cut and removed



- **Safety and radiation protection aspects being assessed**
- No other activities coexisting in the area



# Challenges target #2 dismantling

- REX from target #1 removal (2013) very important
- Target #2 expected to be removed from the service tunnel directly to the ISR for storage
  - Still not clear what type of “conditioning” is required (stainless steel coffin, removal of Pb spallation contamination?)
- Fully removed handling – **improvement of monorail system** already foreseen

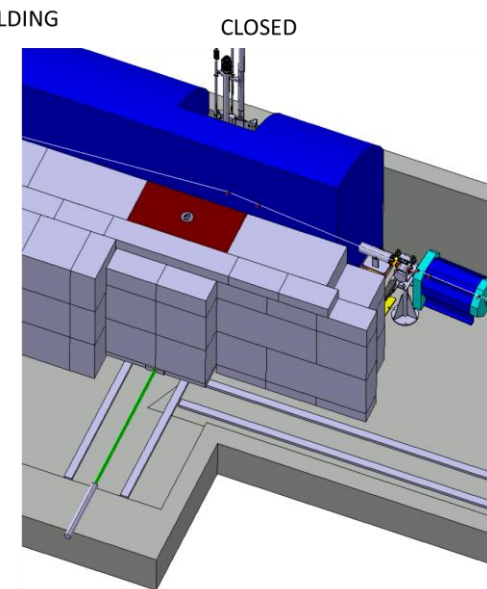
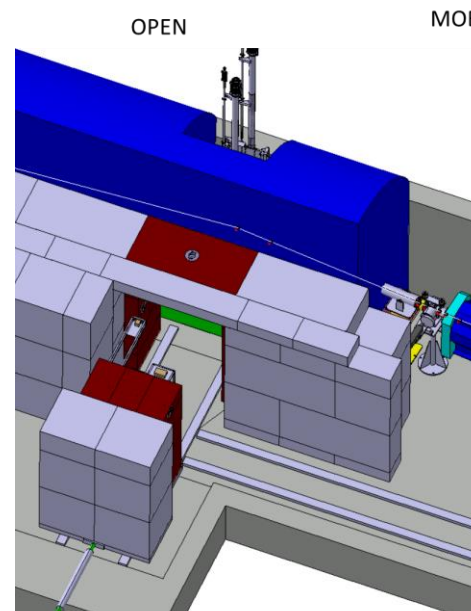
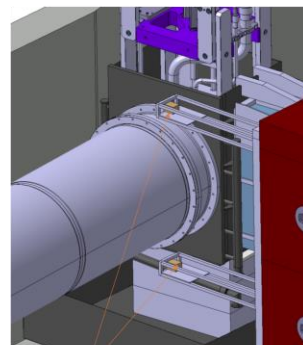
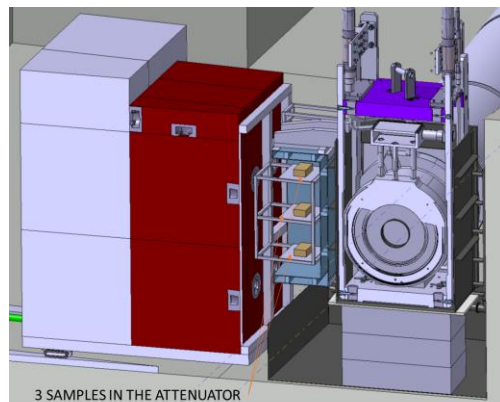


# Planning

- 2017:
  - Detailed target design
  - Improvement of target area sealing (coming EYETS)
- 2018
  - Target construction and off-line tests
- 2019
  - Dismantling of target #2 and removal to ISR
  - Exchange of vertical beam pipe for EAR2
  - Modification of shielding target area for installation of neutron irradiation station
- 2020
  - Installation of target #3 in the pit
  - Reinstallation of vertical pipe for EAR2

# Neutron irradiation station

- Investigating the possibility to realize a material/sample multipurpose irradiation station close to the spallation target ( $\sim 0.5\text{-}3$  MGy/y,  $\sim 4 \cdot 10^{17}$   $n_{\text{th}}/\text{cm}^2/\text{year}$ )



# Involved groups

- EN/ACE, EN/MME, EN/HE, EN/CV, EN/EA, EN/HDO
- HSE/RP, HSE/SEE
- BE/BI, BE/ICS, BE/OP
- SMB/SE
- ❖ **For the moment no showstopper highlighted in the execution of the program but remaining questions on target #2 conditioning before waste storage**

AD-target area  
*PLAN #10006*  
*(and annex)*

# AD-target area consolidation

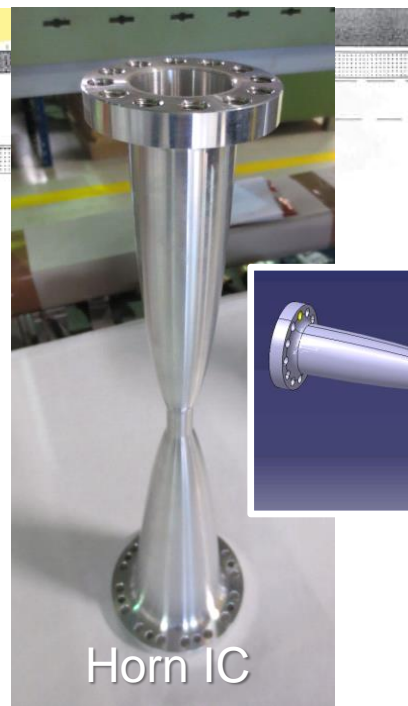
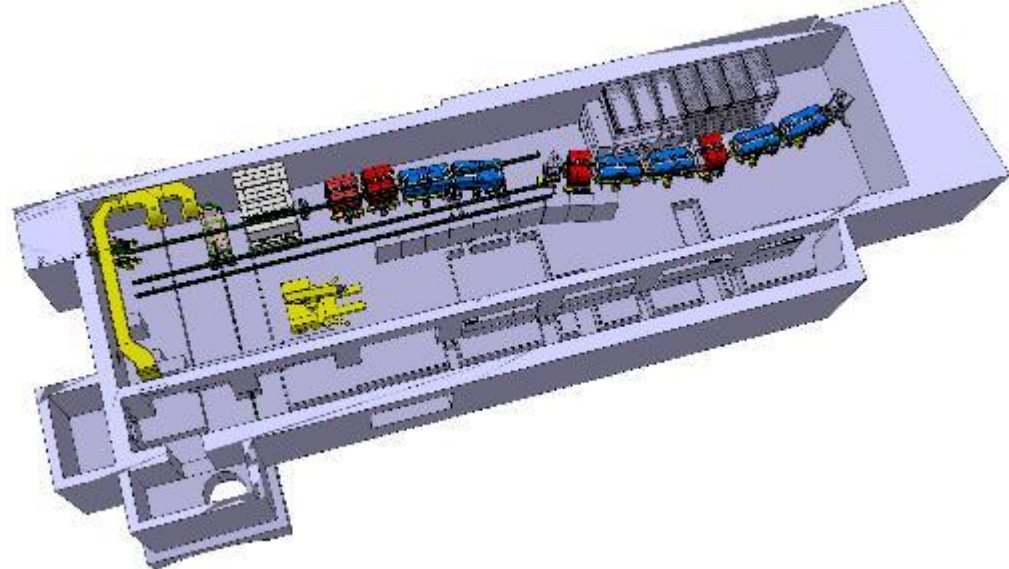
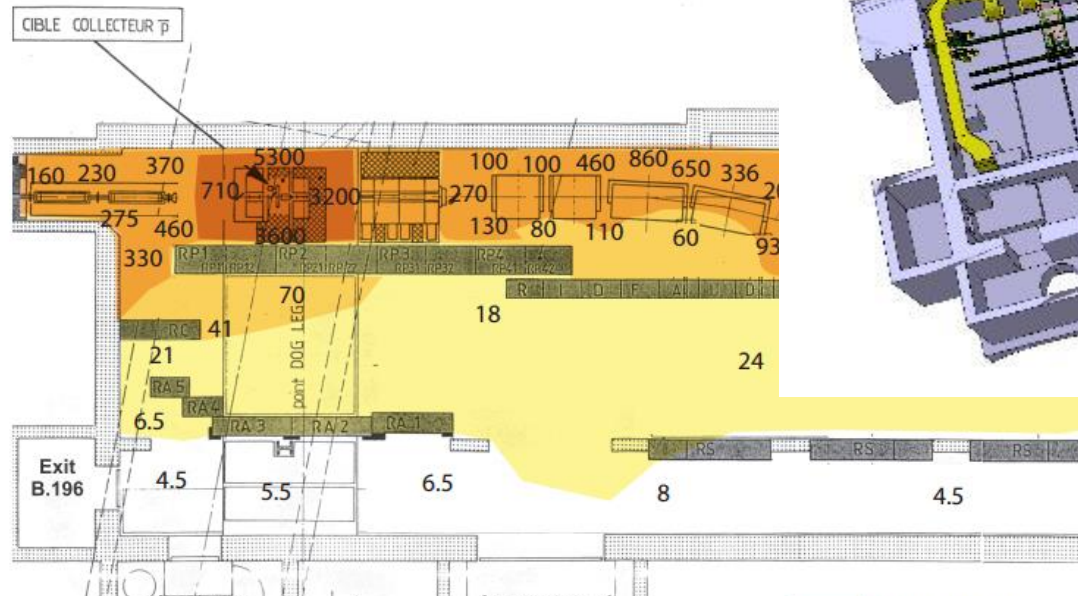
- AD target area provides antiprotons for AD
  - $26 \text{ GeV}/c \text{ p}^+ \rightarrow 3.5 \text{ GeV}/c (\pm 3\%) \text{ p}^-$
- Challenges:
  - High residual dose rate & contamination risks
  - Most of the devices were built in the 80s w/o any (or very little) documentation
  - Lack of spares!
  - Must guarantee long-term operation in the ELENA era

# CERN Antiproton Decelerator Target Area (

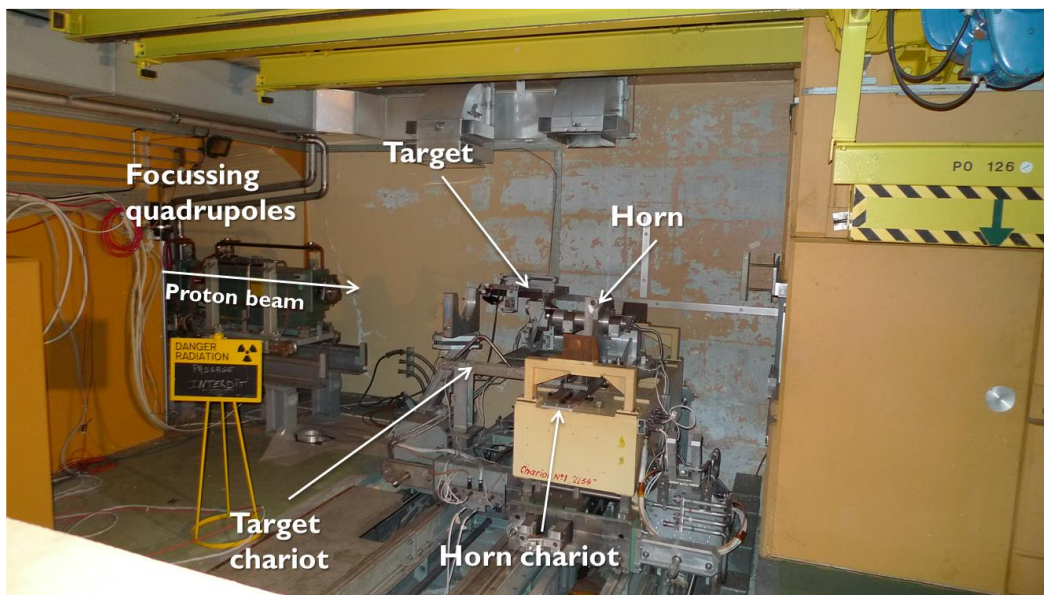
Radiation Survey Measurement - 26/01/2016

Beam stop: 23/11/2015 6:55h

All dose rates in  $\mu\text{Sv/h}$ , measured at 40 cm distance



Horn IC



# AD-target area consolidation

- Significant impact on AD physics in case of failure between LS2 and LS3
  - Known weak points
  - Very long physics stops ( $\geq$  months/year)
- AD horn failure during LS1 highlighted several issues related to the operation of the AD-target area (can be expected 1 every ~5-7 years)
- **A global consolidation plan was issued and financed via ACC-CONS**
- EDMS 1501030 for more info



# Project management documentation

**CERN**  
CH-1211 Geneva 23  
Switzerland



EDMS NO.	REV.	VALIDITY
<b>1537538</b>	<b>1.0</b>	<b>RELEASED</b>

REFERENCE
<b>AD-PM-MG-0001</b>

Date: 2016-01-27

## PROJECT MANAGEMENT DOCUMENT

### **AD-TARGET AREA CONSOLIDATION PROJECT WORK PACKAGES DEFINITIONS**

#### ABSTRACT:

This document recalls the rationale for towards the AD Target Consolidation Project and provides an initial definition of the work packages required. These work packages will be further developed in the form of engineering specifications.

- Project work packages defined, agreed and financed, for execution from 2016 until 2020
- All documentation in the AD-BASELINE



**LS2**  
Days

7th & 8th November 2016

<http://indico.cern.ch/event/564604/>

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# Work packages definition

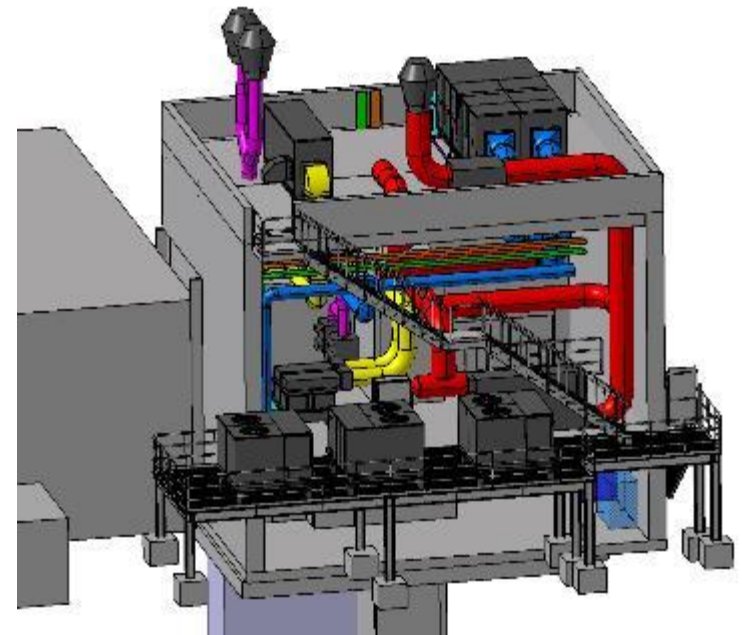
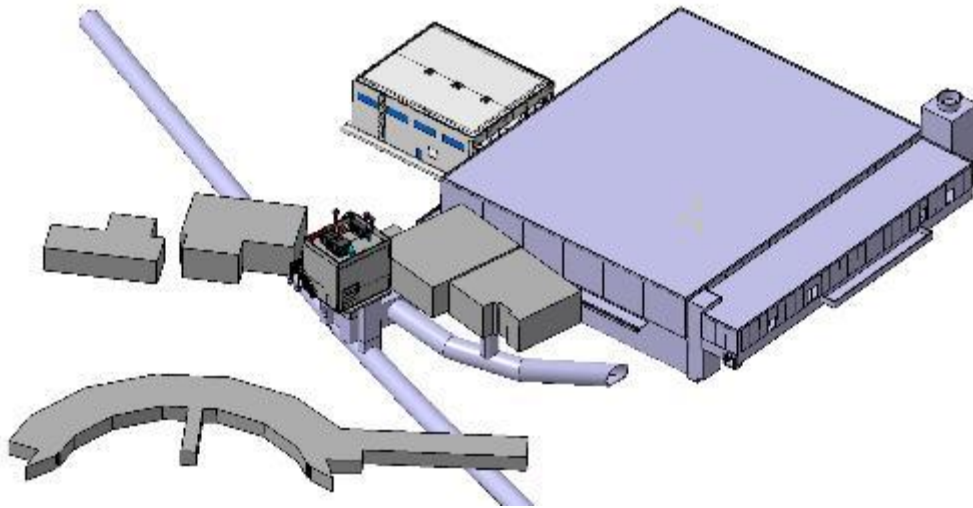
- WP2: Antiproton production target upgrade
- WP3: Magnetic horn assembly consolidation, production and tests
- WP4: Consolidation of target & horn trolleys
- WP5: Target area ventilation replacement
- WP6: Target area decontamination
- WP7: Building consolidation (b196 project)
- WP9: Consolidation of target area magnets
- WP10: Transport methods consolidation
- WP11: Beam instrumentation consolidation
- WP12: Electrical infrastructure consolidation
- WP13: Reconstruction of concrete mobile curtain
- WP14: Consolidation of fire detection system
- WP15: Consolidation of radiation protection detectors

# Main elements to be renovated

- Antiproton target and its cooling system
- Magnetic horn (+ long term test bench)
- Supporting trolleys and movement system
- Upstream quadrupole magnets
- Target area ventilation system
- Consolidation of surface building and complete renovation of building 196

# AD-target ventilation and b196

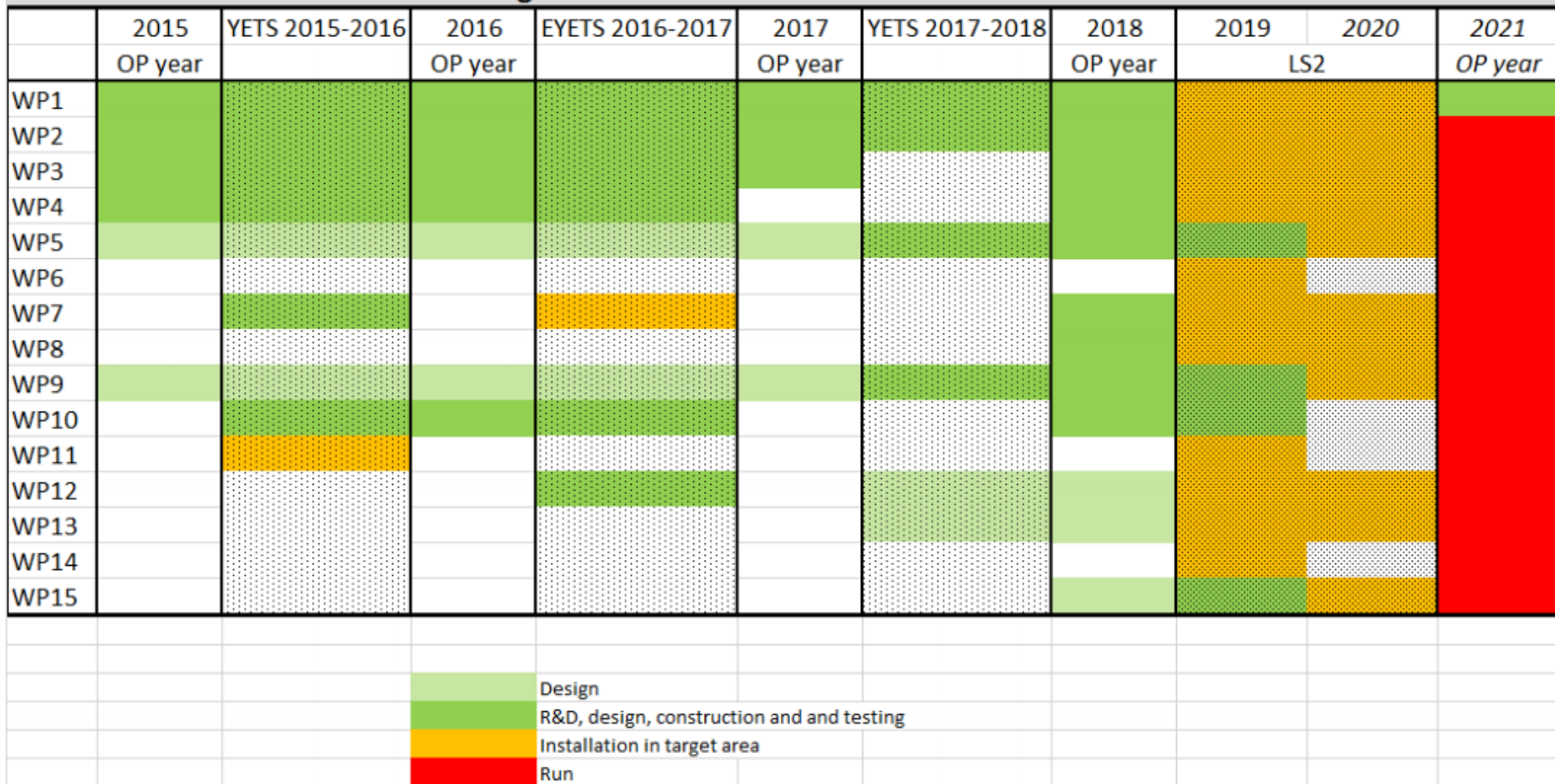
- The consolidated building 196 will house the new ventilation system (1531102 & 1531103)
- DO for new building 196 being prepared



# Planning and cohabitation

- **Most of the activities already started and/or planned in detail**
- Execution of certain activities (i.e. decontamination of target area and installation of new BIDs) requires the removal of most equipment from target area for ALARA
- Building 196 and ventilation system installation will be sequential
- **Masterplan being assembled – shall be agreed with EN/ACE**

## AD-target area consolidation timeline - EDMS XXXX



# Logistical & safety aspects

- Under discussion whether a **global ALARA committee** will be required, taking into account the duration of the works in a limited stay zone
- Space for **radioactive waste** (trolleys, magnets, horn, stripline, etc.) plus waste from decontamination required during 2019
- HSE/RP/AS will be heavily involved

# Involved groups

- EN/ACE, EN/MME, EN/HE, EN/CV, EN/EA, EN/EL, EN/HDO
- HSE/RP, HSE/SEE
- BE/BI, BE/ABP, BE/ICS, BE/OP
- SMB/SE
- TE/ABP, TE/MSC
- ❖ **For the moment no showstopper highlighted in the execution of the program**



# Conclusions

- n\_TOF target replacement and AD-target area renovation are both on track to be executed during LS2
- Detailed masterplan to be executed, but all activities seems to fit in the planned duration of LS2



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