Technical Board Meeting

- News at the start of the 2018 run
- Radiation (monitoring) in 2018
- July-November 2018 and beyond

ILLINOIS

June 5, 2018

Caroline Riedl

CERN

Communications

- Minutes of TB meeting April 10, 2018:
  https://indico.cern.ch/event/718572/attachments/1634841/2654259/TB-Minutes-2018-04-10.pdf

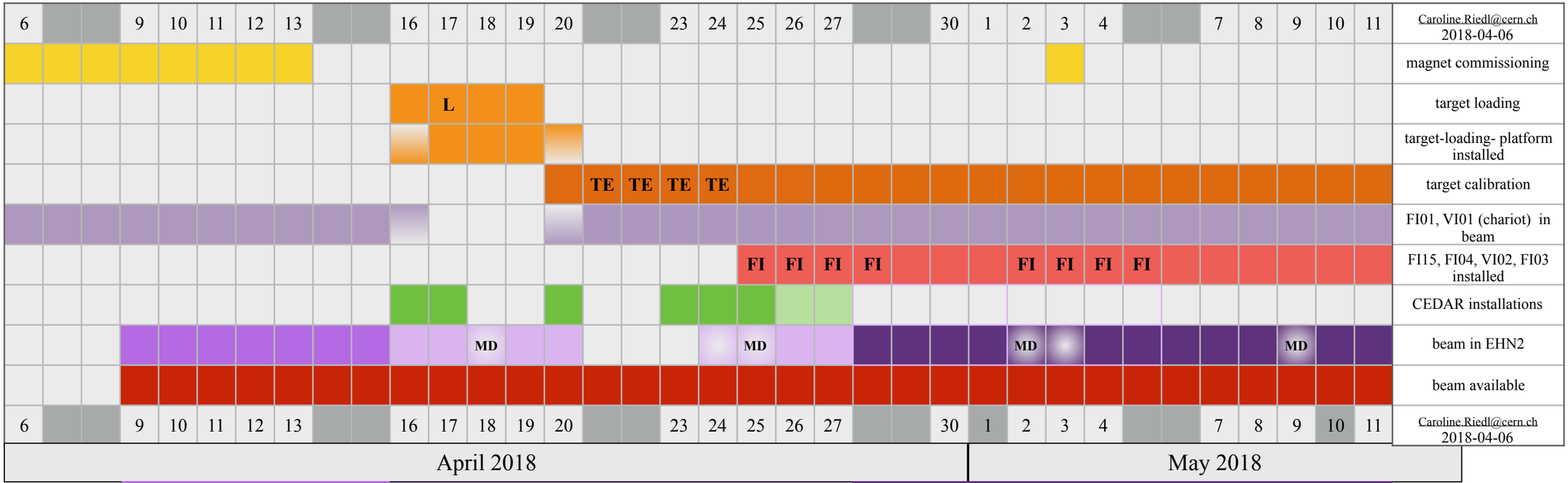
- Caroline will stay in office as TC until September TB meeting but remotely from Illinois.

- 2018 TB meetings:
  September 3
  November 6

Events since last TB meeting

- April 8: received beam permit
- April 16-30: CEDAR works
- April 17: loading of target
- April 18: removal of NA64 Straw module
- April 20-24: target TE calibration. *Smoother than in 2015 because fewer activities in hall.*
- April 24: installation of concrete platform for beam telescope
- April 25: installation of SF03 & survey with position adjustment
- April 26-28:
  - installation of VI02, SF04, SF1.5
  - survey of VI02, SF04, SF1.5 with position adjustment
  - installation of Veto Up&Down
- ~ May 3: trigger commissioned
- May 8: target trim coil setting check; field rotation test; long-term solenoid test (May 4-8)
- May 8-10: lithium absorber configurations
- May 10: movement of chicane (CERN technicians had repaired 1 jack pump - oil leak), switch to dipole
- May 11: beam steering part #1; *we now know that beam is still off: Δx=-8mm, Δy=-2mm (A. Guskov @ June 1 WM)*
- May 14: removal of 2mm thick holding plate of polarized target
- May 15: removal of PRM TPC

Preparation of COMPASS 2018 DY run - no change since April 6



April 9-15: muon beam day & night

April 16-20 & 25-27: muon beam with multiple interruptions due to target loading & COMPASS installations; beam in the night

April 28++ hadron beam day & night with increasing intensity + muon beam at certain times

(*) defined as “FIs installed + 2 weeks”

	target loading	physics (*)	reason for change
current	April 17	~ May 14	push magnet commissioning to be only 4 weeks
Bonn March 22	April 24	May 21	startup of LHe production delayed
TB February 20	April 17	May 14	
CM January 25	April 17	May 14	mobile LHe dewars & skip empty target calibration
TB December 4	May 8	June 4	cooling tower consolidation
perfect world schedule	March 27	April 23	

Planning

- The diaphragm of the 2nd CEDAR on M2 is blocked, intervention Tuesday June 5 (Philippe Carriere (BE-BI) & Serge Mathot (EN-MME)

- Tests on the BA82 demineralised cooling station June 5, 9:00-12:00 (Jani Lehtinen)

- RW & MWPC FEE intervention: Tuesday June 5

- Then survey Wednesday 14:30 of PS01 & DC4

- TS1 ("Long MD") June 18-21:
  - SM2: test a new digital current regulation for the SM2 power converter. The analogue regulation will be put back after the test. *Proposed19th and 20th of June afternoon (13H30-17H30), asked to anticipate this week.*
  - CEDAR installations.
  - Intervention of power converter rack (DCCT), Sylvain Ravat, 1 day.

- Spares for new MWPC cards?

- Beam tuning #2 as soon as beam is back (currently in 1+ week period of no beam in North Area, failure on a transformer powering the magnets on the way from the SPS to the North Area)

Cooling

CERN water
raw: 18˚C (eau brute = EB)
chilled: 7˚C (eau glacée = EG)
tap ~ not controlled (eau potable)
distilled (eau demin = ED)

- Contact persons (EN-CV): Jani Lehtinen, Hassane Sabri, and Bill Bannister from CV.

- **Target pump room:** temperature gradient, side of pumps too warm. Bad ventilation?
  - Jaakko installed thermo sensors
  - Yamagata installed commercial fans
  - Hassan (EN-CV) will install bigger fan

- Temperature of **tap water in 888**: was **issue for MW cooling** (EIO tube secondary cooling) April 30 & May 1, measured to be 30 C on May 1, also afterwards found to be warmer than usual (also rest rooms in 888). CV site visit May 2, explanation “well pump” (—> Vincent)

- Jaakko installed thermal sensor pipe of **chilled water** in old control room. Set orange alarm.

- **NMR rack temperature** (water outlet). Cooling water pump had stopped, refilled water and started again. Raw water is used for primary cooling, distilled is closed circuit. Last time filled in March. Affects polarization measurement. When cooling not sufficient, then polarization is measured to be too low. Phase transition of NMR cable.

- Planned interventions for **DAQ barrack AC**s: planned for long MD (June TS1), will be anticipated because of long down-time of the SPS this week.
  2 AC units, turn off 1 at a time with backup (portable) cooling provided by CV.

  May 16: maintenance of **other ACs in 888 barracks**

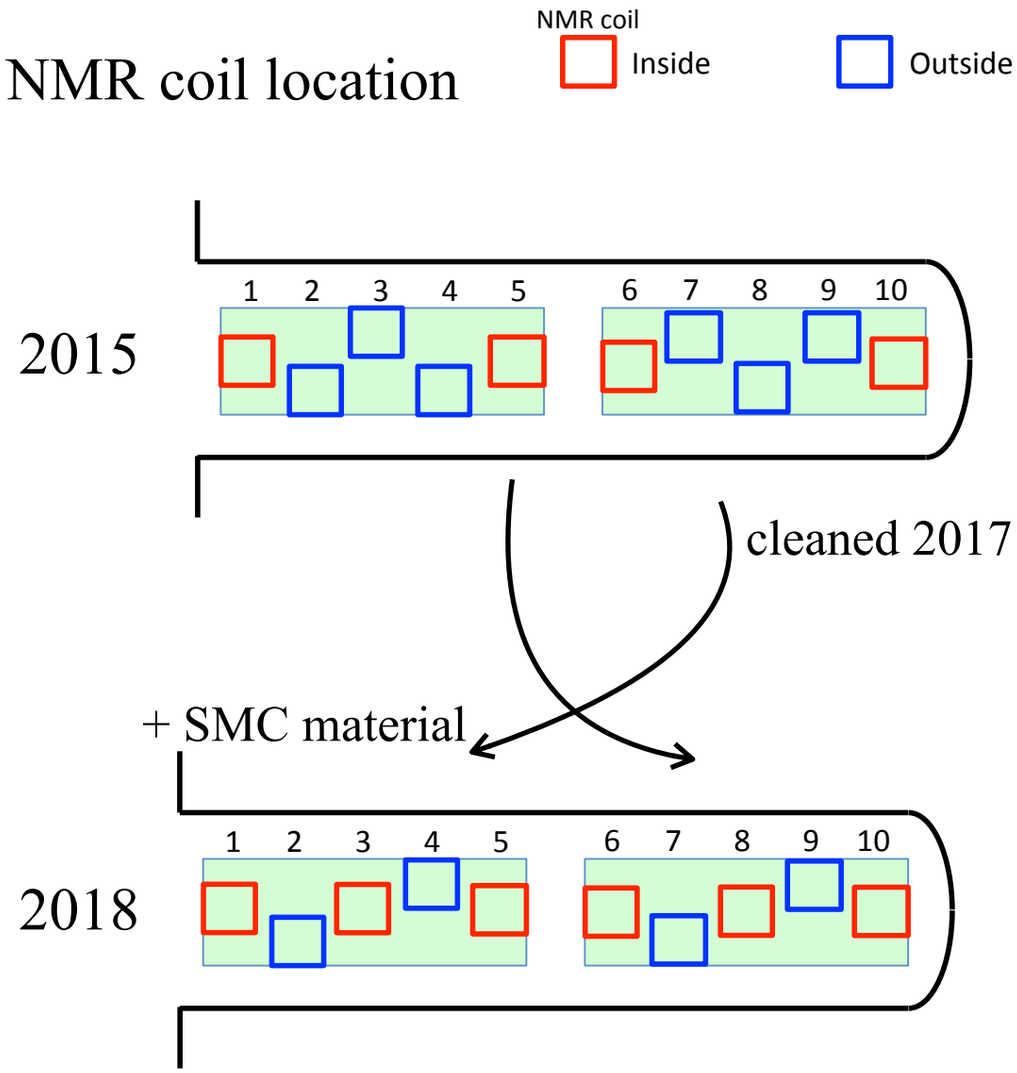
- **Cooling unit for GEM**s on Jura side not providing sufficient power? Is OK after CV check

- **Cooling of BMS barrack**: will get quote for improved shielding

Polarized target

More in Nori's talk

NMR coil location



i.e. 2015-upstream material is 2018-downstream material
cleaned 2015-downstream material is 2018-upstream material
older SMC material was added to the upstream cell

Positions of the magnet

Genki May 31, 2018

Point	2015 (cm)	2018 (cm)	⊿ (cm)
1	-340.79	-340.53	0.26
2	-100.81	-100.73	0.08
3	-98.81	-98.70	0.11
Center of the magnet	-229.86	-229.60	0.26

→ The position of the magnet in 2018 is the same as 2015.

Positions of the target cells

Year	Upstream cell		Downstream cell	
	Upstream edge	Downstream edge	Upstream edge	Downstream edge
2015	-294.5	-239.3	-219.5	-164.3
2018	-294.6	-239.5	-219.2	-164.0

→ Slight difference due to re-assembly of the cells.
They will be imported to PHAST as soon as possible.

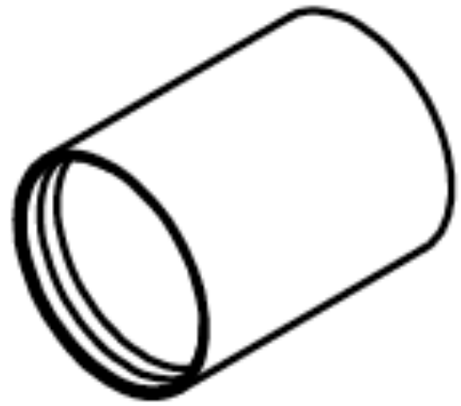
- Polarization lost: May 11 (during physics) because exhaust line not sufficiently cooled, fast discharge. Action taken to prevent this in the future: increase of helium flow.
- Polarization lost: May 23 (during polarizing) because of broken motor control of MW cavity. Actions for the future: control by hand, or exchange broken parts (not yet decided)

CEDARs

More in Marcin's talk

- **Cabling** work in April: signal, LV, HV, ethernet

- Rented new **HV frame** from electronics pool - CAEN SY2527 (provides easy remote control of HV via ethernet).
  Negative HV modules: use the ones for SciFiW (FI55), which is not used this year. Total of 16 channels is needed and 2 modules of 12 channels each are available.



- **PMT gain scan** at CERN:

- Cannot reuse existing mechanical parts from the current **PMT housing**
  —> delay in installation. Produce…
  - Pieces 1,2 : Illinois NPL (done & arrived in Warsaw for annealing)
  - More pieces (to be) produced?

- **Discriminators** fully assembled and final testing done ?

- **Dividers** are fully assembled and can be tested only after mechanical pieces are complete.

- **Optical system for gain monitoring:**

- May 23: EN-EA have re-installed the old PMTs and closed the shielding May 23 with the aim to get some operational experience with the new housing. Plan to open the housing again at the beginning of the TS1. Also: **CEDARs filled with helium since May 23.**

- TS1 ("long MD") June 18-21: **install PMTs et al.**

Open questions:
- on-call responsibility
- pressure scan - who will do it?

CEDAR iFTDC (Igor)

- All TDC modules delivered and installed on the VME carrier cards.

- Flat cables to interconnect carrier cards and iFTDC should be delivered this week by Warsaw group.

- To-do list:

  - Electrical and functional test of all iFTDC modules. I have already tested four cards from this production and it went smooth. Thus I do not expect any problems. I plan to take all 8 iFTDC modules with me to Munich. The tests will be done on June 7-th.

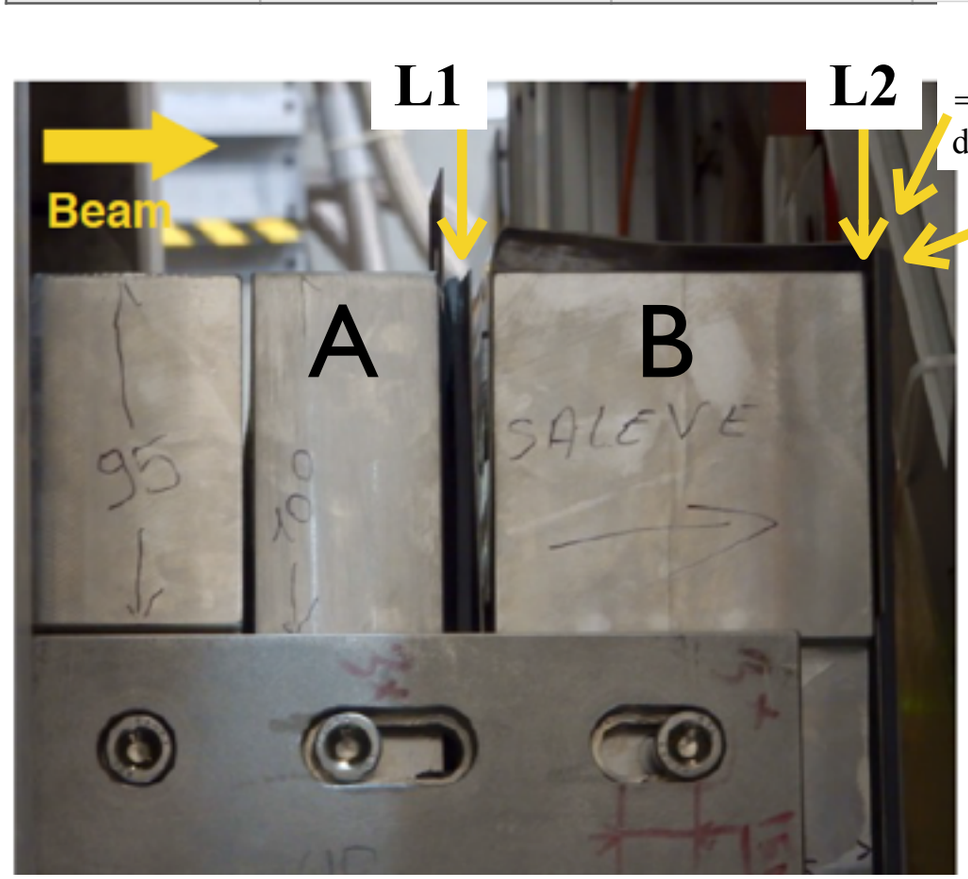
  - Finalizing iFTDC firmware for CEDAR application. A new iFTDC firmware core has been developed and tested. We got 0.5 ns bin width or about 200ps resolution and about 20% DNL. We are now busy with an integration of the new core in a project.

  - We plan to test a full system in Munich including interface to IFDAQ. It will be a functional test only. A full system test with hit rate similar to expected one can't be performed in the lab;

  - We will arrive to Geneva on June 13-th with fully tested system and will commission it outside of experimental area on June 14-th. Installation in the area will be done by Marcin and his colleagues the week after.

Lithium tests @ 120 units on T6 & 500mm target & solenoid ON & chicane not moved

config	dates 2018	changes before installation	run numbers	L1	L1*	L2	PE
1	April 19 - May 8	—	*Before BMS removal: 282890 (179), 282891 (13), 282892 (56), 282893 (200), 282894 (200).* 282896 (200), 282897 (200), 282898 (200), 282899 (200), 282900 (104), 282901 (10), 282902 (19), 282903 (147), 282919 (9), 282920 (72)	x			
2	May 8 ,11:30-18:00	DC4 fix, solenoid OFF	282925 (200), 282926 (200), 282927 (200)				
3	May 8, 18:00 - May 9, 10:00	solenoid on	282938 (91), 282939 (200), 282940 (200), 282941 (200)				x
4	May 9, 10:00 - May 10, 10:00		282971 (200), 282972 (21), 282973 (200), 282974 (26), 282975 (200)		x	x	
5 (2015)	May 10, 10:00 - …	No DC4 (garage) bad DC5 threshold	282991 (200), 282992 (200), 282993 (200)	x		x	x



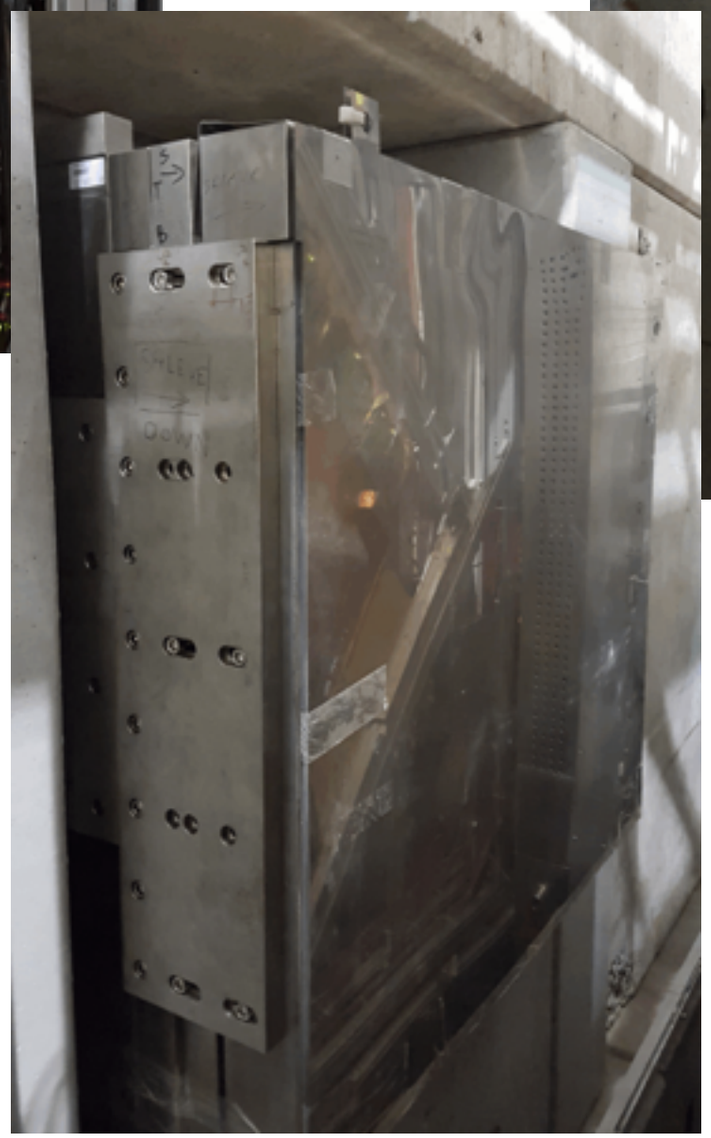
L1* =L1 moved downstream

PE (poly-ethylene)

282926: bad beam extraction (only beginning)
282925, 282926: no RW
282974, 282975: no SciFi15U
282991-282993: no DC4, wrong threshold DC5

- Alain Magnon: 1st look at CAEN currents (May 11 WM)
- Yann Bedfer: systematic look at CAEN currents from DCS→root & integration + normalization (May 25 WM & e-mail DY/coral June 1)

Lithium & PE absorber



https://indico.cern.ch/event/732912/

Today's agenda

09:00 → 09:30 **News and Issues during 2018 run** — 30m
Speaker: Caroline Kathrin Riedl (Univ. Illinois at Urbana Champaign (US))

09:30 → 09:35 **Discussion of candidates as next Technical Coordinator** — 5m

09:35 → 09:45 **News from EATM** — 10m
Speaker: Annika Vauth (CERN)

09:45 → 10:15 **Polarized target** — 30m
Speaker: Norihiro Doshita (Yamagata University (JP))

10:15 → 10:45 **Coffee** — 30m

10:45 → 11:10 **Trigger 2018 setup** — 25m
Speaker: Benjamin Moritz Veit (Johannes Gutenberg Universitaet Mainz (DE))

11:10 → 11:30 **Proton radius test measurement 2018** — 20m
Speaker: Mr Christian Dreisbach (Technische Universitaet Muenchen (DE))

11:30 → 11:45 **DAQ 2021+** — 15m
Speaker: Igor Konorov (Technische Universitaet Muenchen (DE))

11:45 → 12:00 **CEDAR status** — 15m
Speaker: Marcin Ziembicki (Warsaw University of Technology (PL))

12:00 → 12:15 **Lithium absorber analysis** — 15m
Speaker: Yann Bedfer (Université Paris-Saclay (FR))

12:15 → 12:30 **Round table** — 15m
Speaker: Caroline Kathrin Riedl (Univ. Illinois at Urbana Champaign (US))

12:30 → 14:00 **Lunch** — 1h 30m

14:00 → 14:45 **Discussion: radiation 2018** — 45m

Events, monitoring and actions

Speakers: Caroline Kathrin Riedl (Univ. Illinois at Urbana Champaign (US)), Christophe Menezes Pires (LIP Laboratorio de Instrumentacao e Fisica Experimental de Part), Vincent Andrieux (Univ. Illinois at Urbana Champaign (US))

14:45 → 15:05 **DCS: recent and pending integrations and plans 2021+** — 20m
Speaker: Christophe Menezes Pires (LIP Laboratorio de Instrumentacao e Fisica Experimental de Part)

15:05 → 15:25 **2018 run July-November and COMPASS decommissioning** — 20m
Speaker: Caroline Kathrin Riedl (Univ. Illinois at Urbana Champaign (US))

Radiation discussion: overview

1. Meeting with RP May 18, 2018 (Frederic Aberle, Yann Pira, Claudia Ahdida, Johannes Bernhard, Vincent, Caroline)
   - increase of threshold of sensor in barrack when final beam intensity was reached (May 5)
   - planning of **future RP measurement campaigns**.

2. **New radiation probes installed by IT**.

3. a) Frequent **failures of network switches** during presence of 2018 beam (SEU - Single Event Upset)

   7 SEUs within ~ 3 weeks since May 9 (start high intensity beam)

   - 2 network switches can be controlled remotely w/o access necessity (SM1 & 2)
   - 1 network switch cannot (yet) be controlled remotely (gallery) → need access and lose beam time.

   Longer cable for gallery network switch (Christophe): plan to install during long MD when Vladimir Frolov will be at CERN; *what is needed except for 60m long cable?*

   b) Also **power supply of DC/MM affected** by radiation? *Better shielding?*

4. **BatMons campaign** 2015: Salvatore Danzeca (EN-SMM, SMM=Survey, Mechatronics and Measurements);
   start a new campaign 2018?

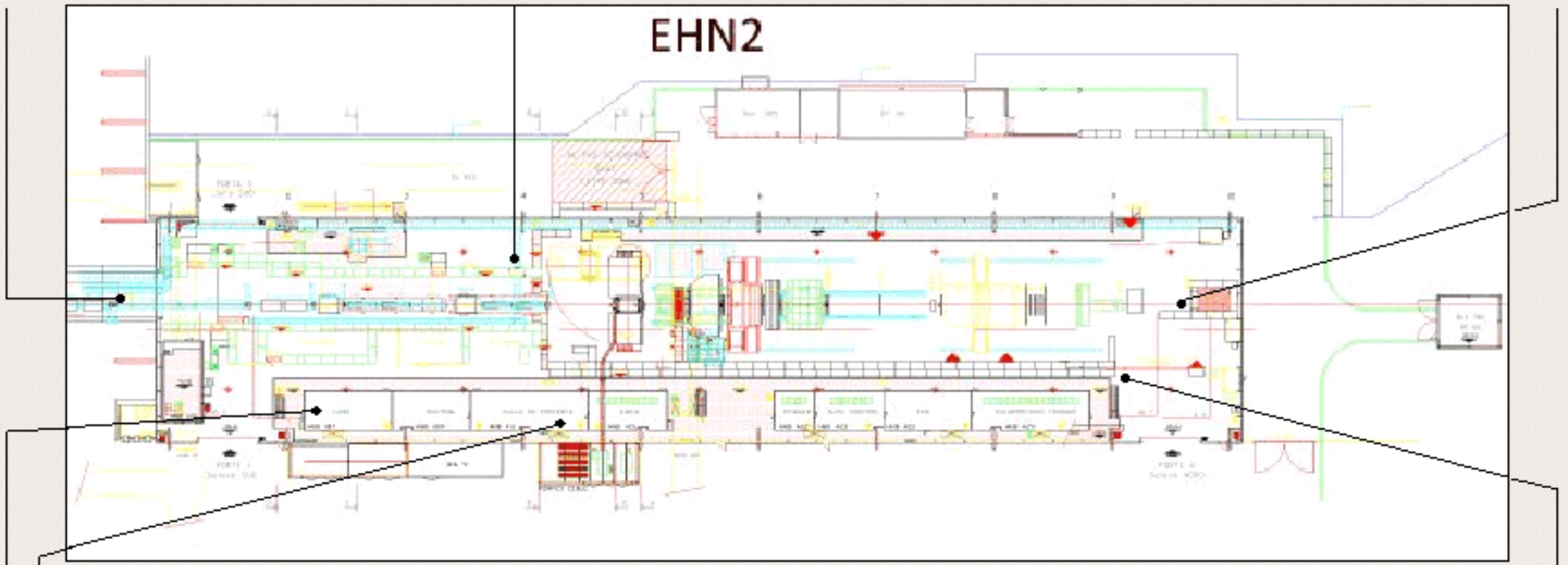
Our monitoring in DCS

Radiation levels

PAXN2111 Mean Dose Rate: 2.107e-07 Sv/h [Alarms]

PAXN2113 Mean Dose Rate: 2.614e-07 Sv/h [Alarms]

PAXN2211 Mean Dose Rate: 0.00 Sv/h [Alarms]



SMS824 - Environmental Monitor

PAXN2212 Mean Dose Rate: 2.681e-07 Sv/h [Alarms]

PAXN2112 Mean Dose Rate: 2.662e-07 Sv/h [Alarms]

PMSG824 Mean Dose Rate: 83.62 nSv/h [Alarms]

PMSN824 Mean Dose Rate: 15.85 nSv/h [Alarms]

PMSG824 MDR integrated 143.39 µSv

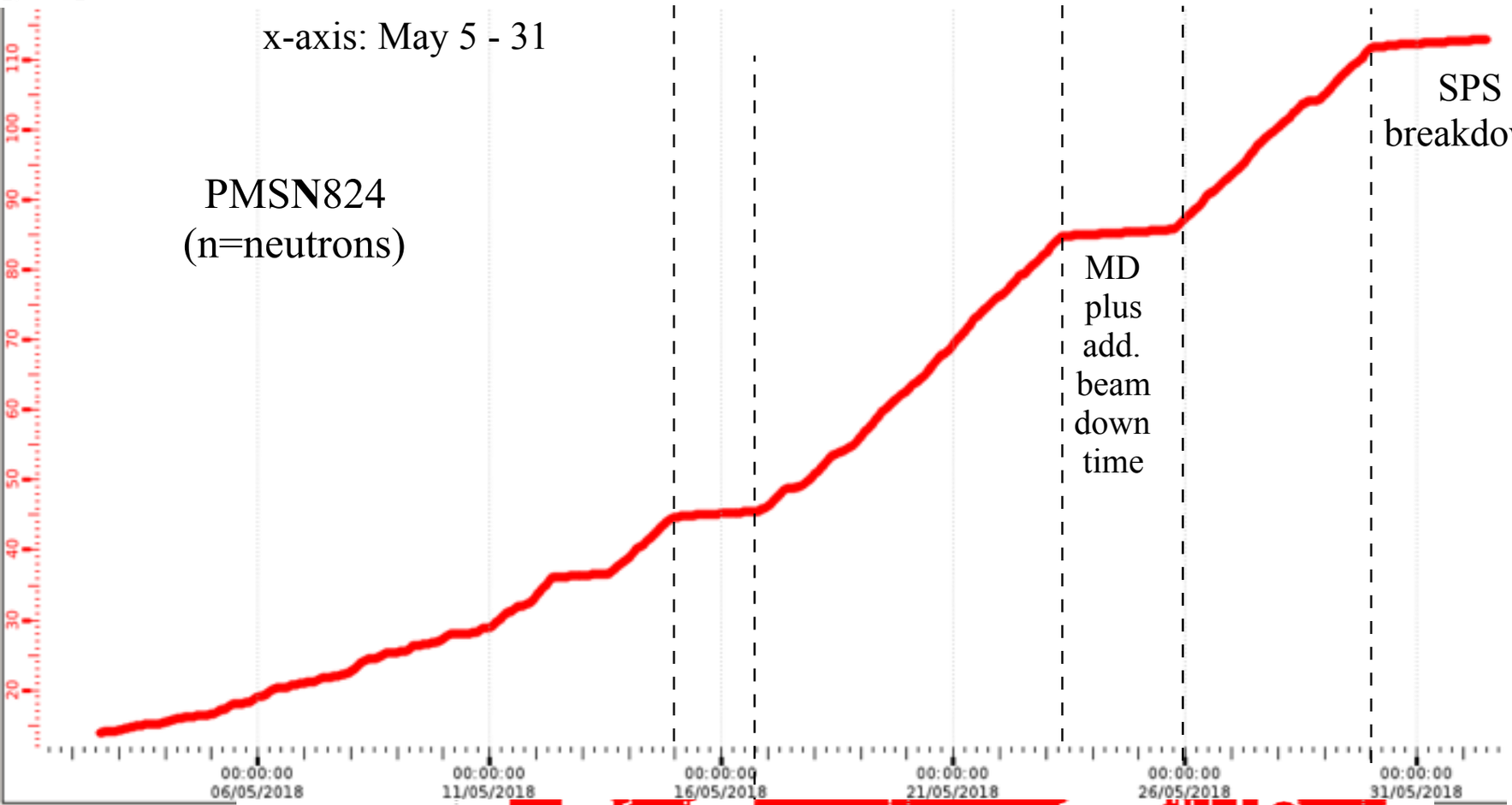
PMSN824 MDR integrated 114.07 µSv

PAXN2213 Mean Dose Rate: 7.312e-07 Sv/h [Alarms]

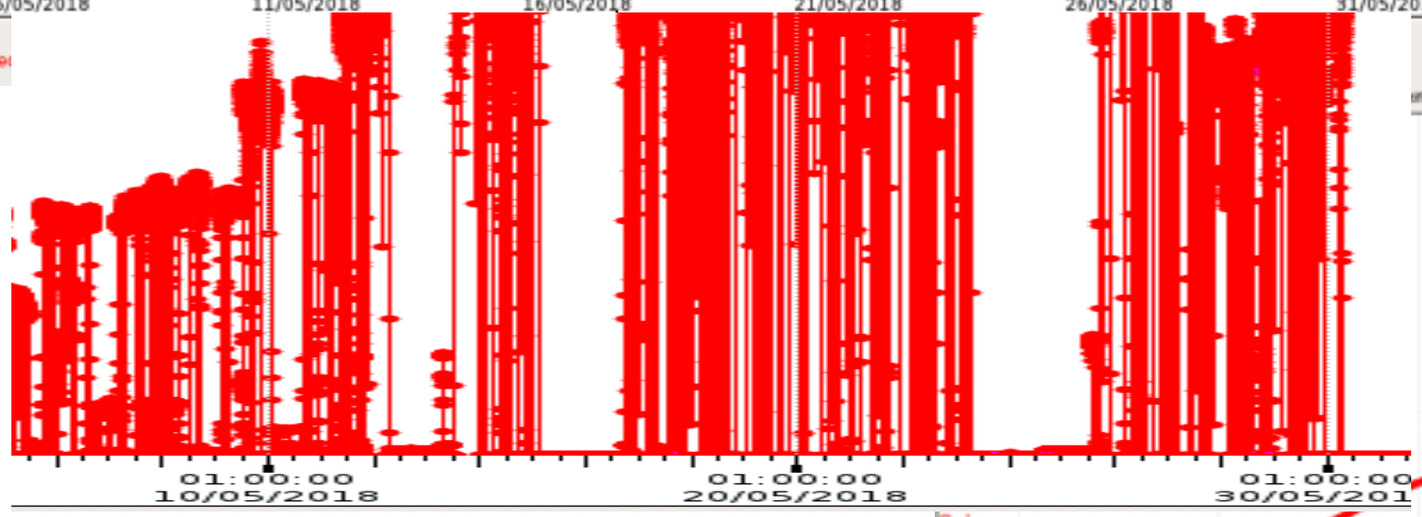
PBXN2213 Mean Dose Rate: 7.312e-07 Sv/h [Alarms]

gave alarm on May 5,
then RP increased limit

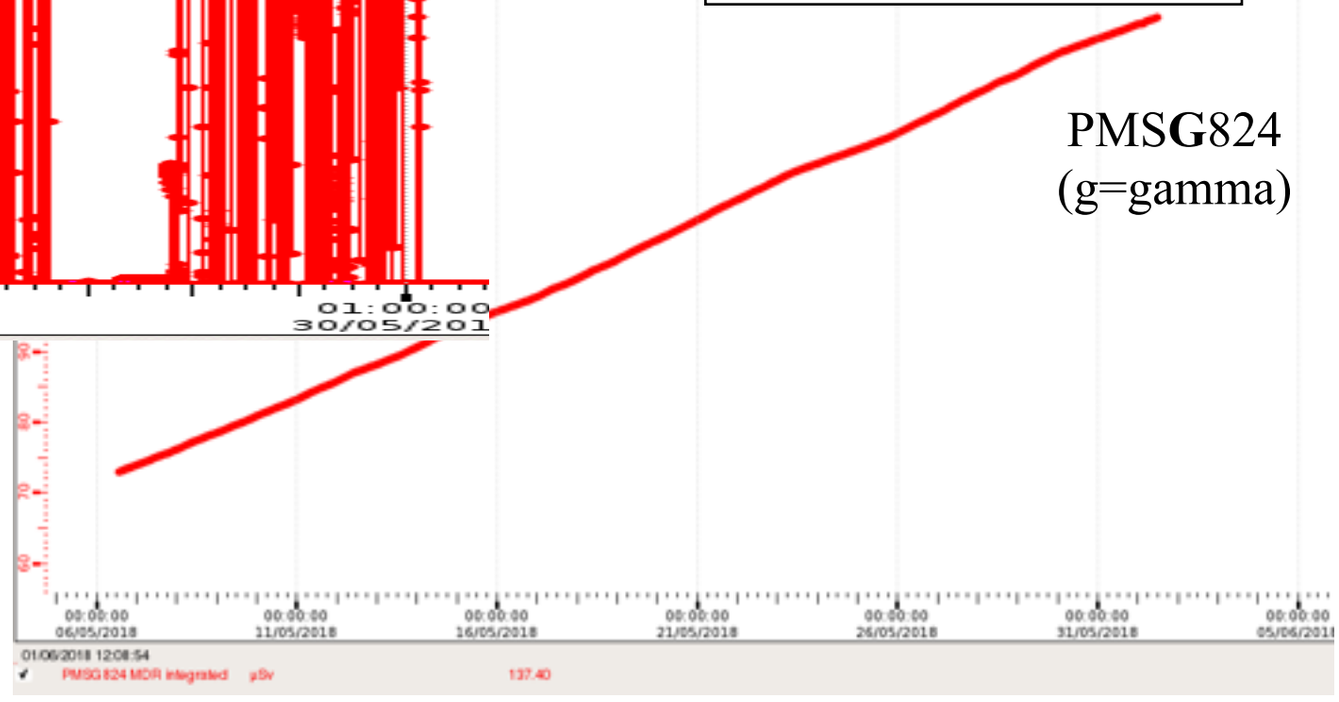
Environmental radiation monitors: integrated 2018 dose



Puzzle 1: 10% of total allowed yearly dose already reached… (=1,000 µSv = 1 mSv) Wrong calibration?!

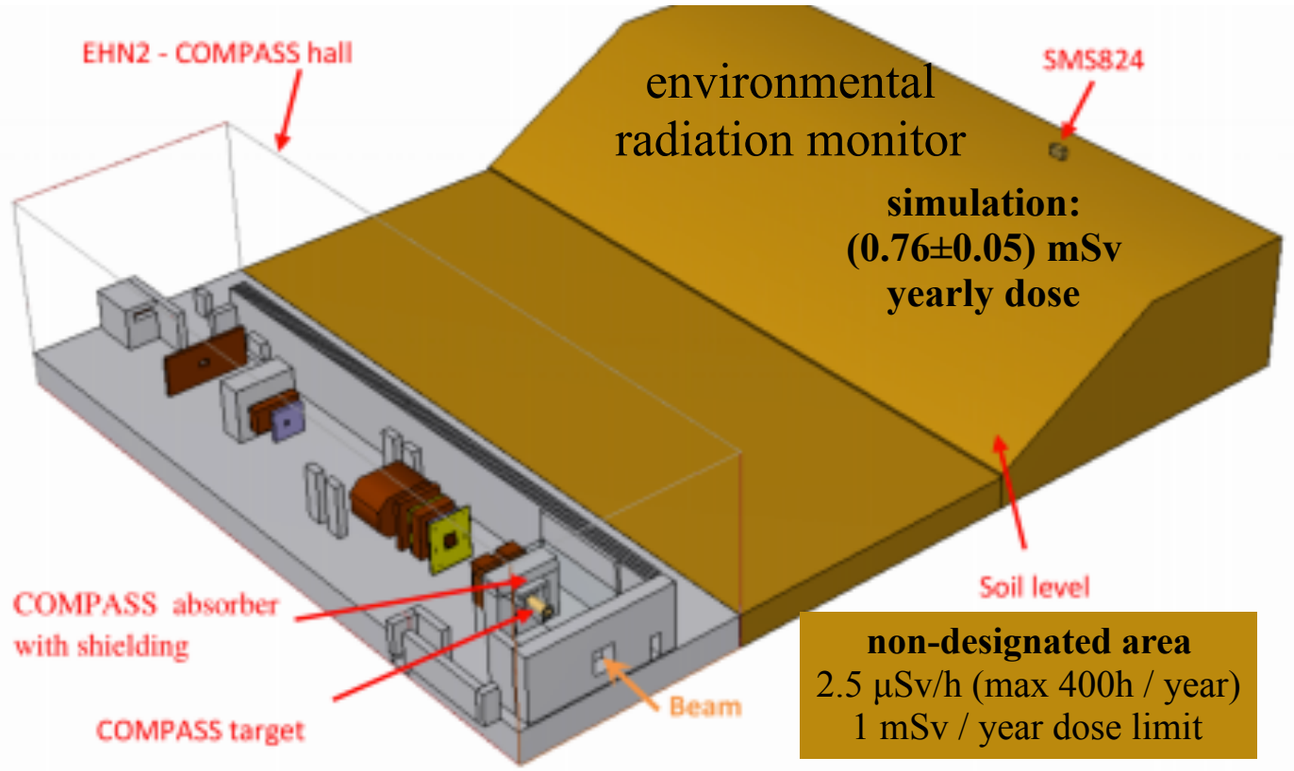


Puzzle 2: why linear rise independent of presence of beam?



2015 vs. 2018

	2015	2018
beam period	April 27 - Nov 16	April 9 - Nov 11
days	203	217
physics days (w/o MD)	106	**140** (projected)
SPS efficiency	86%	
average beam intensity [pions/spill]	3.9E+08	
good spills delivered to COMPASS	486,476	217/203 x 486,476= **520,026** (projected)
pions on COMPASS target	1.9E+14	
integrated dose environmental monitor	0.75 mSv	



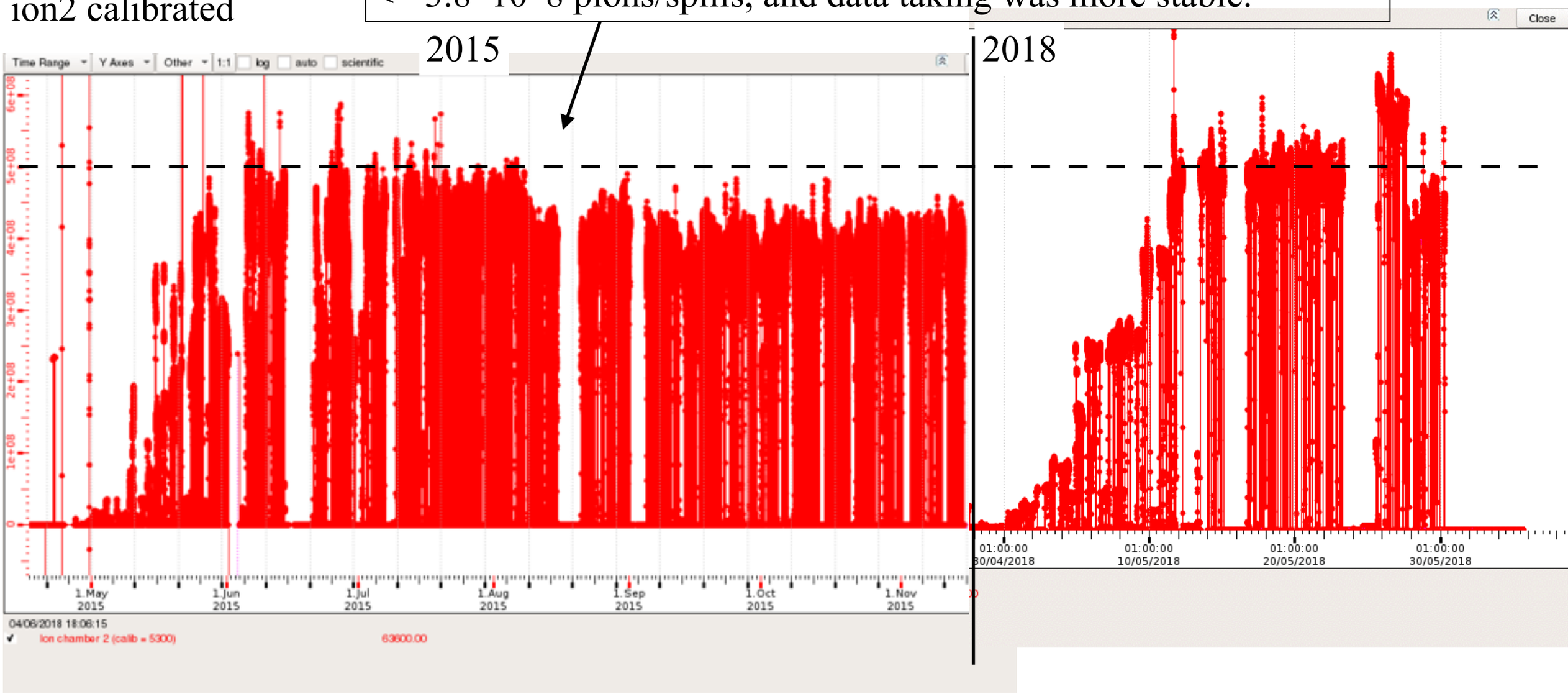
supervised radiation area
= 6 x

2015 run (from Michela):

- Running at higher intensity (4.2*10^8) in the first periods.

- From period 5 we started to decrease a bit intensity running at <= 3.8*10^8 pions/spills, and data taking was more stable.

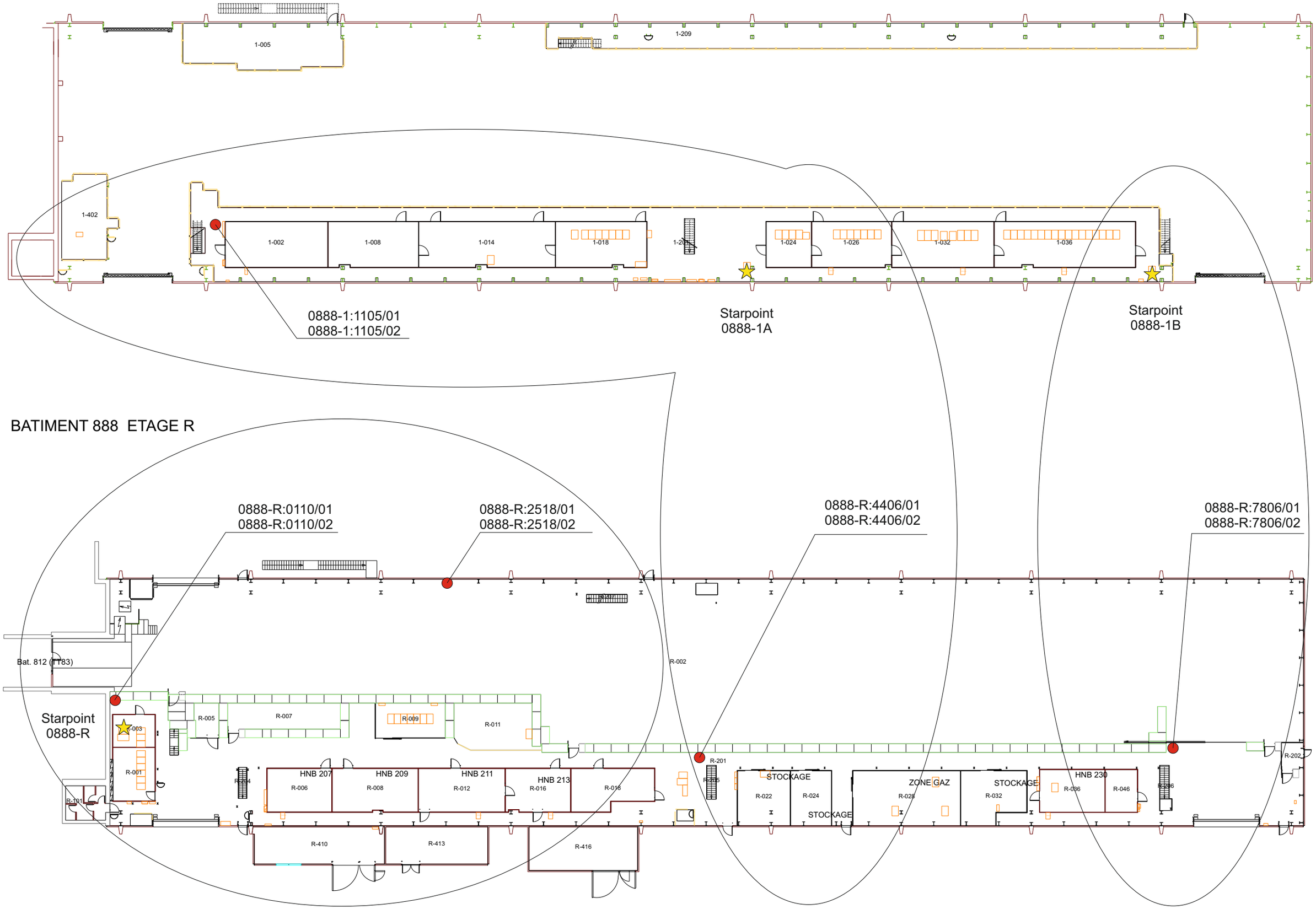
ion2 calibrated



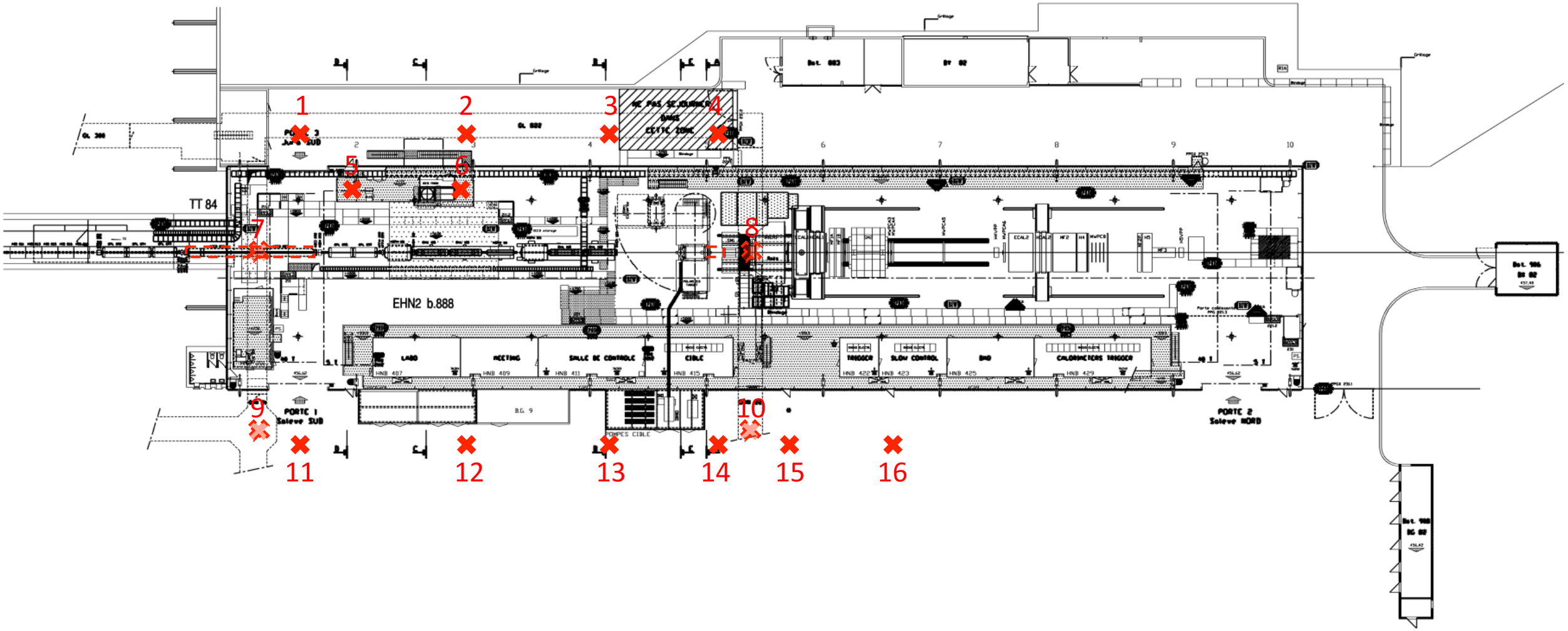
… but is the calibration factor correct after filling of CEDARs with helium on May 23?
Is one constant calibration factor applied for all times or is it time dependent…?

Plan for HSE/RP new Radiation Probes that require IT Network (received from Leszek Borakiewicz, IT/CS).

BATIMENT 888 ETAGE 1



Temporary measurement locations proposed by Frederic

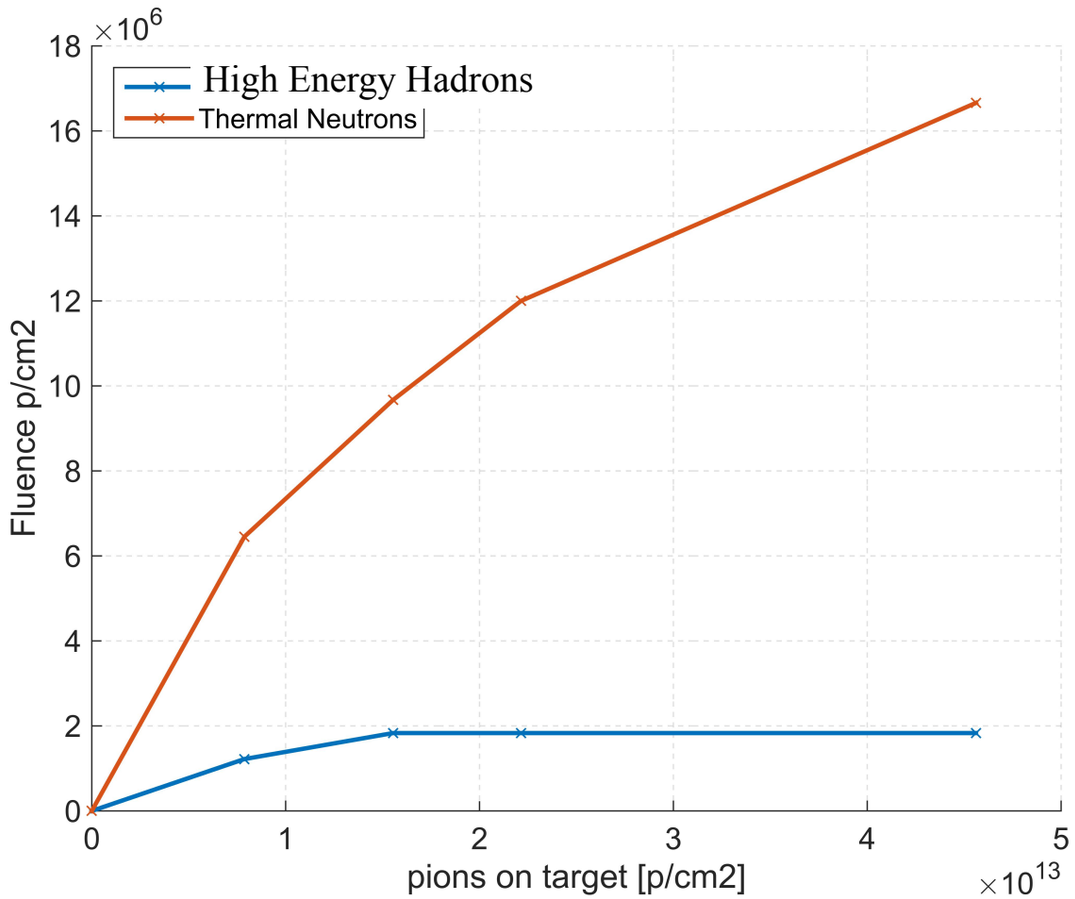


2018: improved shielding for target PLCs

- **SEEs** during 2015 magnet operation, each ~48h loss:
  2x cold-box PLC
  3x magnet PLC
  4x isolation vacuum PLC

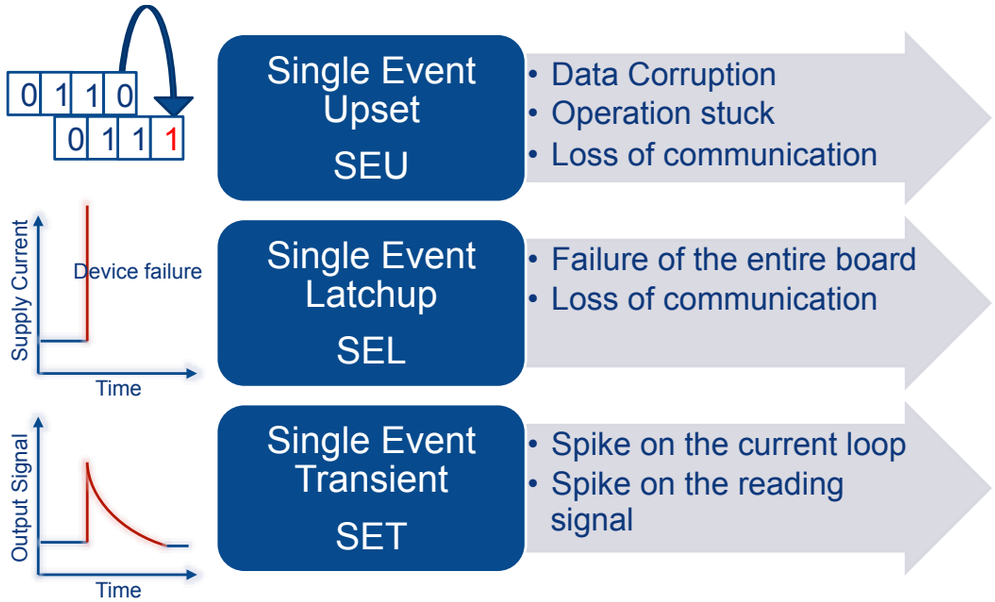
- **BatMon monitors** installed August 2015, ~6 weeks of data

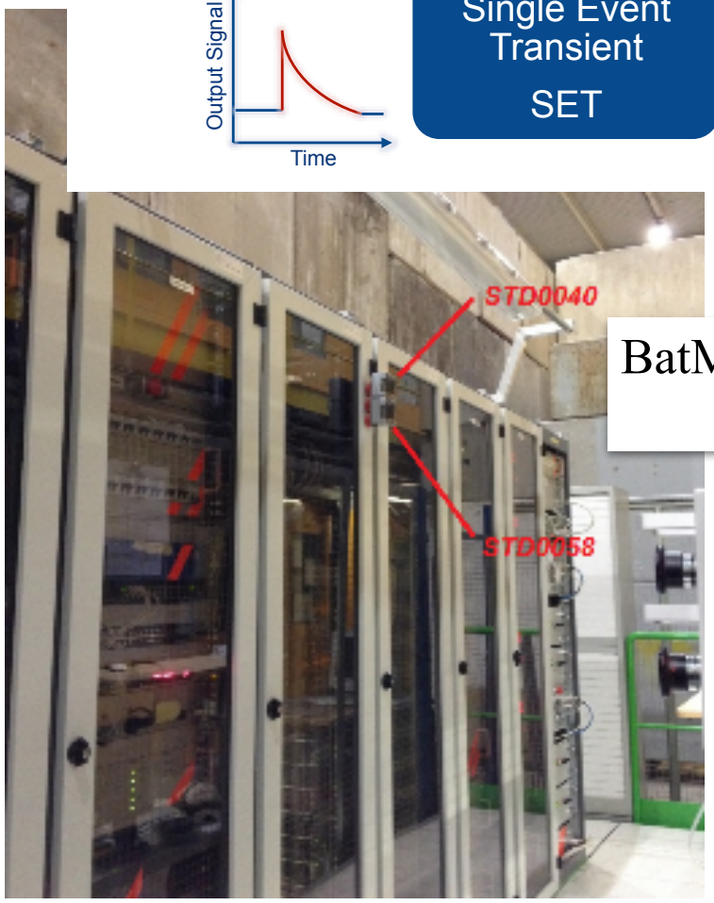
- Measure
  - total ionizing dose
  - displacement damage
  - High Energy Hadron fluence



Salavatore Danzeca's talk at TB meeting Nov. 2015 (COMPASS starts at page 16):
https://espace.cern.ch/na58-mgt-tb/Technical%20Board/_layouts/15/WopiFrame.aspx?sourcedoc=/na58-mgt-tb/Technical%20Board/Lists/Agenda/Attachments/717/Presentation%20COMPASS2.pptx&action=default

What are the effects of concern?





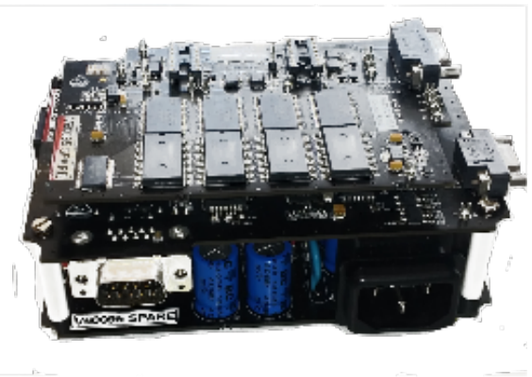
BatMon monitors 2015 (example)

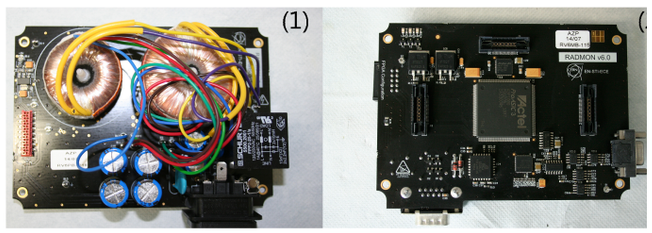
The BatMon

Talk by Salvatore Danzeca
at Oct. 2015 TB meeting

Architecture and radiation hardness

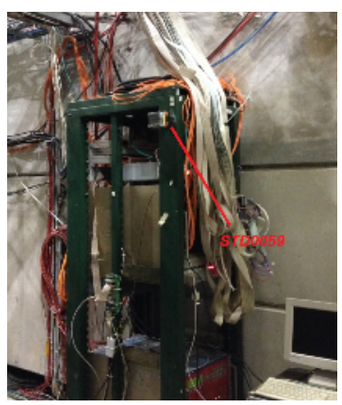
- It is a **fully commercial system**.
- It has to be **radiation tolerant**
- It has to be able to communicate with **an industrial bus** present in the LHC.
- It has to be capable of **monitoring** the three axes of the **radiation effects** (SEE, TID and DD)





What has been installed at COMPASS

- The lack of structured cabling (WorldFIP network) imposes to use a standalone version of the RadMon
- The BatMon is a battery powered RadMon.
- The BatMon has to be read MANUALLY, thus requiring an access.
- The BatMon is capable of reading the three axes of the radiation effects (SEE, TID and DD)
- We have measured only the HEH fluence because the SRAM memories are the most sensitive sensors

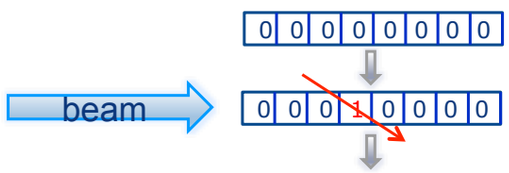


Measurements of high-energy and thermal neutrons

Talk by Salvatore Danzeca at Oct. 2015 TB meeting

SRAM as HEH Fluence detector

- HEH hadrons can induce a bit flip in the data stored in a memory



- We can exploit this sensitivity to carry out a measurement of the HEH fluence
  - Knowing the cross section of the SRAM device:

$$\sigma = N_{SEU} / \Phi \Longrightarrow \Phi = N_{SEU} / \sigma$$

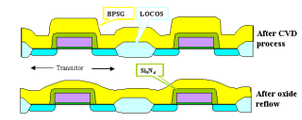
  - The calibration of these detectors has to be carried out in 'relevant' radiation test facility

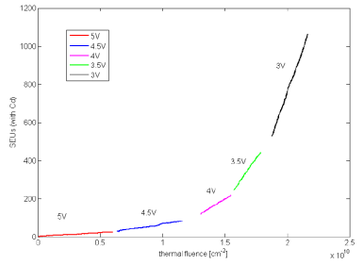
- SRAM = Static Random-Access Memory
- Fluence = radiant energy per unit area and integrated over time

Thermal Neutrons measurements

The SRAM used are sensitive to thermal neutrons if the voltage is decreased [Kramer et al. 2010 IEEE TNS].

- This due to the presence of ^{10}B in the chip





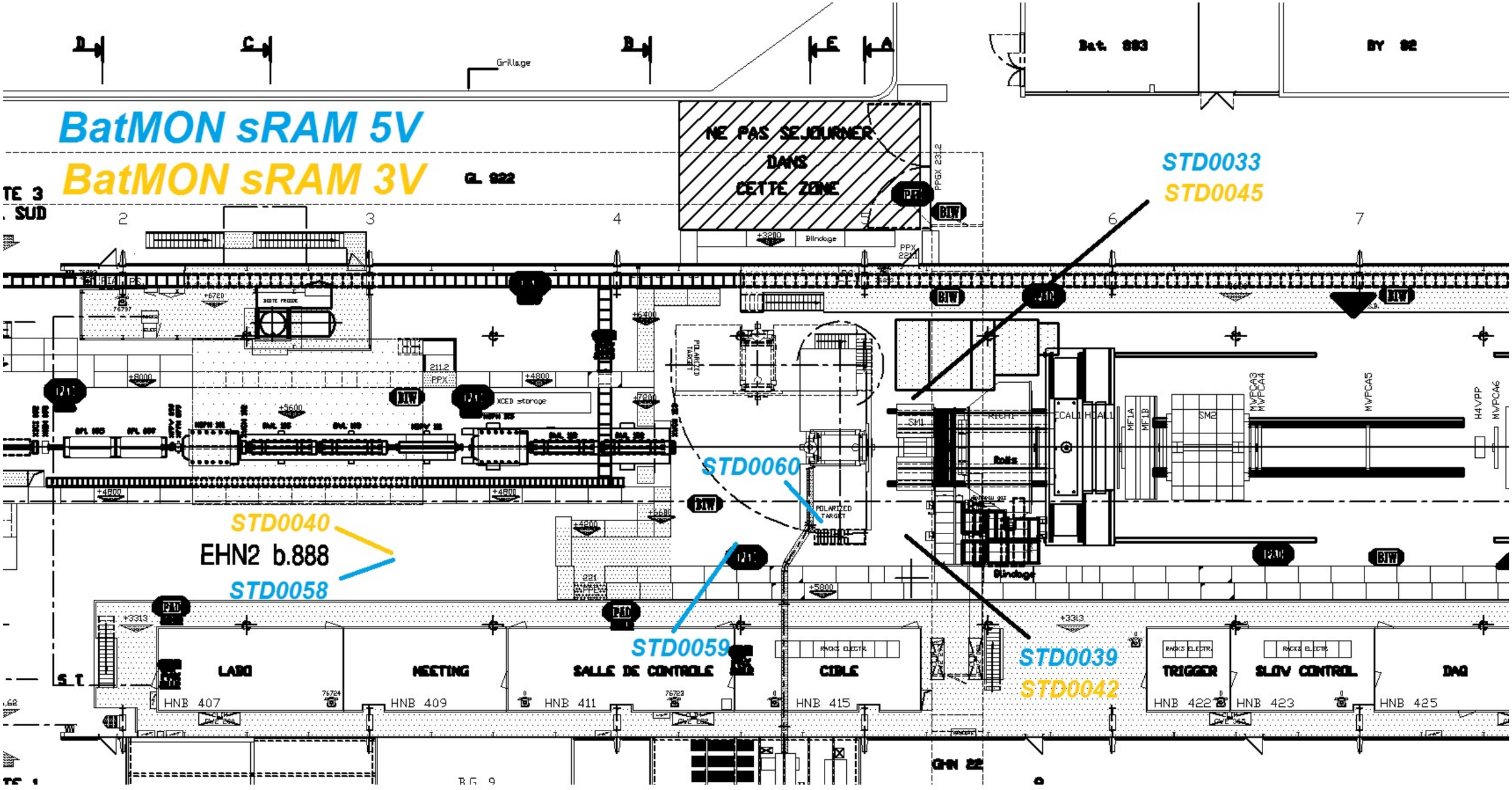
$$R = \frac{\Phi_{th}}{\Phi_{HEH}}$$

- Combine the measurements at 3V with the one at 5V exploiting the high thermal neutrons cross section of the SRAM

$$R = \frac{\sigma_{HEH}(3V) \cdot N_{SEU}(5V) - \sigma_{HEH}(5V) \cdot N_{SEU}(3V)}{\sigma_{th}(5V) \cdot N_{SEU}(3V) - \sigma_{th}(3V) \cdot N_{SEU}(5V)}$$

2015 measurement locations

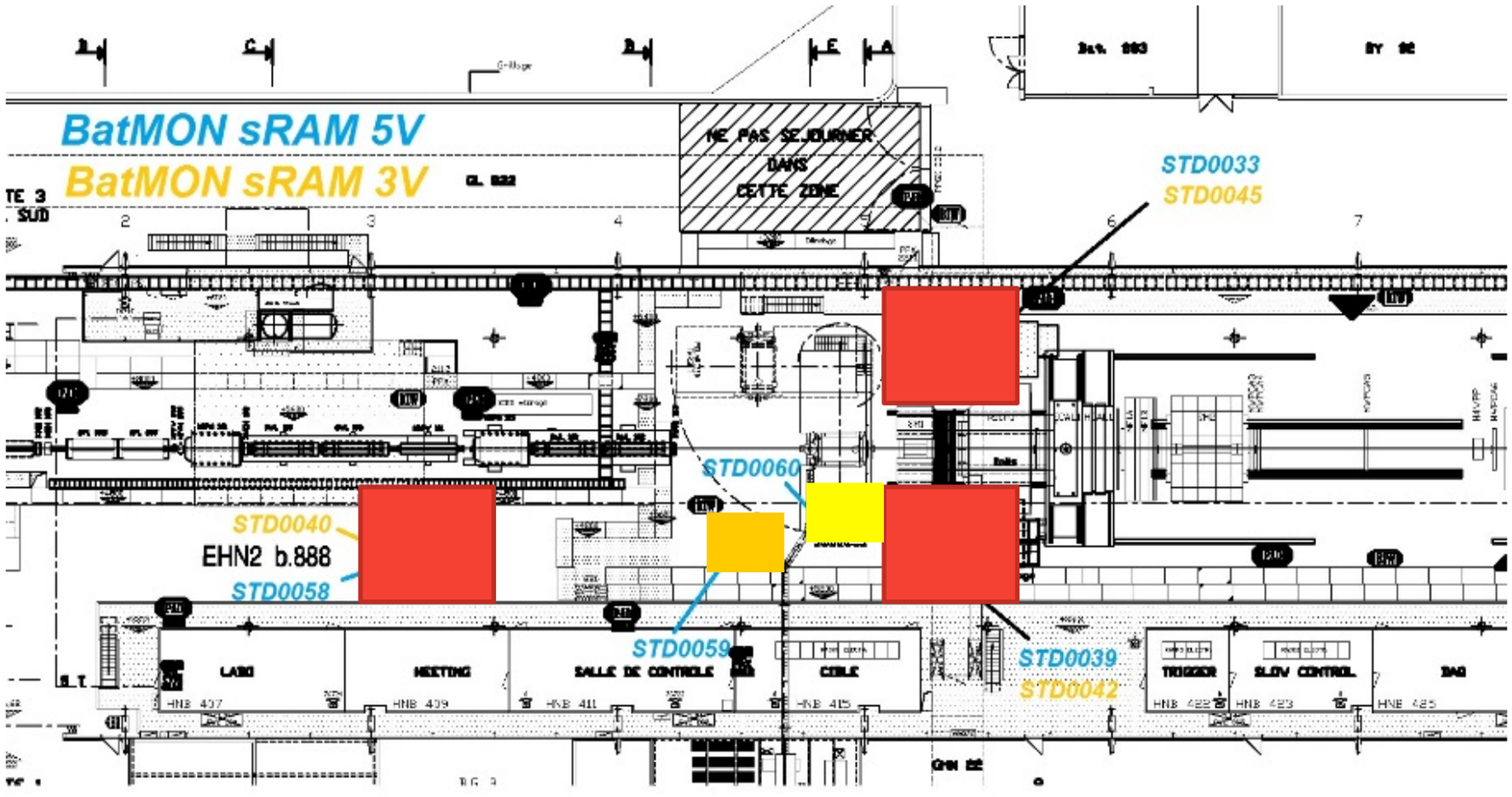
Talk by Salvatore Danzeca
at Oct. 2015 TB meeting



Radiation Level measurements: Thermal Neutrons

Talk by Salvatore Danzeca at Oct. 2015 TB meeting

- Shielding is effective but the thermal neutron contribution is very high
- In red the zones where the R factor is higher

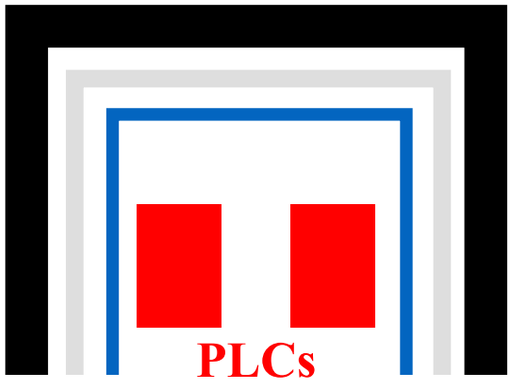


Talk by Salvatore Danzeca
at Oct. 2015 TB meeting

Conclusions

- **RadMon/BatMon System**
  - **6 week of measurements**
  - **Consistent measurements for each week**
  - **HEH and Thermal neutron fluence measured**
  - **HEH fluence per year can be a constrain in the rack facing the target**
  - **Both HEH and Thermals can be an issue for the downstream shielded areas and for the Jura Side rack**
  - **The loss in the beam line can induce a higher than expected HEH fluence in the PLC side upstream. The thermal neutrons fluence can be a constrain in that location for very sensitive device (such as PLC)**
- **Relocation/Shielding Requirement**
  - **Relocation of the rack on the side of the target could be foreseen in order to reduce the failures.**
  - **Relocation of the rack downstream would reduce the failure**
  - **PLC relocation must be adopted considering the criticality of the equipment**

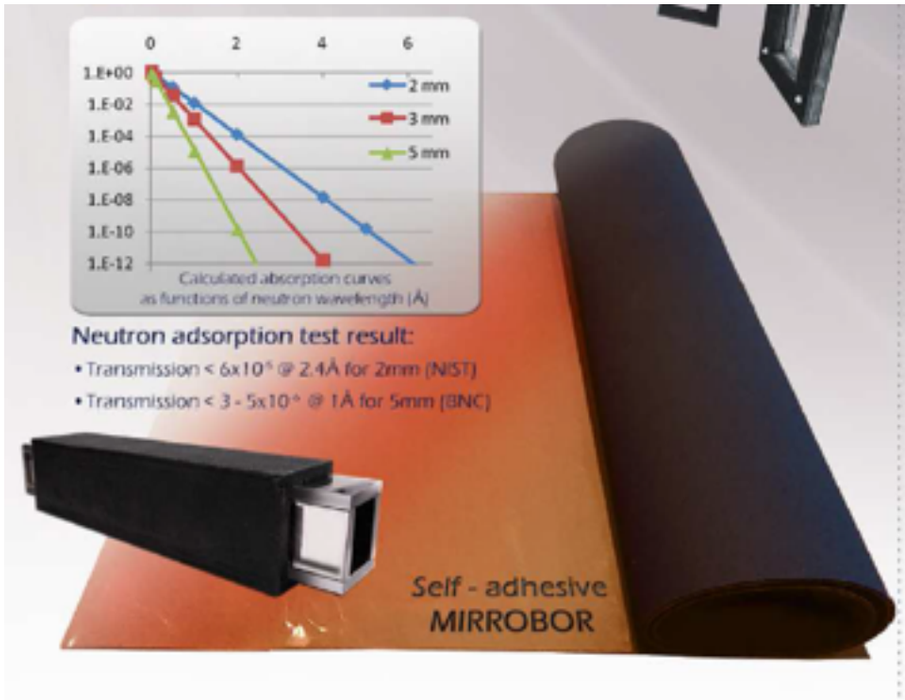
Shielding of target PLCs 2018 (reminder)



concrete 80cm = factor 10 reduction in (high-energy) neutron flux, factor 3 thermal neutrons

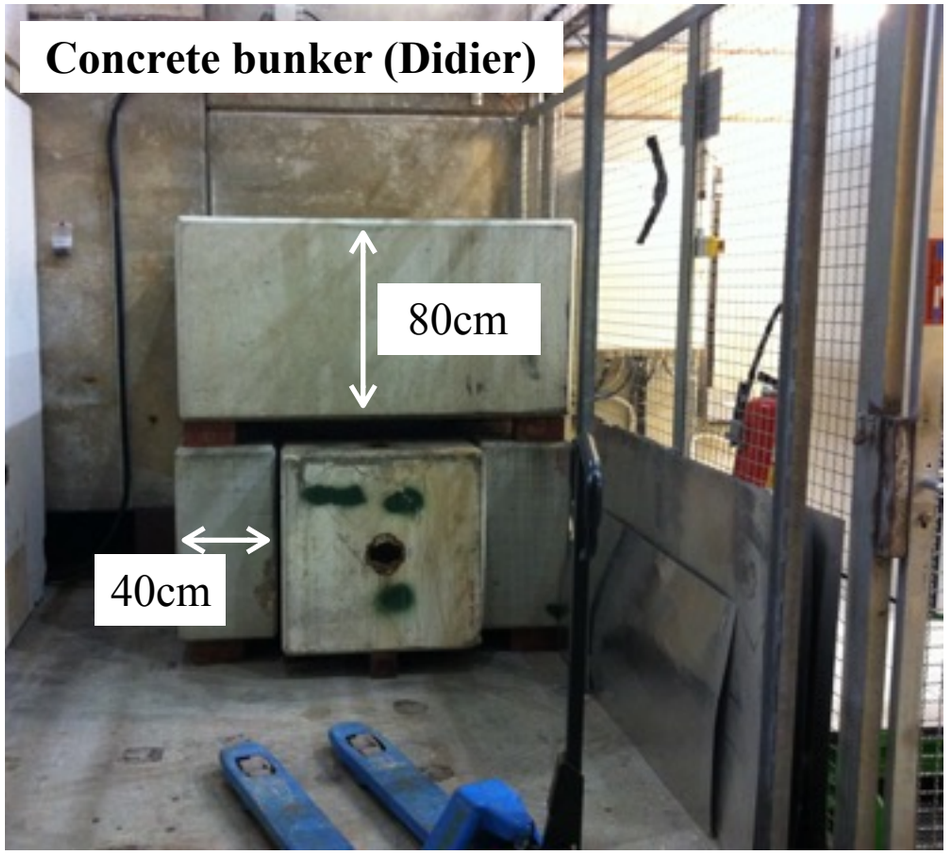
polyethylene ~2cm to thermalize neutrons

boron-carbid sheet to absorb thermal neutrons



Polyethylene around PLC

MIRROTRON Ltd. H-1121 Budapest, Konkoly-Thege út 29-33, Hungary
☎(36-1) 3922642 *Fax:* (36-1) 3922282, *E-Mail:* neutron@mirrotron.hu



COMPASS changeover during LS2

- Transversity run with transversely polarized deuterium target in 2021: SPSC "recommends for approval"
- Change over target area from Drell-Yan to SIDIS.
  - Start asap after end of beam (Nov. 11, 2018).
  - Allow for empty-target calibration and tests of polarized target: 2 weeks; i.e. late November
  - Finish by ~ June 2019.
- Will have to re-install 2010 setup: go to muon beam, no absorber, move target 2.3m more downstream
- EN/HE removal of absorber, displacement of target platform, removal of big chambers to be repaired
- EN/EL disconnection and connection of PT magnet power lines
- EN/CV cooling water
- TE/CRG removal of pump lines and re-installation of old or modified pump lines.
  Disconnection and reconnection of LHe line.

[1] week 1: prep cold box
[2] week 2: run cold box
[3] weeks 3-4: LN2 pre-cooling to 80K
[4] week 5: He cooling to 4K
[5] weeks 6-10: commissioning of target magnet
[6] week 11: empty-target calibration
[7] week 12: loading of target
[8] week 13: loaded-target calibration
[9] week 14: beam

2018:
[6] had to be skipped (which is potentially dangerous!)
[5] was shortened by 1 week
i.e. 11 weeks of prep in 2018 vs. ideally 13 weeks

2021:
Ideally, start preps such that [8] is completed by time of beam arrival (unknown at this point). Need cooling water from including [2] on.

Experimental Area	Experiment	Requirements	Main constraints	Readiness Status	Special Needs - Impacted Equipment / Service Groups Needed: Yes/No, Available/Schedule: ok/tbc Resources: financial and/or personel								
					EN/CV	EN/EL	EN/HE	EN/STI	TE/CRG	BE/ICS	BE/CO	HSE/RP	EN/EA
EA	CLOUD	requested operation in 2019, 2020, 2021	no operation possible during 2020 (EL/CV works)	ok for 2019 option for an early run in 2021	X	X							X
NA	NP02 & NP04	requested operation during LS2	no operation possible when chilled water is not available	operation possible between May and September	X	X			X	X	?		
	COMPASS	early commissioning likely required (e.g, for cryo target)	cooling water and cryogenics	to investigate if special solution like in 2018 is needed	X	X	X		X				X
	NA64	new experimental area	no particular show-stopper	ECR final draft available		X				X			X
	GIF++	operation during LS2 extension of bunker	gas consolidation and cooling/heating (minor)	ECR final draft available	X		X			X			X
	NA62	lKr must be maintained RP needs to access EA to be clarified	backup services must be tested (recent issue identified)	all ok (verification requierd) access to EA in discussion with RP	X	X			X	X	?	X	X

Is there a life after the 2018 Drell-Yan run?

- Meeting with Oliver Pirotte, Johan Bremer (both TE-CRG), Gerd Mallot, Vladimir Anosov, Caroline Riedl May 30, 2018

- **The changeover planning:**
  - dismantle absorber
  - move target platform (uncabling of magnet after warming up of magnet)
  - align magnet before doing pipe work
  - remove additional “balcony” shielding
  - pipe work (start ~ January 2019)
    - o some pipes have to be redone from scratch including welding
    - o leak checks (new pieces before installation under easier conditions?)

- Who will do leak checks, cryo / company or COMPASS? Difficult to predict who can be at CERN in 2019 if there is no run ongoing

- Lifetime of rotary pumps reached already? Maintenance needed before 2021?

- Gerd asks cryo for cost estimate by October

- Cryo visit to the exp. area May 30 to check what has to be done

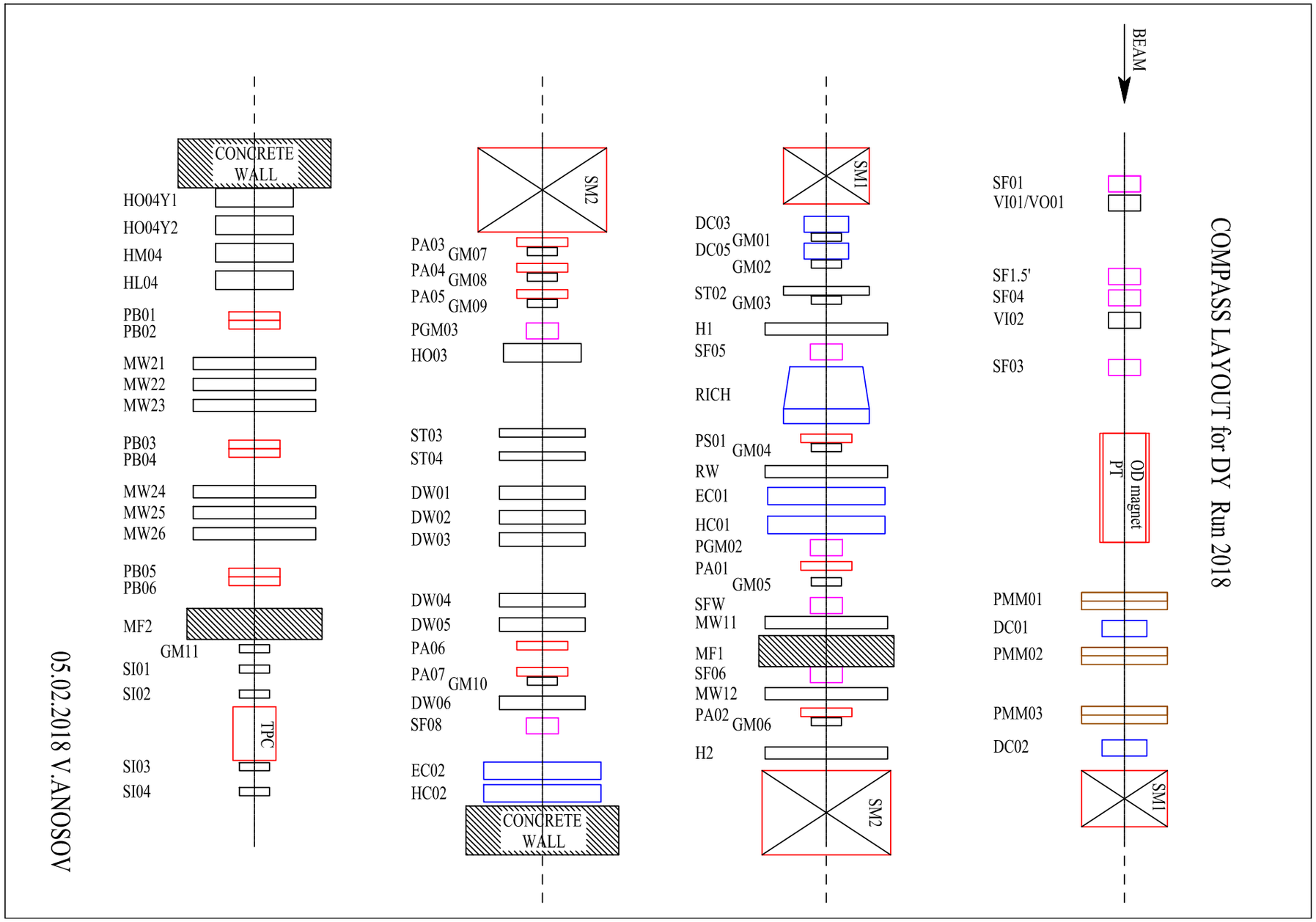
- **Consolidation of the two overhead cranes** in EHN2 during LS2 (Roberto Rinaldesi)
  - Refurbishment of 40 ton crane (PR-539): 6-8 weeks
  - Replacement of 5 ton crane (PR-545): 1,5 weeks

  COMPASS agrees (Vladimir Anosov) if works start not before July 1, 2019 (and supposed end Oct. 2019).

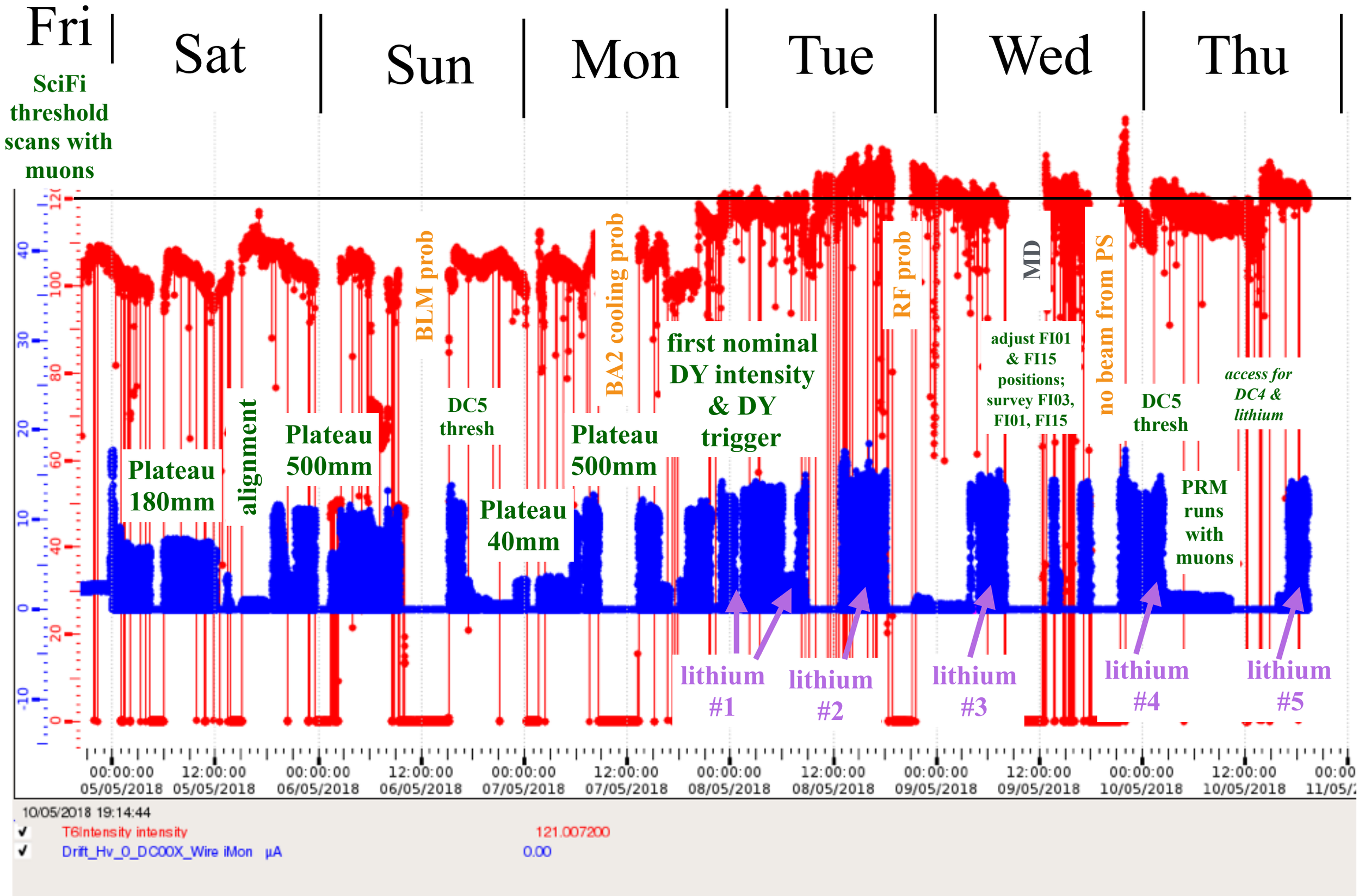
- CAMERA has to be moved out of 888. Waiting for feedback from Saclay / Nicole. (Meeting with Jean-Yves Rousse (Saclay), Jean-Louis Grenard (CERN), Vladimir, Nicole, Caroline on February 23)

- Fun fact: the compressor in May 2018: 5-7 deg input-output, 30m3/hour

Extra Slides

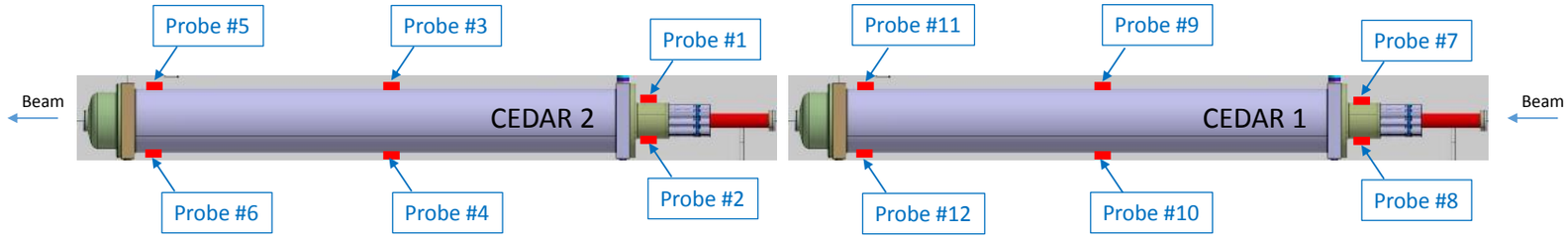


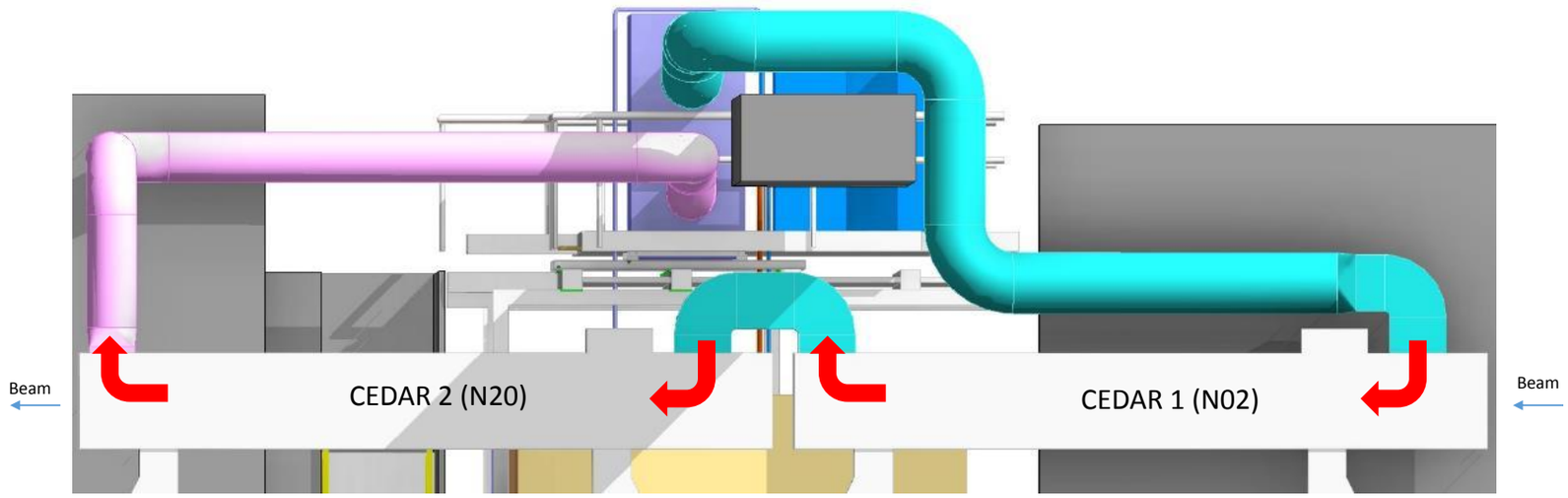
Units on T6 & DC0X wire current vs. time

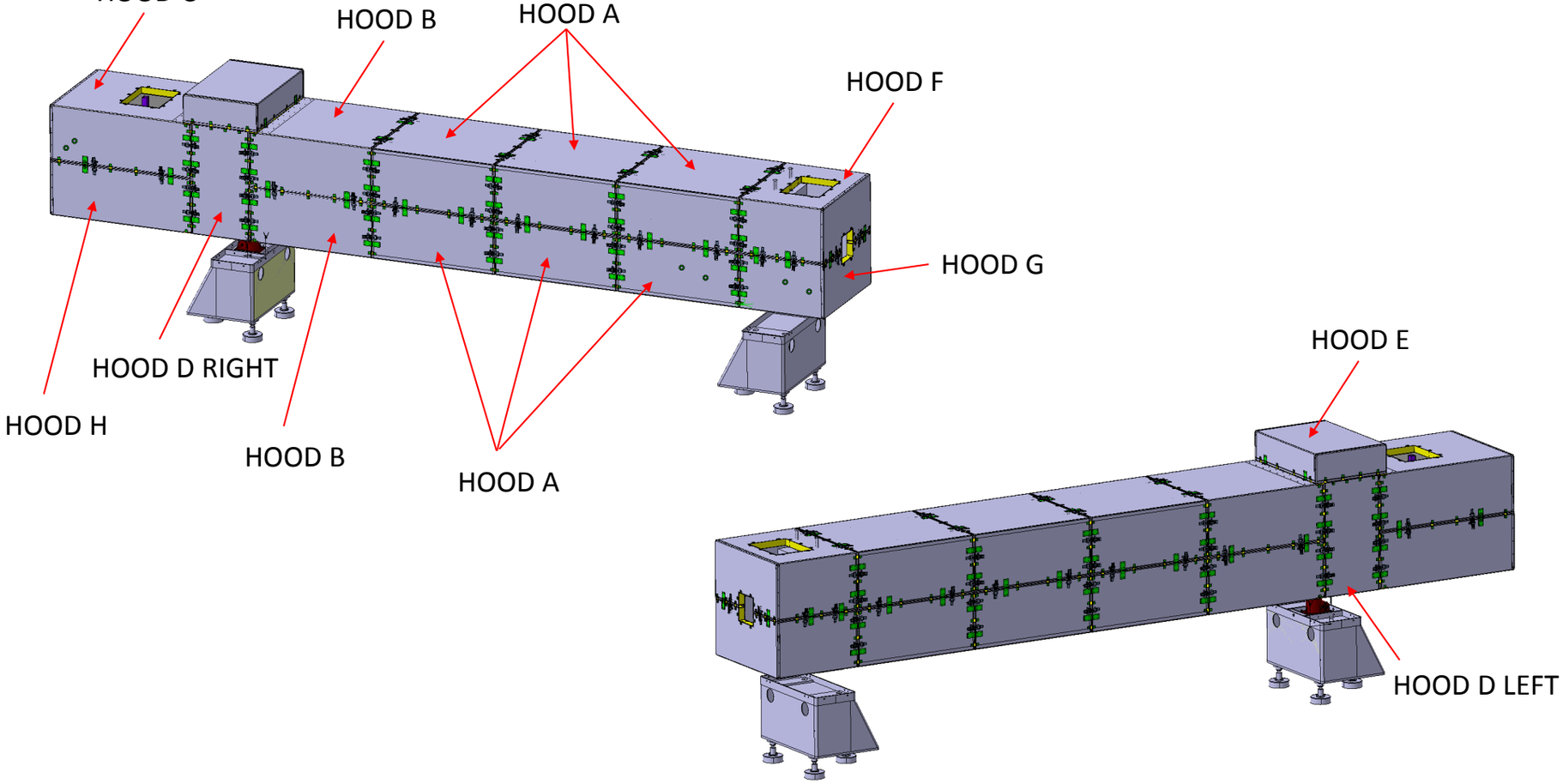


CEDAR: from EN-EA

CEDAR – COMPASS – Pt100 Positions (EN-EA/MME/CV)



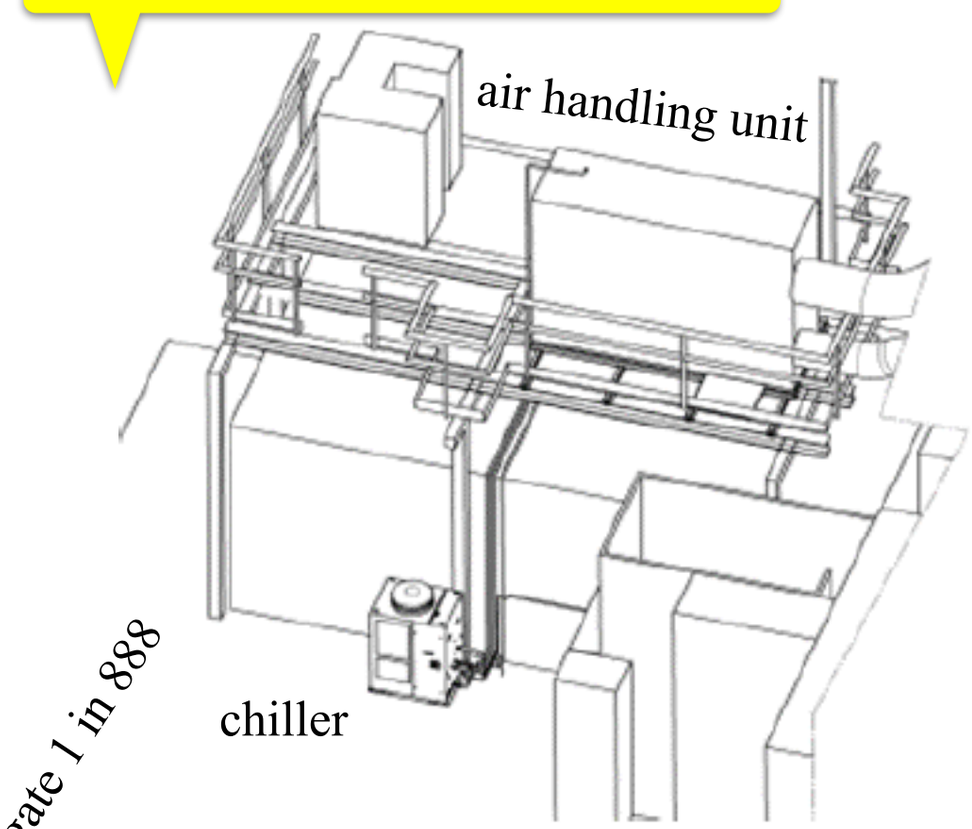




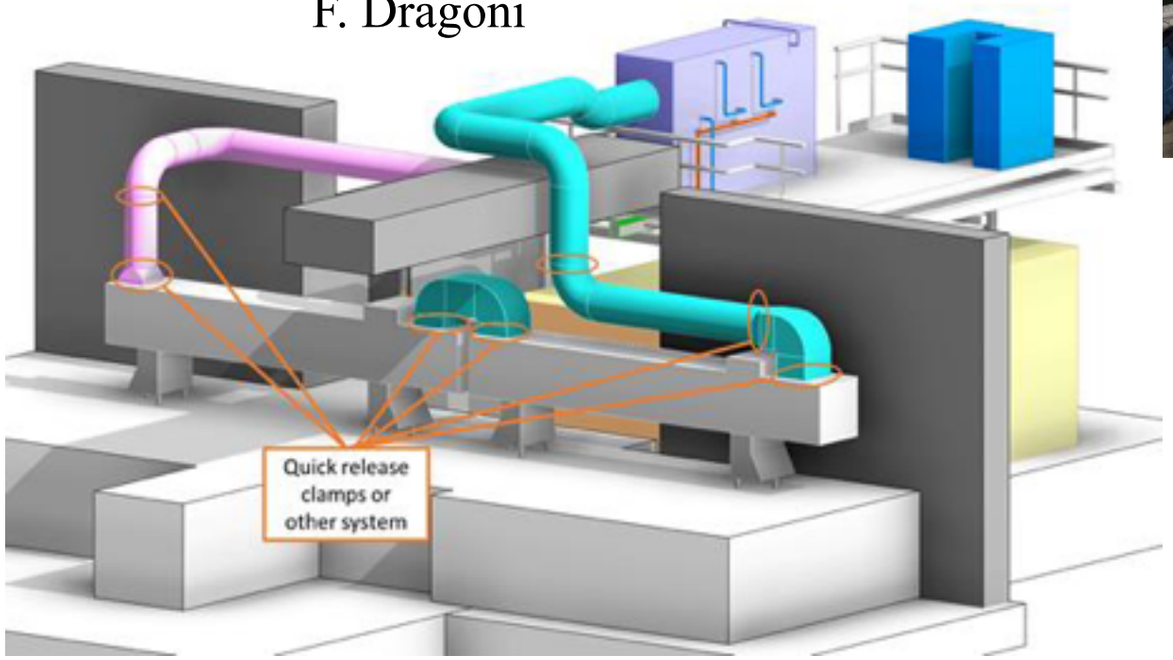
CEDAR upgrade - CERN

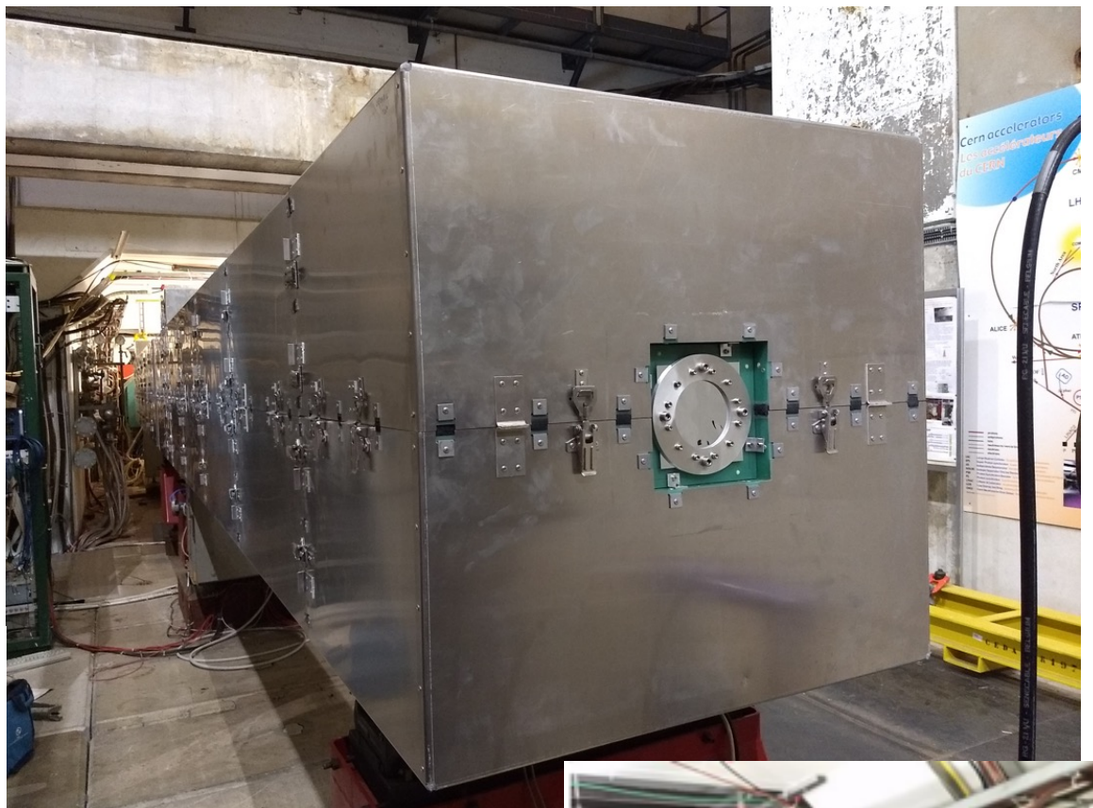
(Serge Mathot, EN-MME) EATM 96 March 13, 2018

- Thermal housing construction and installation finished
- Air ducts and water connections finished



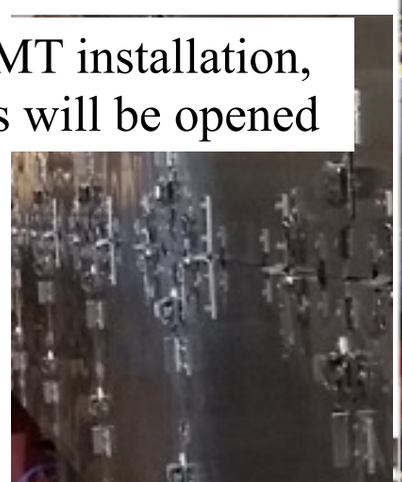
F. Dragoni





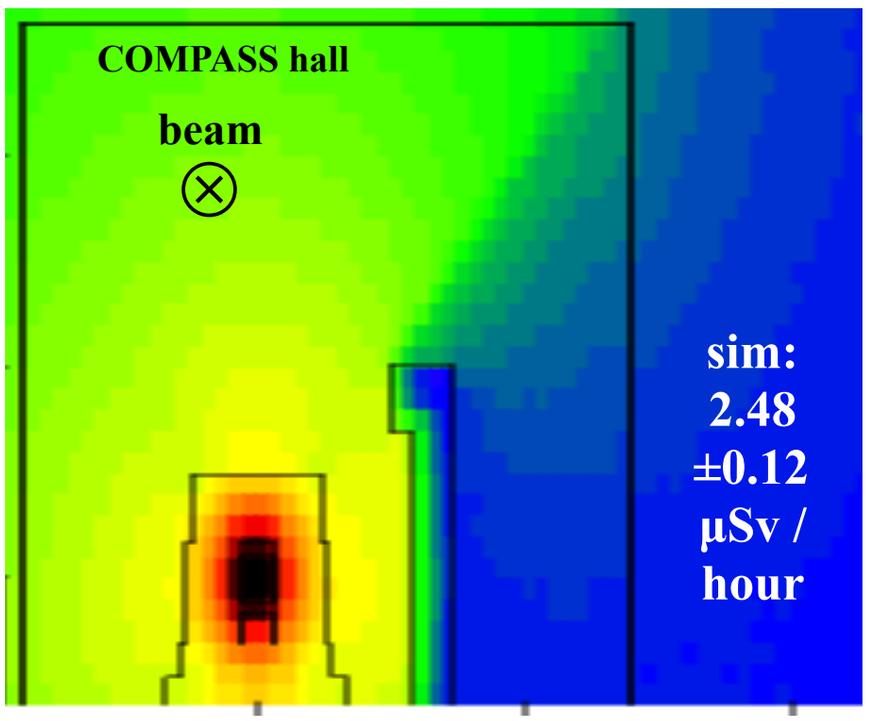
new b**eam window** on thermal housing: 125µm mylar

For PMT installation, clamps will be opened

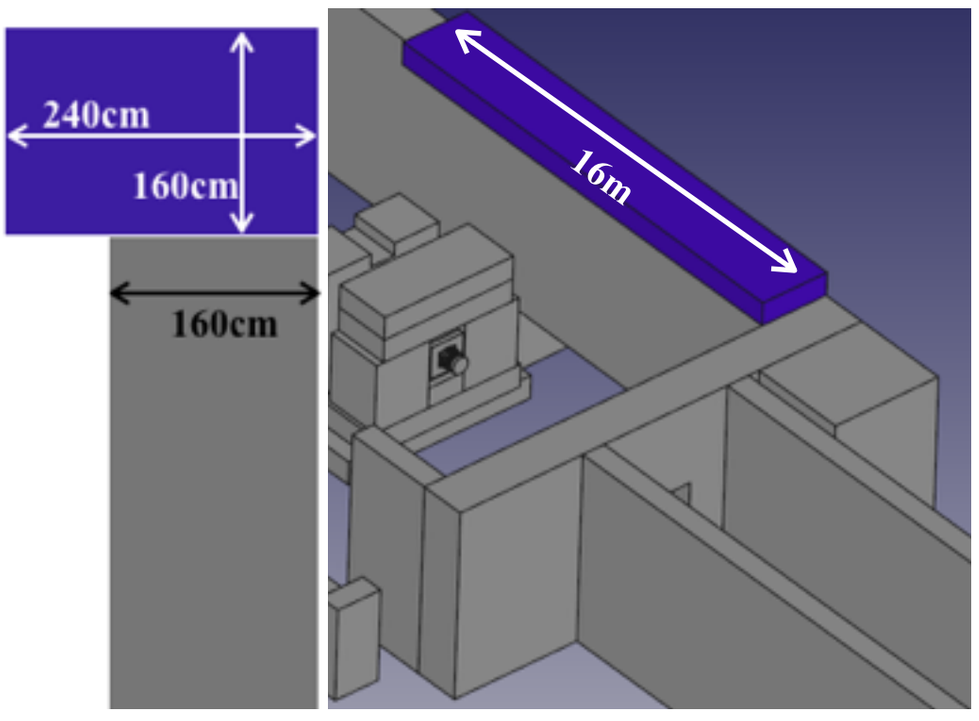


Balcony shielding

- Balcony shielding completed Friday April 5
- Beam permit: received April 8.

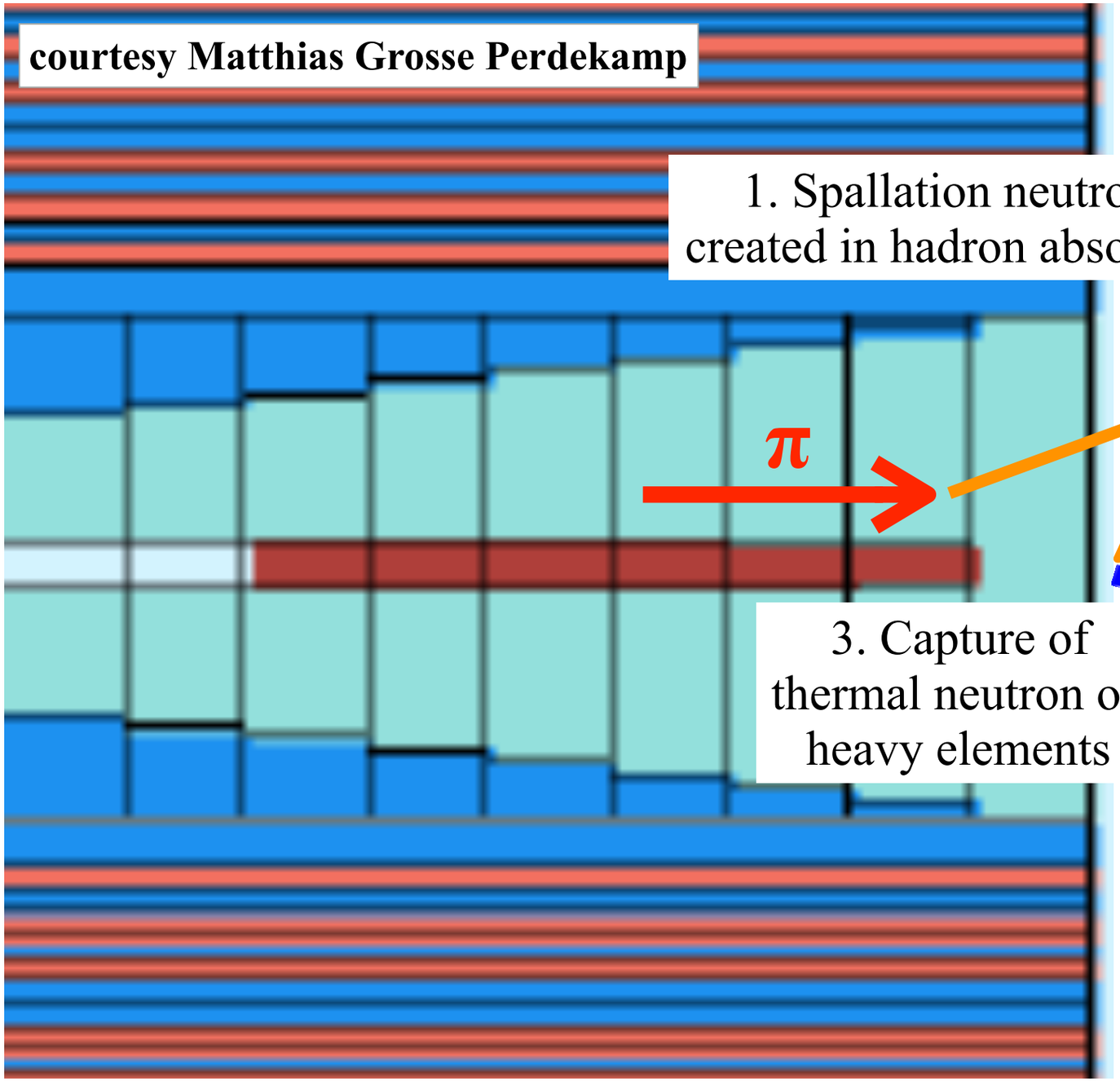


new balcony shielding



BLUE WATERS

Why a lithium absorber?

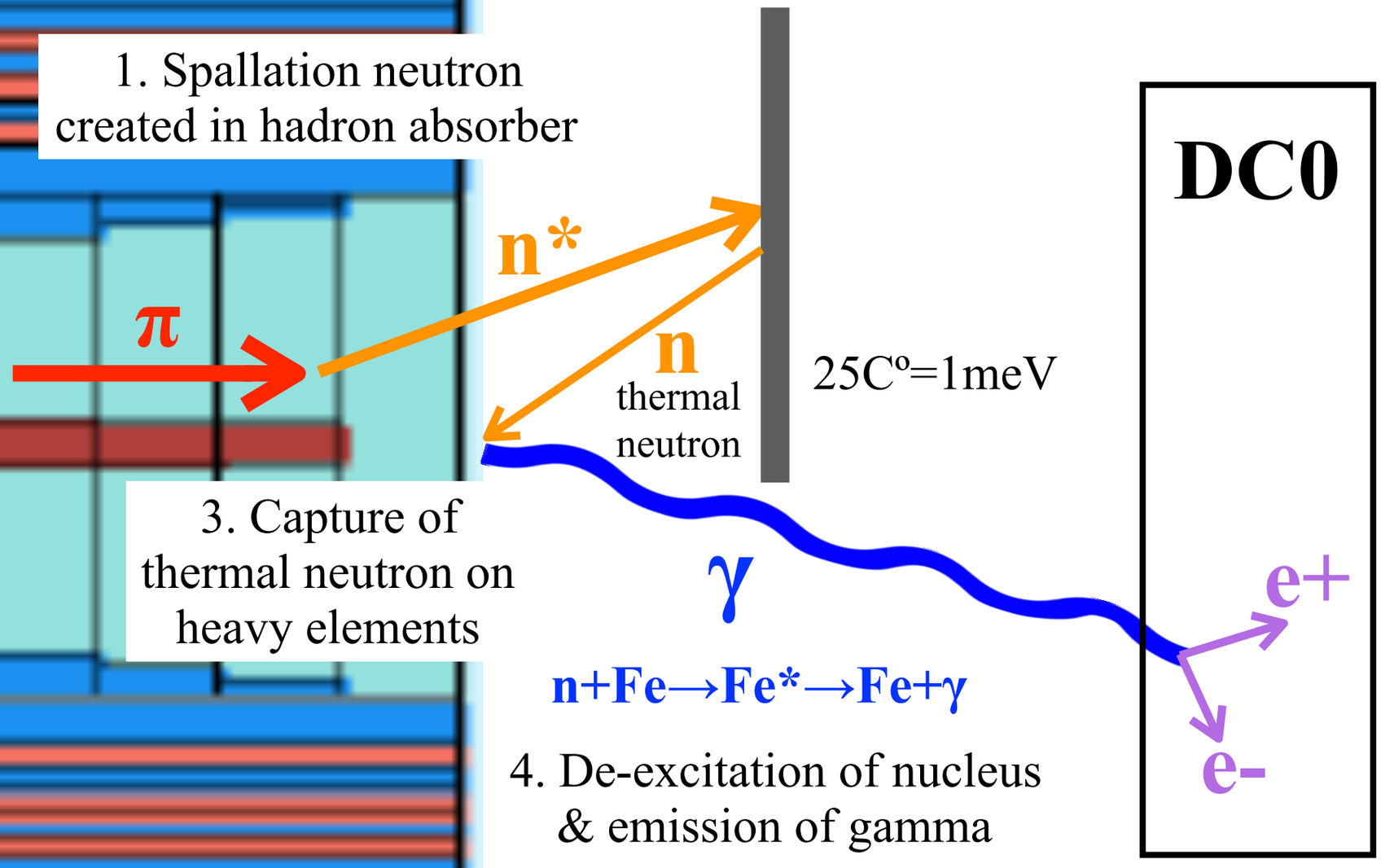


1. Spallation neutron created in hadron absorber

2. Thermalization on heavy elements
(concrete blocks, steel support frames, ...)

3. Capture of thermal neutron on heavy elements

4. De-excitation of nucleus & emission of gamma



Insert neutron absorber here:
- **n + ^{6}Li → ^{3}H + ^{4}He : *stop in air, do not reach DC0***
- **n + B → B* → B + γ_500 keV *: reaches DC0***
- *Both Li and Bo are good in absorbing low-E neutrons*

Required energy cutoff: very small (meV)
Required thermalization & capture time:
very large (~50μs)

2018: improvement of protection of target PLCs against radiation

- Very useful meeting Oct. 17 with Ruben Garcia from EN-STI-FDA (sources, target, interaction): recommendation to
  a) move &
  b) shield PLCs.

- Re-install BatMons in 2018.