



SND@LHC status report, 27 August

SND@LHC Collaboration

Sustained progress on all fronts over the summer

Many expected challenges but project is on schedule and within available budgets in all areas

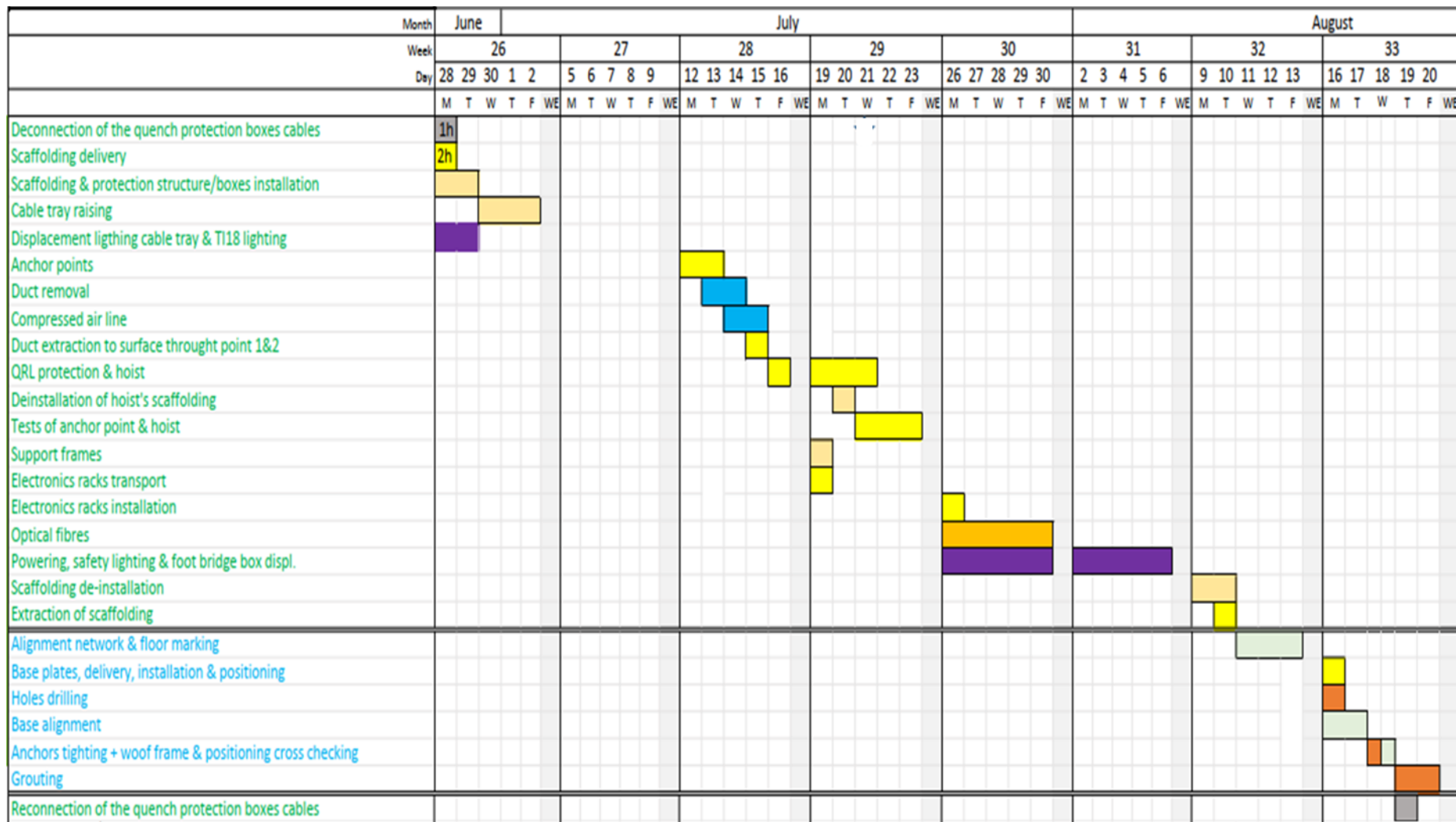
A enormous thanks to everyone involved from EN-HE-PO, TE-MPE-EP, BE-EA-AS, EN-EL-FC, EN-EL-EWS, EN-CV, BE-GM-ASG, EP-AGS-SI, Neutrino platform, HSE, TE-RAS-GLO, LHC coordination and operation

Experimental area and infrastructure

Works underground started as planned on June 28

→ All activities up to now performed smoothly on time and ended with cleanup this week.

→ In the following slides photos of the main activities underground in this period

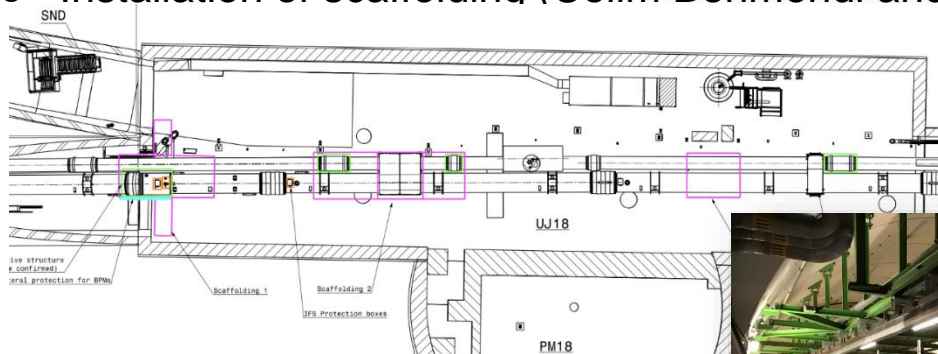


Experimental area and infrastructure

- Installation of protective tables and boxes on bellows, instrumentation and feedthroughs (Pascal Catherine and team)

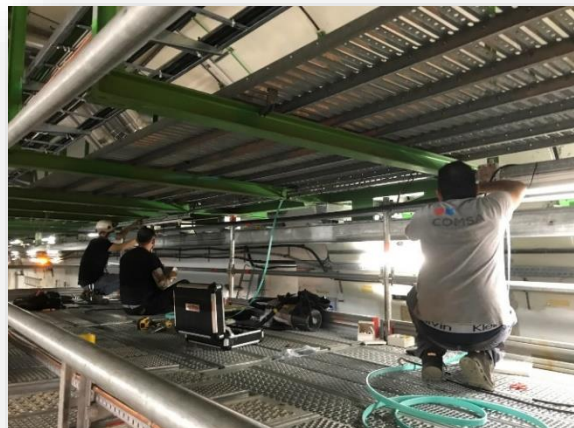


- Installation of scaffolding (Celim Benmehdi and Ouvaroff team)

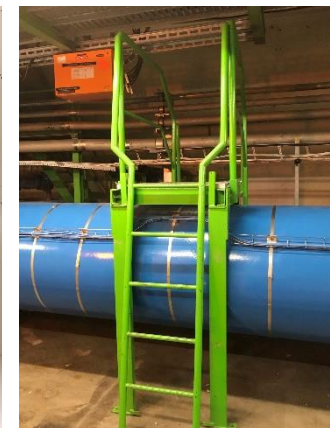


Experimental area and infrastructure

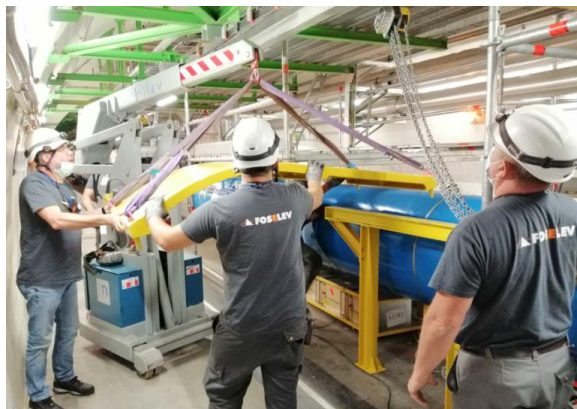
- Preparation for transport channel, electricity and lights, displacement of electrical box on footbridge (Yann Maurer and EN/EL team)



T118 looking down towards UJ18



- Installation of QRL protection and load test (J.-L. Grenard and Foselev team)



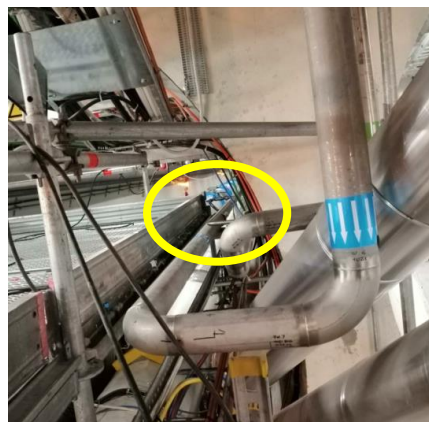
Experimental area and infrastructure



- Removal of old ventilation duct, including section in UJ18 for more space (J.-L. Grenard, O. Crespo and Foselev team)



- Compressed airline (O. Crespo and SADES team)

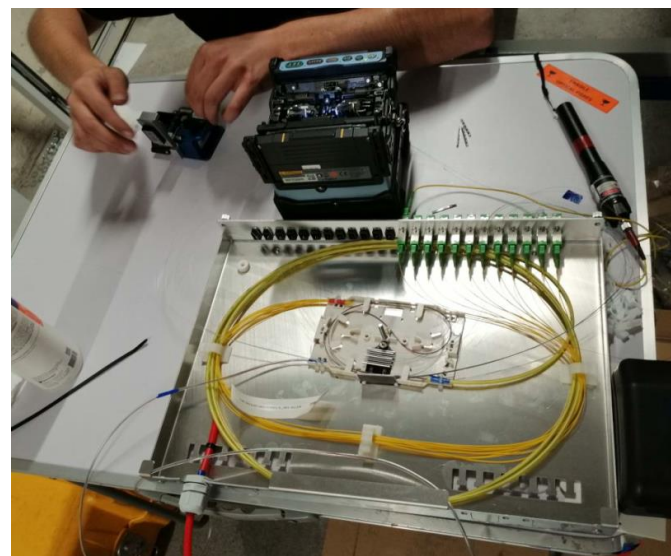


Experimental area and infrastructure

- SND@LHC underground electronics racks (P. Santos Diaz and BE-EA team)



- Optical fibres between surface rack in SR1 and TI18 (J. Rodriguez Fernandez and SADES team)

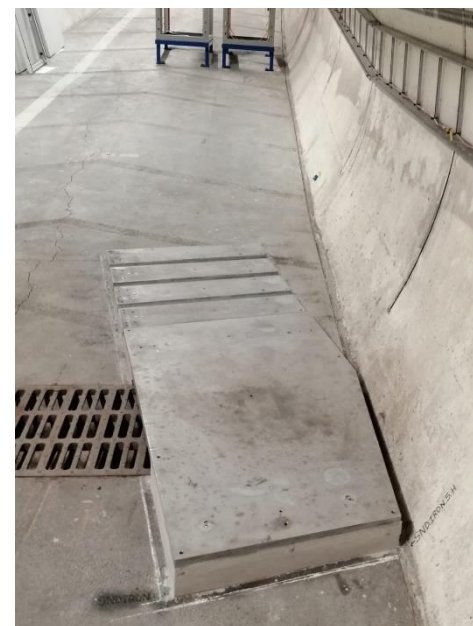
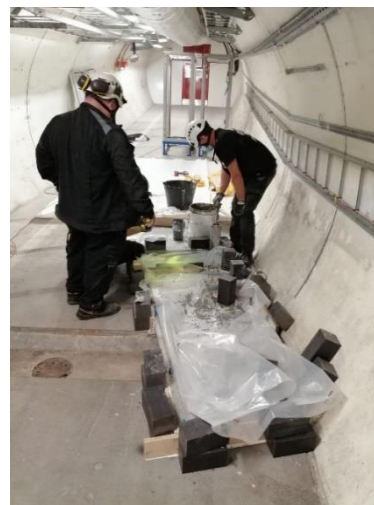
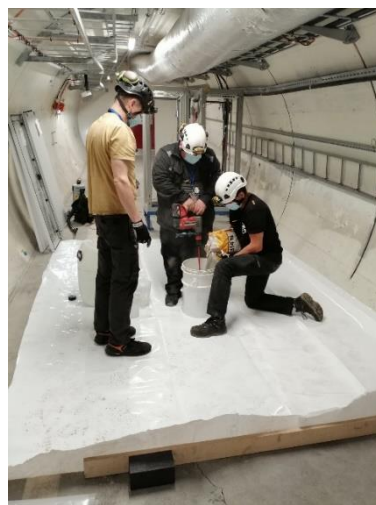


Experimental area and infrastructure

- Survey and positioning of baseplates for muon filters (C. Vandeuvre and survey team)



- Formworks and grouting of baseplates (D. Mladenov and Neutrino Platform team)



- ◉ Muon filter iron blocks

- All but 6 blocks with small threaded lifting points available at CERN
- 5 blocks prepared from machining available non-standard blocks and purchase of one block (M. Lazzaroni, K. Buffet and J. Tonoli team)
- All blocks ready



822	822	822	Modified		Modified	
8	8	8	8	8	8	New
4	4	4	4	4	4	
2	2	2	2	2	2	
						Modified



Experimental area and infrastructure

- Cooling plant under construction, on track for installation w45-46 (O. Crespo and team)

- Electrical cabinet 90% completed



- Cooling plant 70% completed



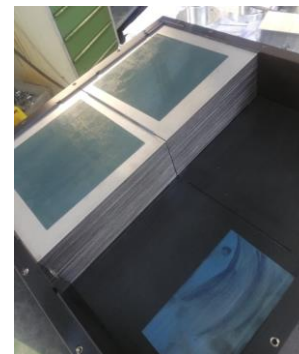
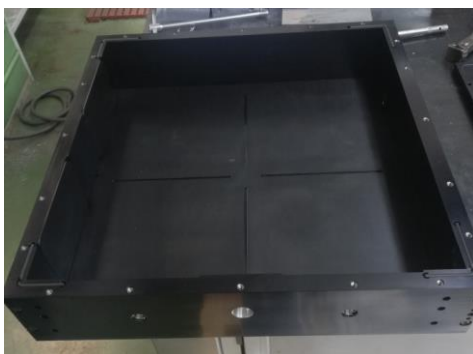
- ◉ Remaining activities that are on schedule
 - Powering of rack in SR1
 - Installation of iron blocks in final position underground after use in H8 test beam (w36)
 - Installation of cooling plant, piping, evaporator in cold box (w45-46)
- ➔ Preparation of experimental area and infrastructure ready for the planned machine cool down starting end of next week (w35)
- ◉ Outstanding issues, shifted in planning
 - Copper/optical network switches installation in underground and surface rack delayed due to 30 weeks lead time ➔ Needed from November but IT has identified alternative
 - Installed AUG cable non-conform ➔ Cable ordered by EN/EL but will arrive only late November
 - ➔ Agreed with cryo, RP, operation and coordination that scaffolding on the left of UJ18 will remain for replacement of cable. Acceptable to deinstall scaffolding with machine at 4.5K since additional protections of bellows, instrumentation and feedthroughs will remain in place. Exceptional Authorisation Request submitted for removal of scaffolding in December
 - ➔ Temporary solution will be put in place by EN/EL to proceed with detector powering and commissioning
- ➔ Bottom-line: no impact on machine or SND construction

Detector construction

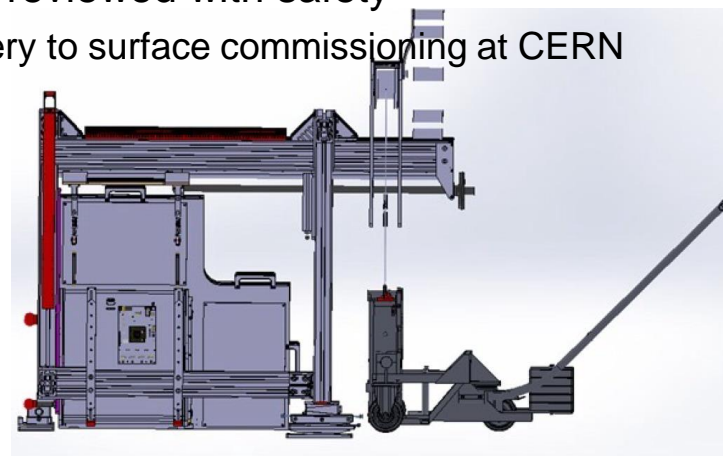
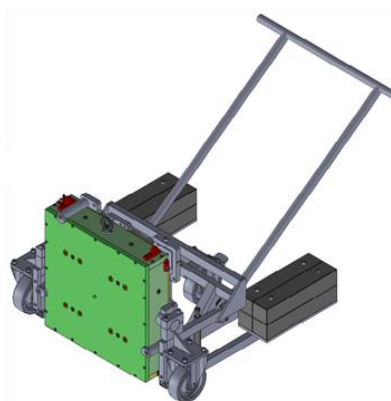
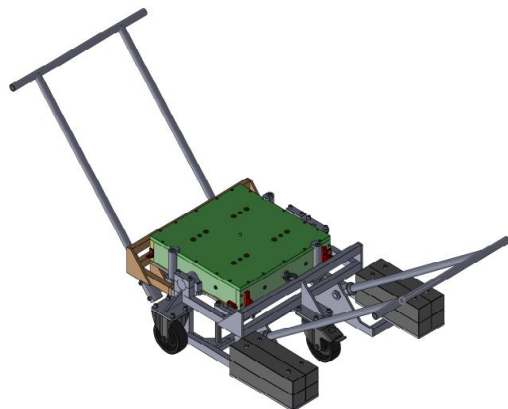
Several design and production reviews held successfully in June

Target system

- Emulsion wall box prototype successfully assembled and tested in company with tungsten plates and aluminum sheets in place of emulsion → Delivered to Naples this week (w34)
 - Light leak tightness tests will be performed in Naples 1-10 September



- Final design of emulsion wall transport trolley, to be reviewed with safety
 - Test of prototype in Naples mid-September, then delivery to surface commissioning at CERN

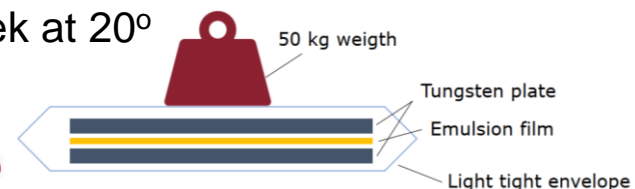


Detector construction



Target system, cont'd

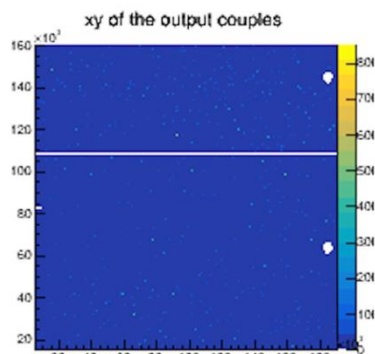
- Mechanical test of emulsion, vacuum packaged for one week at 20°



Fog level
(grains/1000 μm^3)

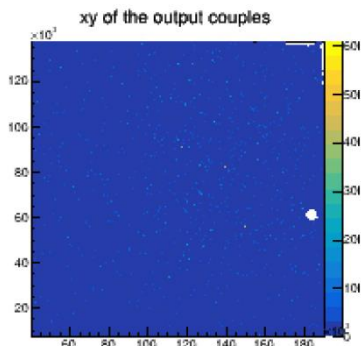
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TOP 2.3 ± 0.7
BOTTOM 2.5 ± 0.5



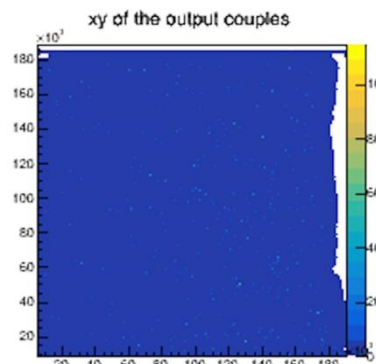
SIFON

TOP 3.5 ± 0.5
BOTTOM 2.3 ± 0.4



BANGO

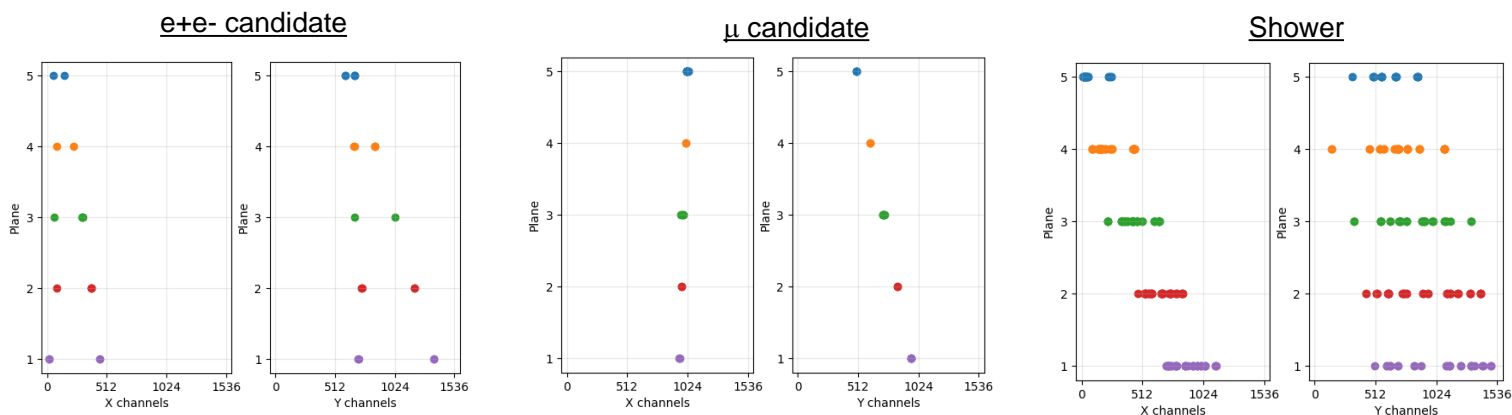
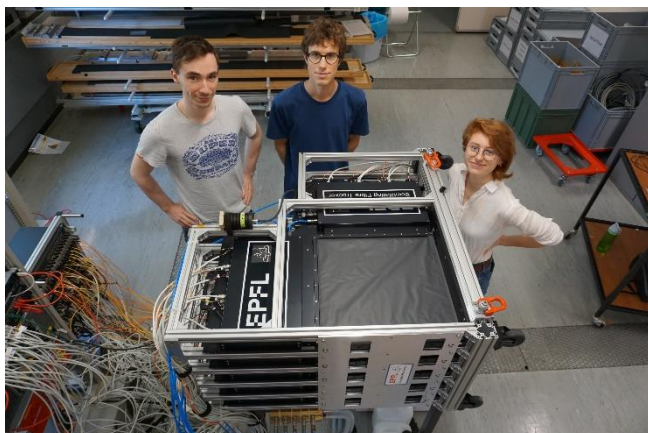
TOP 2.5 ± 0.5
BOTTOM 2.5 ± 0.2



- ➔ No significant distortion observed and good quality of reconstructed segments over the whole surface
- ➔ Also equivalent to a first chemical compatibility test, no hint of fogging
- ➔ Two other chemical compatibility tests are ongoing
 - Naples: Slavich films with Sifon pure tungsten (99.5%) and Bango alloy (95%W), 4 weeks@5degrees
 - ➔ Films will be analysed next week
 - Japan: Nagoya films, not yet started due to problems with emulsion gel production, now solved
- Order for half of the tungsten, sufficient for first batch, submitted to SIFON (Aug 6)
 - Splitting of order for administrative reasons

SciFi Target Tracker/ECAL

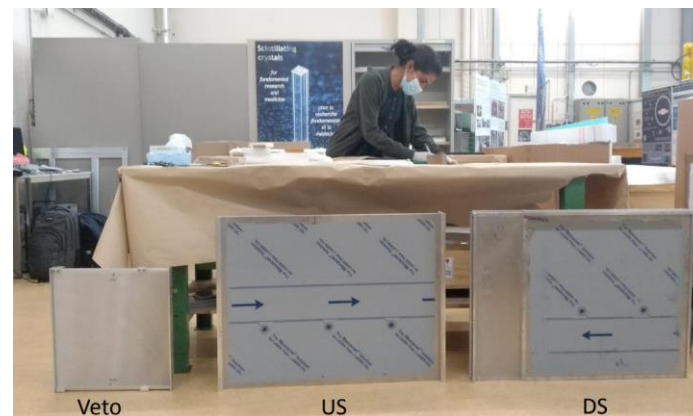
- Successful data taking with the whole setup, including full DAQ, event builder and controls, and cosmics at EPFL
- Setup will be brought to CERN surface commissioning mid-September



Detector construction

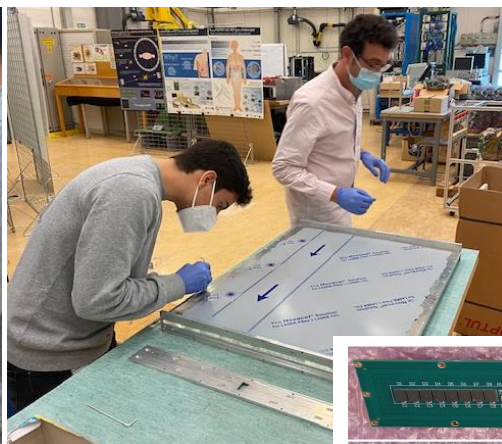
Veto system

- Mechanical frame finished and at CERN
- Scintillating bars at CERN, wrapping will be done after 1st DownStream muon station
- PCB under test at CERN



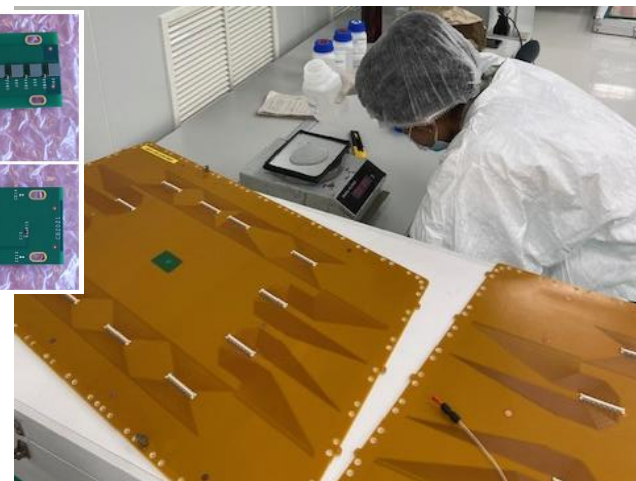
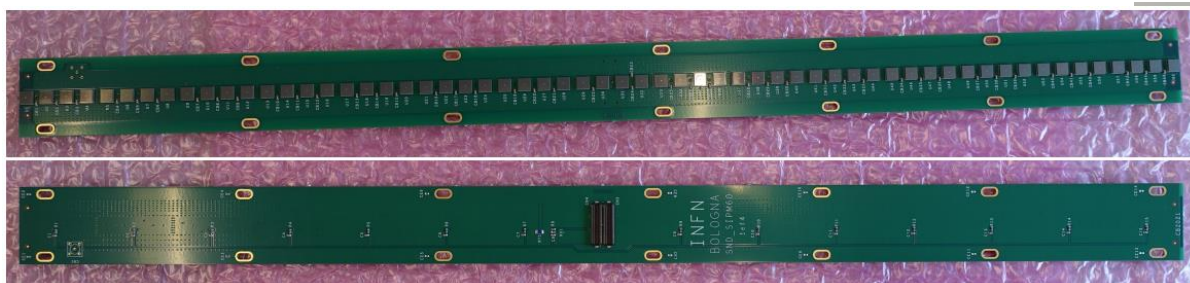
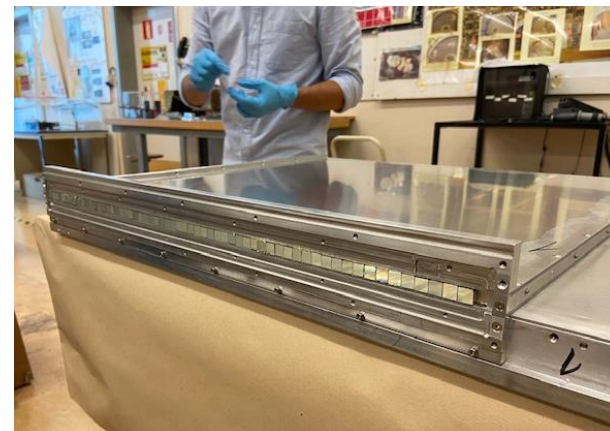
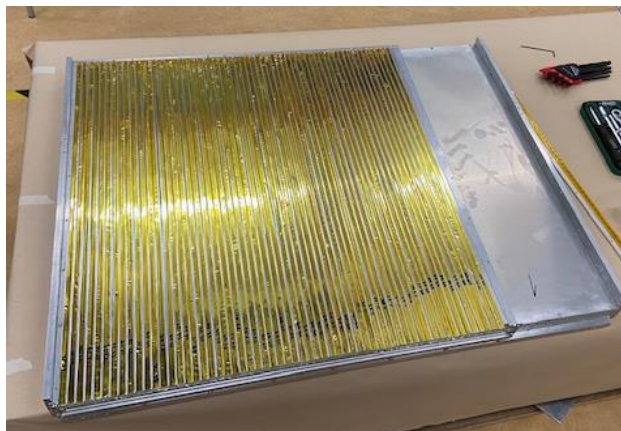
UpStream (US) muon system

- Mechanical frames finished, bars have been wrapped and installed in frames
- PCB were delayed from manufacturing, arrived in Zurich 18/8, testing ongoing at CERN and EPFL
- Challenging to be ready for beam test next week but still on track

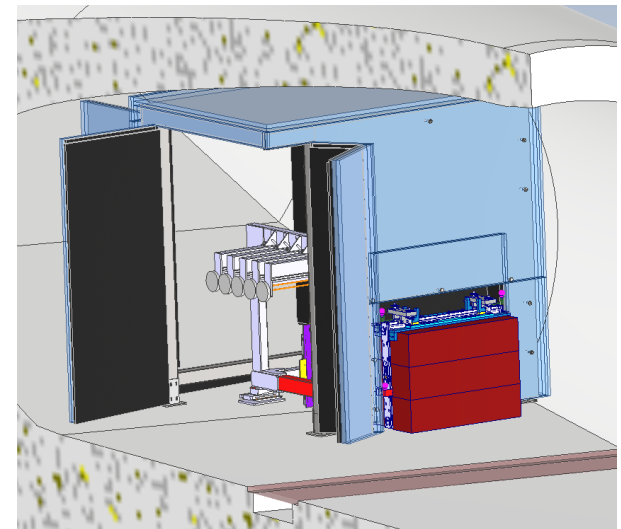
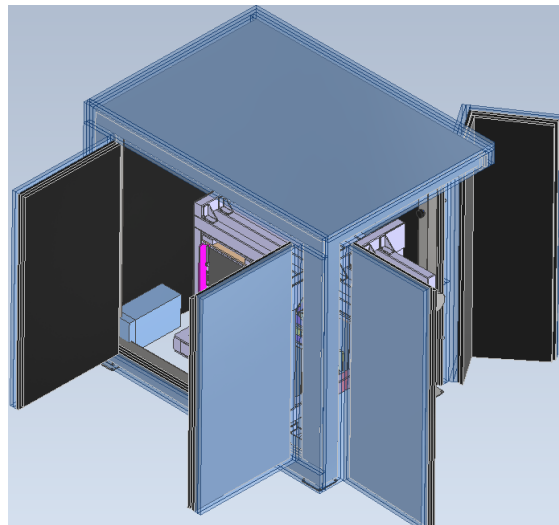
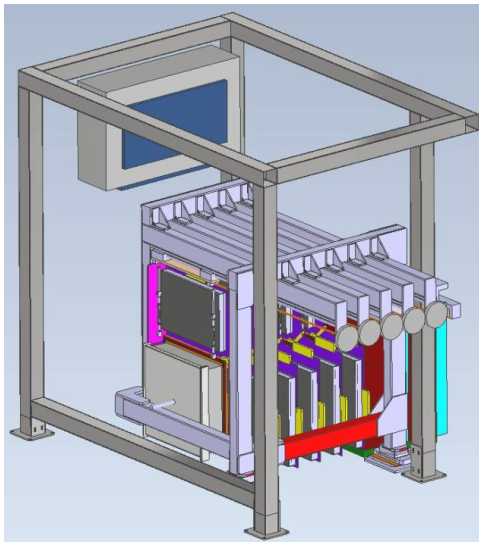


DownStream (DS) muon system

- Mechanical frames finished and at CERN
- First DS station bars inserted in frame and ready for test beam together with US system in H8
- PCBs under test at CERN and silicon gel production for assembly started



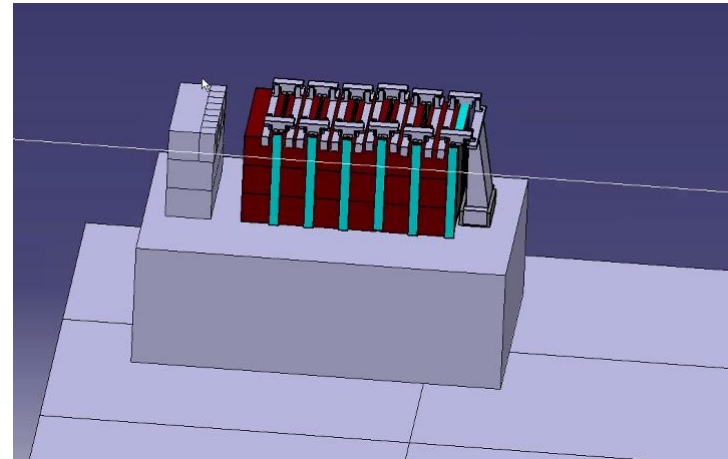
- ◉ Cold box under design, material ordered directly to CERN (M. Liz Vargas, Chile)
 - Final neutron shield configuration consist of 2x25mm Plexiglas and 50mm boron(30%)polyethylene. “Mirrorbor™” will be used to in feedthroughs and other openings
 - Design check with simulation of access for emulsion wall trolley ongoing
 - Box will be manufactured at CERN by engineer from Chile, end September-October
 - ➔ Need access to workshop, contacting same workshop where he worked for ATLAS two years ago



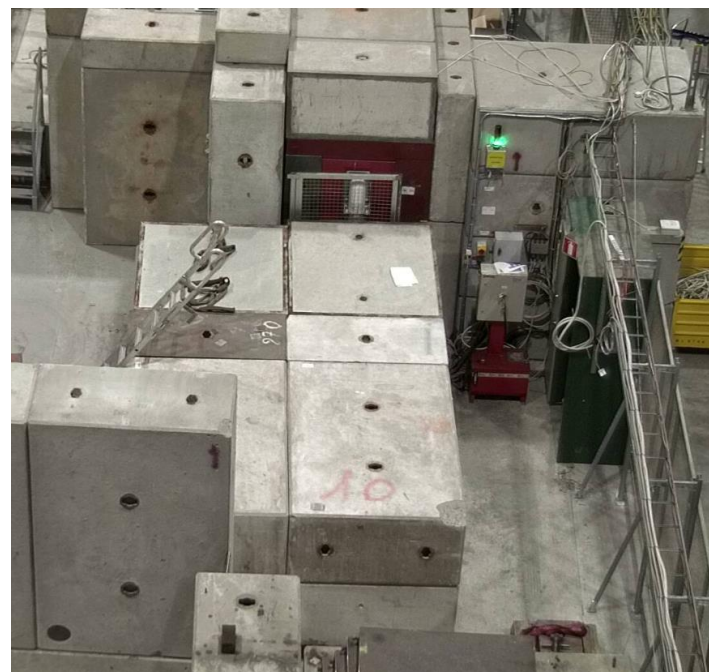
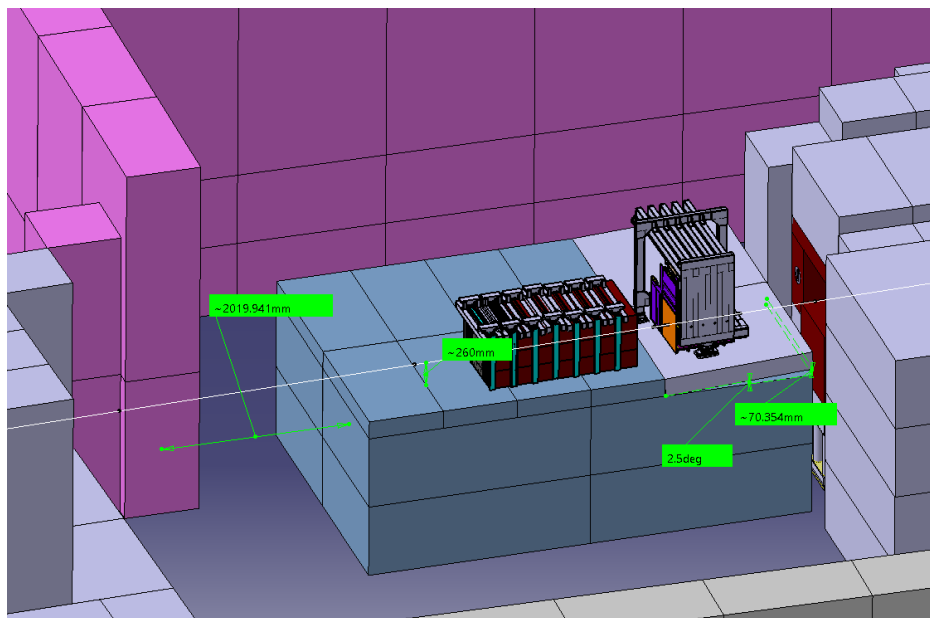
- ◉ Full DAQ system and controls have been developed and tested with SciFi system at EPFL
 - Event builder has been tested up to hit rates three orders of magnitude higher than expected particle rates
 - Reconstruction under development
 - Currently system is controlled through Python but work is ongoing on GUIs
 - Data quality monitoring being developed
 - ➔ As is, system is ready for the detector commissioning phase

- ◉ Good progress on software
 - Implementation of channel mapping, detector hit classes, digitization, processing of MC response, geometry underway
 - Successful test to read and calibrate SciFi raw data into hit objects, and produce hit raw position, hit maps, signal distribution, and event time.
 - Adjusting final detector position in software pending measurements of iron blocks by survey
 - Recording of luminosity from ATLAS and run database still to be worked on, in contact with ATLAS for luminosity

- ◎ Test beam in H8 for SND-muon/HCAL for energy calibration in preparation
 - Access to zone from now, start of setting up on Monday morning, start of data taking with pions at 300, 200 and 100 GeV from September 1
 - Setup will comprise 5 US muon stations and 1 DS muon station, 30cm of iron in front to emulate the equivalent material budget of the target system
 - Only three (potentially four) days of beam were allocated so we have also expressed interest in the week that was freed in the end of September if we face difficulties

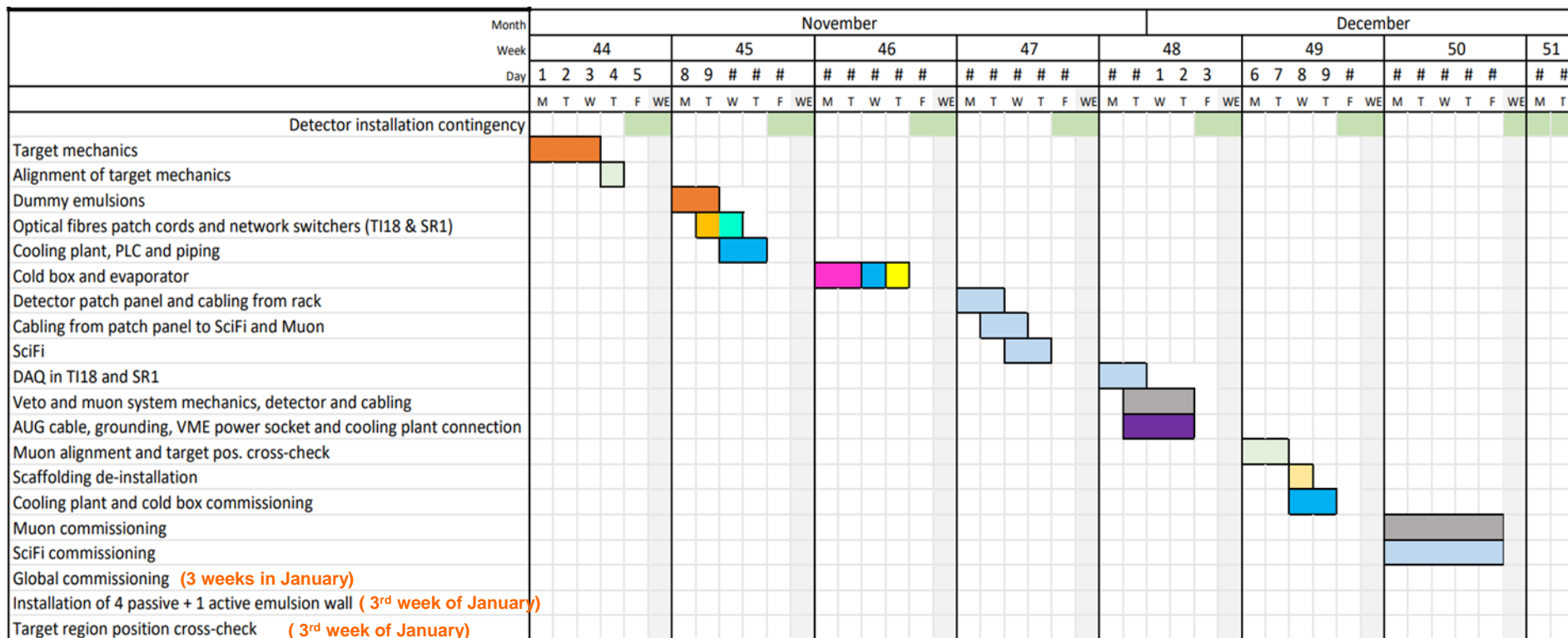


- Surface commissioning in H6 September - October
 - Area being set up, will have correct slope under target system to exercise wall trolley
 - Move in with full muon system, SciFi in test rack, and complete DAQ system right after H8 test beam
 - Surface commissioning will use alternative iron blocks to have the proper blocks directly installed in TI18 after H8 run
 - Target system will come in second half of September



Installation planning

- No significant changes



Target team
 Antonia Di Crescenzo
 Muon team
 Christopher Betancourt
 SciFi team
 Guido Haefeli
 U. Andres Bello
 Matias Liz Vargas

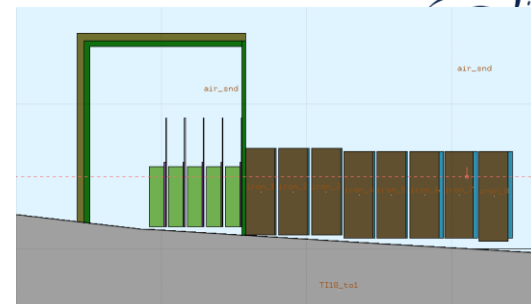
EN-EL-FC
 Jorge Rodriguez Fernandez
 EN-EL-EWS
 Yann maurer
 IT-CS
 Mohssen Souayah

EN-CV
 Olivier Crespo-Lopez
 BE-GM-ASG
 Camille vendeuvre

EN-HE-PO
 Jean-Louis Grenard
 BE-EA-AS
 Sidi-Mhamed Benmehdi

P. Santos Diaz
 27.08.2021

Other and Collaboration matters



- ◉ Radioprotection checks ongoing (A. Infantino, HSE)
 - With detector positions and layout, FLUKA geometry implemented
 - Simulation to check activation of tungsten
 - Finalise procedure for emulsion replacements and constraints
- ◉ We are in contact with FASERnu and LPCs about the replacement strategy for 2022
- ◉ MoU for Construction out for signature
- ◉ MoU for Maintenance&Operation discussed in June Institutes Board and now ready for circulation
 - Plan to have it ready for signature by end of September
- ◉ Allocated budgets for construction have been made available in time
 - Project remains within available budgets
- ◉ Availability of manpower for construction, surface commissioning and installation is good
- ◉ Commissioning/Run Coordinator appointed: E. Zaffaroni (EPFL)
- ◉ Physics Coordinator and Editorial Board search committee in place
- ◉ Research Fellow from neutrino platform has joined the CERN SND group part-time
- ◉ Six SND@LHC talks already given/scheduled at Summer conferences
- ◉ Invited to contribute to the common paper on LHC machine and experiments for Run 3

Dark Room facility: Common FASERnu/SND/DsTau/SHiP request

- Underground space identified for storing one detector while the other is constructed/developed in dark room
 - Space is a short distance into AWAKE access gallery (PGCN81 in TAG41), accessible from SPS ECN4;
 - Seems to satisfy the requirements (depth, activation, accessibility);
 - Limited access for ~3 weeks a year during AWAKE operations → need to check that it does not fall around any LHC technical stop;
 - Although area satisfies requirements, continue to look for more convenient storage (e.g. P1 HL-LHC area)
- Progress has been made on the dark room refurbishments:
 - The dark room has been cleared-out and obsolete equipment removed;
 - Foresee to merge together 2 small rooms to form a dedicated drying room, and knock a door directly from the dark room to this drying room. Works for this planned to take place soon;
 - Discussions with EN-CV on renovating the cold water and ventilation system have converged;
 - In terms of funding for the refurbishment, EP management has agreed to contribute at a level which basically covers the renovation of the cooling and ventilation system and we are now discussing the details of the renovation of the rooms.
- RB has asked for memo to explain need for renovation of cooling/ventilation, the proposed solution, and cost



Future room for assembly



Future room for development