# Minutes of the PS-SPS Users Meeting held on May 25th, 2023

**Next user meeting:**
Thursday, June 1st

, 2023 10:30 CEST
Meeting room 874/1-011

## News from the PS & SPS Physics Coordinator (E. B. Holzer)

PS and SPS beam stop Wednesday 24 May at 9 am for 30 minutes

Target intensities T2 / T4 / T6 = 90 (until July 5th) / 57 / 60

Wobbling change in week 22 for T4:

- H6 and H8 polarity change for higher energy beams in H8 for SND.
- Wobbling setting to keep beam quality and intensity for NA62 as requested.

Scheduled test of dedicated AWAKE running (no beam to North Area) on Friday for one hour starting at 11:00 (if no LHC filling during this time). To compensate for the loss of the North Area cycles, AWAKE will stop 2 hours earlier on that day (22:00 instead of 24:00).

Week 23 Thursday 8th of June from 7:30 to about 9:00: Next scheduled Booster intervention / beam stop

MD planning for the comming weeks:

This week (week 21):

- PSB: short parallel MDs
- PS: short parallel MDs

Next weeks:

- Week 22 and 23: Crab cavity MDs → no beam sent to North Area
- Week 25: Planning MDs during cooldown requires RP authorization and therefore requires planning of the interventions to be known reasonably well in advance.
  → Current plan: COLDEX, crab cavities and Linac4 source tests

### First report about EURO-LABS Transnational Access (TA) call for applications (E.B. Holzer)

## PS Machine Report (Matt Fraser, Alex Huschauer)

- Main issues:
  - Over the weekend: cavity C10-81 not pulsing and C10-11 frequently tripping --> fixed during access on Monday
  - Synchronisation and other issues with KFA71 modules continue --> ABT experts looking at it daily

        - Problem when updating software for KFA71 yesterday (3h downtime instead of 30 mins) --> problem understood, soon to be rolled out
        - EAST T9 stopped for several hours on Thursday due to power converter issue and other EAST users later for access
- Activities on beams:
    - New EAST cycle with ramp of dedicated TOF created to increase parasitic intensity to ~550E10 p
        - This will allow us to increase the flux to 2.2E12 p/s once we get the green light
    - TOF 28 ns request received for 7 June
        - tested this morning, no pre-pulse measured and acceptable in terms of beam loss --> ready for TOF
    - delivered intensity to TOF and T8 well on track

# SPS Machine Report (Please Add Your Name Here)

- SFTPRO:
    - High transmission and low losses at extraction
    - PS worked on optimising the sharing of emittance between islands and core - done and NA62 is happy with the change
    - main issue was on R2211/12 bend in H4 - seems solved
    - today starting with EBC at 15:00
- HiRadMat:
    - almost done - maybe last few shots on friday. Today no beam requested
- LHC:
    - some difficulties in filling, hence longer fills from time to time
    - today high intensity LHC beams until mid of afternoon.

# Safety / Radiation Protection (Please Add Your Name Here)

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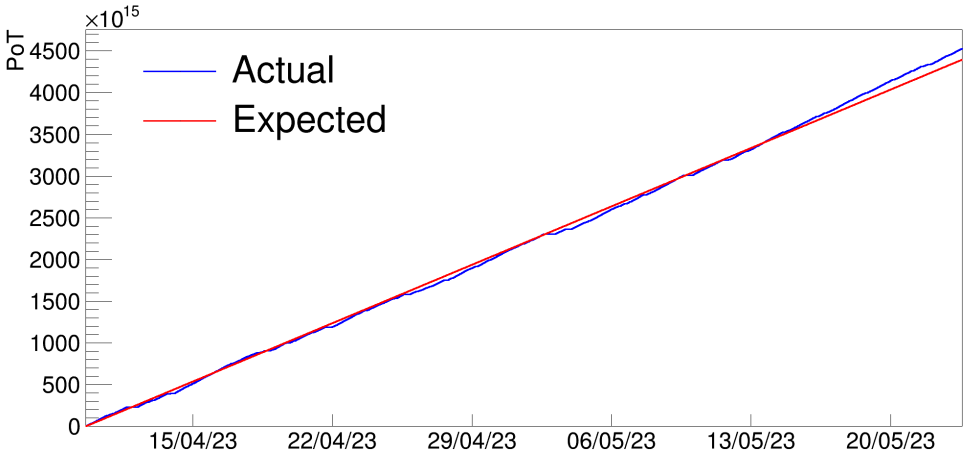
# n_TOF (Nikolas Patronis)

- EAR1: 181Ta(n,g) runs nicely and smoothly. Today the natEr(n,g) campaign will start with the same detector setup.
- EAR2: Neutron capture setup auxiliary measurements on-going (still two weeks on this)
- NEAR: Setup for 89Y(n,g) reaction study with 20mm B4C filters (installation on WED 24/5/2023)

- PoT: 4.5E18 (even better than expected. Many thanks to the PS teams!)



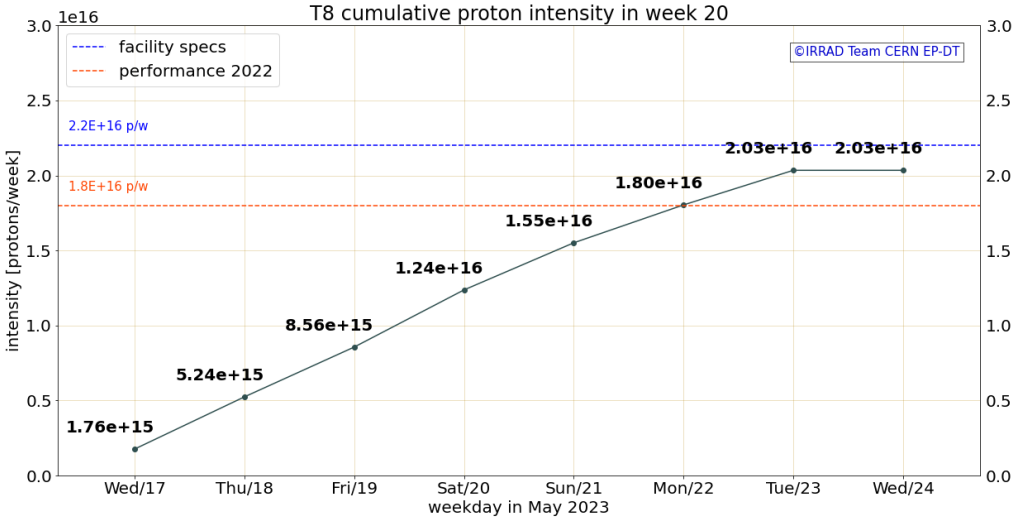

# East Area Beam Status (J. Bernhard)

T09: CALICE data taking continuing. Quadrupole (RQNEL012) fault on 18.05. causing 4 h downtime. XCET044 local electronics fault on 24.05. with 3 h downtime. Next week low momentum configuration for ATLAS Malta. Access needed in mixed area for about 2 h on Wednesday.
T10: no users until 6 June.
T11: next CLOUD run in September.

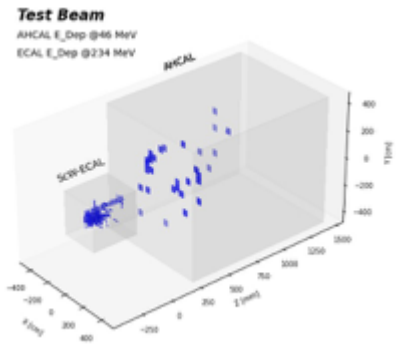
# East Area Users Tour de Table

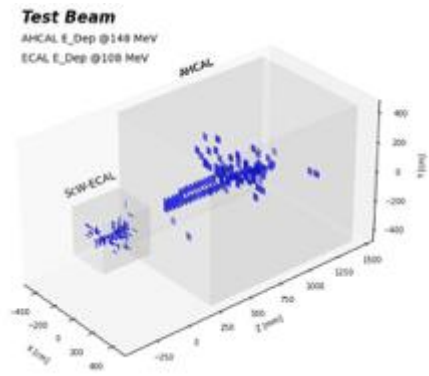
## T8: IRRAD / CHARM (F. Ravotti, S. Fiore)

Another very good week with no issues. During the access on Wednesday we exchanged samples for TE-MSC, EP-ESE and ATLAS (IRRAD), TE-MPE and BE-CEM (CHARM). Stable and intense beam all week long, approaching close the weekly target intensity (see below). Next regular access on Wednesday next week. Possibility for a stop (and acces to CHARM only) on Friday this week (to be confirmed).

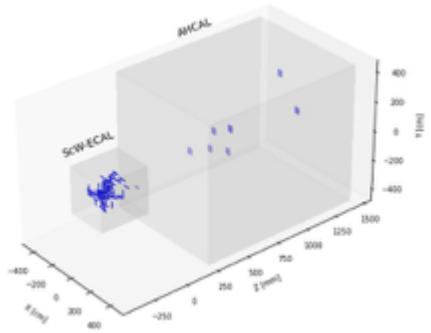


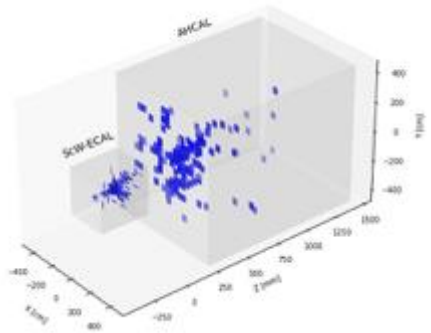
## T9: CALICE ScW + AHCAL (Yong Liu)

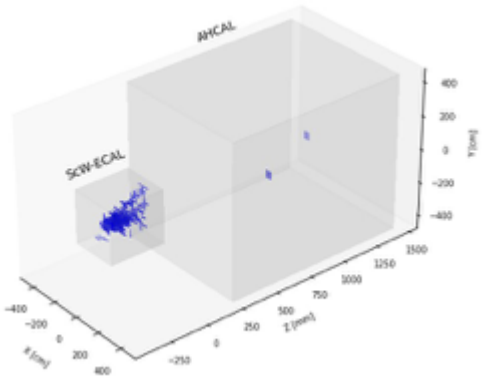
- First week for CALICE ECAL and HCAL prototypes at PS-T09
    - Setup: combined ScW-ECAL+AHCAL prototypes
    - Finished 10 GeV $\mu-$
- beam for MIP calibration
- Finished $\pi-$
- beam for energy scans (1-15 GeV): finished
- 1, 3, 5, 8, 10, 12, 15 GeV
- $e-$
- beam for energy scans in 0.5-5 GeV: finished
    - 0.5, 1, 2, 3, 4, 5 GeV
- In total over 1M events collected
- Event display of low energy hadronic showers
- 5 GeV $\pi-$
- 

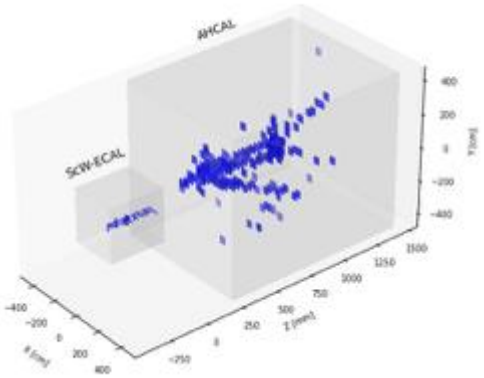
- 

- 10 GeV $\pi-$

- 

- 

- 15 GeV $\pi-$
- 

- 

- Observed better pion purity at PS
- More prominent fraction of electrons in hadron beams at SPS-H2
- Observed electrons in mixed hadron beam

- Used an obstacle in the beam to suppress electron yield (XCON025, 4 mm lead)
- Plans of the second week May 25-31
- Setup: AHCAL prototype alone
    - Plan to move ScW-ECAL out today
- $\pi^-$
- beam for energy scans (1-15 GeV)
- $e^-$
    - beam for energy scans in 0.5-5 GeV
    - Preparations of transportation in early June

## T9 Incoming: ATLAS MALTA (Brian Moser, Simon Koch)

**Context:** We would like to measure the radiation length of a complex, active material stack (in our case, an ATLAS ITkPix quad module) using multiple scattering of low-energy electrons/positrons.

**Telecope details:**

- l = 2m x w = 0.4m x h = 0.5m
- Telescope planes are MALTA monolithic, 300um and 50um silicon.
- DUT is ITkPix quad on linear stage.
- Plus off-telescope readout and services.

**Beam requirements:**

- Electrons/positrons at rate of 10k-50k/spill
- Energy between 100-500MeV to match desired rate
    - plus as high as possible for some alignement runs
- $\Delta p/p \sim 5\%$
- would be desirable
- Prefer to operate with beam pipe in place if possible
- Already had some fruitful discussions with Dipanwita

**Other requirements:**

- 1 DESY table for telescope
- 1 regular table for services
- N2 supply (120l/h) for dry environment
- Spill timing signal
    - We were informed that there is a TTL signal available during the meeting

**Contact Persons**:
*Main contact:* Ignacio Asensi

*Measurement contacts:* Brian Moser, Simon Koch

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# Outgoing: AWAKE (Giovanni Zevi Della Porta)

Third week of proton run: completed physics program. Gained time from NA issues, lost dime due to LHC issues. Details:

- Monday: Plasma length = 6.5 m. Start with Xenon (narrow and wide bunch), then Argon (wide bunch)
- Tuesday: double access to explore 3.5 m and 3.5+6.5m plasma.
- Wednesday (MD): change setup to a single 10-m plasma
- Thursday: dedicated-AWAKE supercycle. Xenon plasma dataset (narrow, wide and asymmetric beam optics)
- Friday: LHC injection issues
- Saturday: Helium plasma scans. wide-bunch proton optics in Helium, then Argon plasma
- Sunday: LHC injection issues. Finished Argon plasma

Issues:

- Tuesday: Access system failure caused patrol loss also in CNGS area

Summary of 3 weeks (see slides):

- Extractions per day (for days with beam): 1000 ± 450
- Hours per day: 10 ± 2 expecting beam, 6 ± 3 receiving beam
- Availability: 57% ± 22%

# HiRadMat (P. Simon)

HRMT62 experiment 90% completed. Thursday access to TNC / TT61 and final 10 shots possibly on Friday, depending on the findings. Excellent beam conditions and flexibility w.r.t. beam intensity.

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# North Area Beam Status

## H2, H4, H6, and H8 Beams (J. Bernhard)

H2: RADICAL installed, smooth beam conditions.
H4: NA64e reported smooth beam conditions.
H6: Some magnet trips but only very short downtimes. Was high intensity week, now back to lower intensity.
H8: CMS MTD reported good data taking. SND installed this week, so far the beam looks good. The issue with QUAD19 (power converter) came up again this morning, and was quickly fixed by the experts.

## Other Beams P42, K12, and M2 (J. Bernhard)

M2: AMBER 190 GeV/c finer alignment done last week and yesterday the same was done for 60 GeV/c. Stable conditions.
P42/K12: Stable beam conditions with slightly lower intensity, as agreed. Request to adjust sharing today by NA62 for checking whether nominal intensity is ok --> 90-100 T2 / 57 T4 / 60 T6, then back to 100 T2 / 48 T4 / 60 T6 in the evening.

# North Area Users Tour de Table

# P42-K12 and M2

## K12: NA62 (Renato Fiorenza)

We removed most of the instabilities of the DAQ; we are still left with some small issue. We requested a test today at full intensity in order to check how the current problems scale with intensity and whether there are any showstoppers for the intensity increase. We will come back to reduced intensity to keep the DAQ stable for now; as soon as our problems are fixed we will request the full intensity that we want to keep during the rest of the year.

## M2: AMBER (Maxim Alexeev)

During the weekend we have finished the commissioning of the spectrometer and started the first data tacking period with 190 GeV beam. The data tacking was smooth, and we greatly appreciated 3 spill extraction periods. Sometimes the beam was delivered closer to 50 units that 60, needed to call. We have a hard time to set the values of the CEDAR diaphragm, seems that the precision of the setting is as low as 0.5mm and same is true to the movement of the CEDAR over CESAR. Presently the 190 GeV point has been completed and we are going to the 60 GeV. In total we are planning the set of 60, 80, 100, 190 and 250 GeV to be completed within 25th of June.

# H2

## H2 Outgoing: ALICE FOCAL (Max Rauch, Tommaso Isidori for ALICE FoCal)

- No beam at Thursday
- Some surprises / lessons learned
    - Data taking machine needed reinstallation since IP address changed
    - Never change ethernet switches!
    - 40 year NIM crates/modules can break down
    - Timeframes of readout units have to be compatible with each other
- Good electron and hadron beams, totally sufficient for our needs. Thanks!
- FoCal-E -> “full chain”: common CRU readout, online-reco, QC
- FoCal-E Pad layers 100% available
- FoCal-E Pixel layers 100% available
- FoCal-H SiPM+readout 100% available
- Monday: FoCal-H only (without FoCal-E in front)
- In FoCal-E pads, a lot of optimization studies were done on the fly, thanks to our good online monitoring
    - timing of the detector
    - adjustment of ADC-TOT connection + trimming/thresholds
- FoCal-E pixel: technical studies done
    - Use only a subset of pixels (grid mask)
    - Use triggering scheme as foreseen for ALICE/LHC data taking at 100 kHz and 50 kHz
- FoCal-H transport back to Meyrin lab just finished

### H2 Main: RADICAL (Randy Ruchti, Carlos Perez Lara)

We are using electron beams in the energy range 25 < E < 125 GeV to measure the energy dependence of the timing resolution and spatial resolution a compact EM calorimetry (RADiCAL) module. We make these measurements at the maximum of the EM shower, where the number of particles in the shower is at its largest and where the transverse spatial size of the shower is characterized by the Radiation Length rather than the Moliere Radius. For our module this is 4.5mm vs 13.7mm.

We are presently operating at the 125 GeV electron energy using DSB1 wavelenth shifter, and will the make measurements over the proposed energy range into the coming weekend. Then we will switch to another, very rad hard wavewshifter LuAG:Ce, and will make the same set o measurements.

For comparison, we will take measurements of the module behaviour and performance with hadron beams of 50 and 100 GeV.

### H2 Incoming: MUonE ECAL (Enrico Conti)

We use electron beam 20-150 GeV range for the calibration of the PWO crystal ECAL. Energy scan (planned): 150-100-50-20-75-125 GeV.
We request that beam moment spread stays within 1.5% in all energy range.
Although beam purity could be an issue, we do not request installation of beam Cherenkov detectors since they are almost ineffective in the energy range where PID is needed.
We sit on the NIKEF table to move the detector w.r.t. the beam. We do not interfere with the following group EP-FTS which stays on the downstream platforms. At the end of our period (on Sat morning) we put down and apart the NIKEF table.
Definitive de-installation is done on next Wed 14 June.

## H4

### H4 Main: NA64e (Vladimir Poliakov)

17 May. All instrumentation was removed from beam line.
The beam parameters were significant improved. The beam halo is 3%, 2 times better, than 2022. Hadrons and muons contamination is 0.3%, also better than 2022. The beam size is around 6mm RMS.
Thanks a lot BE-EA group and vacuum team, Sylvain, Michael and Nicos.
The final beam and trigger tuning, all calibration and alignment runs - done.
Data taking started on Sunday.

## H6

### H6 Outgoing Main: EP PIXEL (Dominik Dannheim)

Very succesful high-rate beam time, despite delayed start because of SPS extraction problem on Wednesday/Thursday.

- Largely improved beam rates, thanks to optimisation of beam line and very good tuning of beam settings by Dipanwita and Laurence. We get up to 2x higher integrated rates in our small-area devices at the beam-line radiation limit, compared to last year. This matches with

about the same increase in the beam-line scintillator rates (close to 1 MHz within the spills), which implies that the beam profile is similarly narrow as last year.
- Access to H6B now a bit more complicated, as we also have to stop beam in H6A for it. Otherwise radiation alarm in H6B triggers from the still too high muon flux behind the beam stopper. Could try to reduce collimators a bit before the access, to avoid this issue.
- Efficient data taking (mostly remote) thanks to excellent collaboration with ALICE and MALTA parallel users in H6A. Typically 1-2 hours of downtime for parallel-user access per day.
- All performed mechanical and monitoring improvements to telescope worked out as planned, leading to improved telescope performance and data-taking efficiency.
- Achieved all measurements for 2 of the 3 planned devices (DPTS 65 nm and FASTPIX 180 nm monolithic small-area sensors). The third device (Timepix3 iLGAD) is now installed and can be partially tested parasitically.

### H6 Outgoing Parallel: ALICE ITS3 (Paolo Martinengo)

Very successful week, thanks to the main user for their patience and flexibility and of course to DIpanwita & C. for the very nice beam.
Set-up still in the area, would like to measure rate with normal beam intensity.
We would also like to install new set-up alresady next Wednesday in preparation for the next high intensity period.

### H6 Main: ATLAS AFP TOF (Please Add Your Name Here)

### H6 Parallel: ATLAS HGTD (Stefano Manzoni)

We started the installation yesterday at 11 AM. The setup is now ready with one LGAD board installed at room temperature. We got the ok from safety this morning and now we are finalizing the trigger setup with TLU box. Just received a batch of sensors that will be installed soon. We expect to be fully operational this afternoon/tomorrow morning.

### H6 Incoming: ATLAS BCM PRIME - Week 22, Main (Please Add Your Name Here)

## H8

### H8 Main: CMS MTD (Giulia Sorrentino)

3rd week of measurements
On Sunday we began tests with TOFHIR2C. Debugging on Monday. Good data taking from Tuesday afternoon.
We are low on personpower, from Saturday night on there may be no one in the control room. We will take a few remote measurements and then start disassembling our setup.

### H8 Incoming: SND@LHC - Week 22 as Main, Currently Parasitic (Christopher Betancourt)

On Monday the passive iron blocks were put in place, and on Wednesday the Scifi target tracker was installed and began taking parasitic data. The muon/HCAL detector planes are finished today and DAQ testing will before installation next Tuesdat (May 30).

# Parasitic Users

Reporting for parasitic users is optional, please add your name below:

### H6 Outgoing: ATLAS MALTA

### H6 Outgoing: ATLAS ITK PIXEL

### H8: SND@LHC (Ettore Zaffaroni, Christopher Betancourt)

Please cf. also above

- Tracker installed on Wednesday, took data Wed evening and during the night
- Data taking will continue today and tomorrow

### H8 DUMP: STRAW TRACKER 3D

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# AOB

*Minutes by the respective speakers, edited by E. B. Holzer and M. Schwinzerl*