

Accelerator Complex Status

End week 35 (Tuesday 5 September 2022)

Technical Infrastructure (Clement Pruneaux):

Statistics:

- About 4'00 alarms.
- 532 phone calls (393 incoming, 139 outgoing).
- 89 ODM created.

Events worth mentioning:

- Wed. 31.08, Loss of SPS beam caused by BA2-TT20 access system problem. Temporary fixed by piquet at 4h44. It seems that one of the relays that sends the tunnel AUG (SPS2) from one of the EIS EUC01/M2 chassis is out of service.
- Sat. 03.09, Loss of beam SPS because of lightning. At 07:22 Main Magnets of SPS in fault. Lightning strike close to CERN. No electrical perturbation recorded on PSEN.

Details: <https://wikis.cern.ch/display/TIOP/2022/09/05/TI+Week+summary%2C+Week+35>

LINAC 4 (Piotr Skowronski)

It was a very good week for LINAC4 with only 45 minutes of downtime for total of 6 faults:

- 5 trips of source's einzel lens power converter, most probably caused by flash overs
- Trip of CCDTL0102 RF line.

PS Booster (Foteini Asvesta):

It has been a very good week for the PSB with an availability of 99.5%, with the only fault being a quick reset of an extraction kicker.

During the week it was decided that the vertical wirescanner in ring 3 will be replaced during the technical stop. We have experienced some issues with this piece of equipment since the beginning of the run and after follow up and studies involving all experts the decision to exchange it was taken. In addition, a faulty Tomoscope card was replaced. It should be noted that this didn't affect the standard measurements as two scopes per ring are available.

Otherwise, usual operations continued with standard follow up of the status of the operational users and cleaning up as needed.

ISOLDE (Alberto Rodriguez):

It has been a good and calm week at ISOLDE. Experiment IS666 (49K beam to VITO) was cancelled. So, the main focus of the week has been the preparation for the third high-energy experiment of the year (30Mg @ 8.5 MeV/u to the ISS).

The investigation on the SRF trips that started the week before continued until Wednesday this week. Daniel Valuch (in SY-EPC, but still responsible for the LLRF of HIE-ISOLDE) worked together with Nicolas Guillotin, Thierry Dupont and the rest of the TE-CRG team to understand and solve the problems with the stability of the SRF cavities. The situation seems to be a lot better now. In addition, a new start-up sequencer was deployed on Friday morning to reduce the time it takes to restart a cavity after it trips.

On the beam side, a new reference setup (22Ne8+ at 8.52 MeV/u) was prepared in preparation for the 30Mg11+ beam delivery to ISS. Also, the GPS separator, REX-TRAP and REX-EBIS have been

prepared using stable 24Mg (target installation on Wednesday, separator setup on Thursday, RILIS laser setup on Friday, REX-TRAP and REX-EBIS setup on Saturday).

Apart from these activities related to the post-accelerator, a MEDICIS target was irradiated on Wednesday and Thursday and ISOLTRAP took stable beam from HRS for several tests throughout the week after the solid state teams stopped their beam time on Tuesday afternoon.

PS (Denis Cotte):

Une autre très bonne semaine pour la machine PS avec une disponibilité faisceau de plus de 96%. Les principales sources d'arrêts des faisceaux venaient :

- du déclenchement d'un disjoncteur sur les cavités 10MHz rétabli par le piquet HL-RF.
- un pulse répéteur défectueux empêchant les cavités 40 MHz de pulser sur les faisceaux LHC, temporairement réparé par l'expert RF.
- un problème de refroidissement sur un quadrupôle de TT2 (F16.QDN180) solutionné par le piquet EPC.

En début de semaine, le PS continuait de fournir les faisceaux de faible intensité pour nTOF (quelques pulses dédiés à 50e10) et pour le run « CERN Shielding Benchmark Facility » (5e9 - 60e10) de la zone EAST_T8 jusqu'à mercredi sans soucis.

À la suite du retour du faisceau EAST_T8 pour IRRAD/CHARM l'intensité lu par le SEC_01 était légèrement plus faible que début Aout. (4.3e11 pour 5e11). Pendant le Week-end, le problème a été identifié comme étant un mauvais « scaling factor » sur l'équipement.

Du côté des ions, à la suite de l'avancement du setting-up de la semaine dernière, les deux variantes EARLY et NOMINAL ont été extraites et envoyées sur la Dump D3. Pour ces deux faisceaux, le fonctionnement du stripper en TT2 a été validé. A noter, une légère amélioration de l'efficacité d'injection au PS avec 90% sur les deux faisceaux.

Côté MD, le PS a fourni différentes intensités du faisceau MTE à la machine SPS(empty bucket channeling) ainsi qu'une version « Barrier Bucket » pour extraction en zone nord.

Des ions de plomb de charge 80+ ont fait quelques tours dans la machine PS après passage du stripper dans ETP. Une mise à jour de POPS (prévue pendant le TS2) est nécessaire pour continuer ce setting-up.

Enfin dimanche, et pour la première fois cette année, des ions ont été envoyés sur la Dump de la zone EST avec une extraction lente.

PS - East Area ():

No report.

AD - ELENA (Sergio Pasinelli):

The week was calm.

Tuesday: Alpha complains about the catching efficiency. Found several quads OFF in the ELENA lines LNI and LNE01. All lines were checked during the day and all devices were ON!

Last check before the night reveals DI. BHZ6025 in fault. Reset + ON solve the fault.

Wednesday: Adjusting C10 cavities C10-25 & C10-25, we managed to increase efficiency (93% to 97%) on the 3.5 GeV/c plateau.

Sunday: DR.BHZ in fault. Called First Line. First Line has changed the power supply DR.BHZZ20-21.

SPS (Arthur Spierer):

Another good week for the SPS with an availability of 90.5 % at the moment of writing.

The week started by reducing the losses on the Fixed Target beam following sparks on ZS3 (Saturday, gap increased) and the failure of two vacuum control boards in BA2 (Sunday). The normal operating conditions were recovered Monday at noon, mostly by re-adjusting the ZS Girder position. The ZS3 gap was progressively reduced to reach its initial value of 20mm on Tuesday.

On **Monday** and **Tuesday**, the short parallel MDs could benefit from a good beam availability (wire-scanner with Carbon Nano Tubes wire, PS2SPS transfer studies, coherent betatron tune shift measurement and new optics for HiRadMat BTV). On **Wednesday**, we had a dedicated MD on the barrier bucket transfer (with successful extraction up to NA62) and in parallel studies on the BCMS beam with 5 batches. The latter caused an injection kicker spark and extraction Kicker vacuum interlocks at the end of the day.

On **Thursday** afternoon the slow extraction method was switched to Empty Bucket Channeling for a few hours on the operational beam with promising results. **Friday** and the **weekend** were quiet with very good availability for the SPS.

SFTPRO: Total intensity of about $4e13$ protons and sharing adjusted as requested by physics along the week. A new ES algorithm (Extremum Seeking) to improve 50 and 100 Hz noise reduction was tested along the week.

AWAKE: beam ($1e11$ or $3e11$ protons) delivered to AWAKE when requested

Main issues/faults of the week:

- RF power intervention of 45 minutes to replace several solid state amplifier modules on cavities 3 and 6. The breakage rate increase seems to come from the SFTPRO cycle. The LLRF settings were modified along the week to reduce the power peaks. This has a slight effect on the spill as notified by COMPASS. Settings are left over the weekend awaiting for stats/feedback.
- The previous week transverse damper trips are attributed to some rare shots with bad injection steering.
- Short mains trip due to intervention in BA2
- Access system issue in BA2 (AUG board) during Tue-Wed night required a piquet intervention. Time lost due to Access piquet only receiving calls from TI.

Some follow up for next week:

- Planned stop on Wednesday morning for LLRF upgrade
- Intervention from SY/EPC/HPC (Olivier Michels and Charles-Mathieu Genton) in the shadow to put a new box to improve the 100 Hz regulation (one hour intervention with mains off) together with SMD5 fixes
- BCMS measurement campaign
- MDs (Short parallel)
 - Test linear wire scanner 516 equipped with CNT wire (Monday morning)
 - PS-SPS transfer studies (Monday afternoon)
 - Q26 Growth rate measurements
 - Instability growth rate at injection (preparation for crab cavity MD)
 - Loss of Landau Damping threshold measurements at 200 GeV.

SPS North Area ():

No report.

AWAKE (Giovanni Zevi Della Porta):

Second week of protons. Hosing studies. Increased plasma density from 1 to $2E14$ per cm^3

- Monday: Electron beam tuning with RF and beamline experts. Hosing studies in the afternoon.
- Tuesday: Setup $3E11p$ bunch with optics for large transverse size, proton/laser delay studies with different plasma densities to study adiabatic focusing and for SMI/eSSM studies.
- Wednesday: Access during Machine Development, mainly dedicated to laser work. Partially recovered from issue which was resulting in occasional missing shots (we will need to replace flash lamps to fully recover). Also observed a significant pre-pulse, potentially affecting SSM, which was partially recovered by alignment but will also need further investigation after the run.

- Thursday: Adiabatic focusing and plasma light measuring with different seeding configurations. At the end of the day began increasing vapor source temperature to reach 2E14/cm³ density.
- Friday: Access in the morning to realign Rb density diagnostics, and for continued investigation of laser prepulse. Afternoon: eSSM and hosing studies with 1E11p at 2E14/cm³ density
- Saturday: Continued working with 2E14/cm³ density but increased proton bunch intensity to 3E11p to study eSSM and hosing.
- Sunday: eSSM and hosing studies at 2E14/cm³ density and 3E11p intensity.

LINAC 3 (Rolf Wegner):

Linac3 delivered quite reliably beam to LEIR with a typical intensity between 30 and 40 uA. However, Detlef has been quite busy in tuning the source for keeping its performance up to this level.

One beam interruption occurred: The tank 1 amplifier tripped in the night from Monday to Tuesday but could be restarted without problems.

Together with LEIR the issue seen last week where the debuncher cavity phase on EARLY affected the following NOMINAL cycles in LEIR was investigated. The effect was this time less clear and more erratic than the week before. The RF acquisitions of the debuncher cavity were checked, they followed the requested ppm commands on both users. The suspicion now is that the issue is caused by a parasitic effect, as for example a degradation of vacuum level by EARLY which then perturbs the following NOMINAL injections in LEIR.

LEIR (Reyes Alemany):

Here the main activities in LEIR during week 35:

- To be highlighted:
 - Improvements on the regulation of the ITE.BHN40 power converter, the trajectory dispersion between the 7 injection of the NOMINAL beam which in some points of the line was up to 6 mm, now is reduced in average to 2 mm.
 - The shielding installed in the ITE line during YETS21-22 proved to reduce the impact of the PS stray fields by a factor 2 (as simulations predicted)
 - Started commissioning the Pb80+ cycle in PS
- Investigating the behavior of the L3 debunching phase, which should be PPM but it is not.
- Investigating the loss of 10% in beam intensity from ETP to PS injection
- Continuation of the debugging of the turn-by-turn LEIR BPM RING functionality
- Very reliable LEIR equipment this week, almost no faults.

CLEAR ():

No report.

LHC (LHC Coordination webpage):

First phase of TS1 has been completed. RF cavities are at room temperature. Pieces to increase distance between safety valve and rupture disc should arrive Monday 05.09. This configuration was tested in the cryo lab with little decrease of temperature of the rupture disc in case of opening of the safety valve. On Monday RB cycles to 11600A. Summary (* = training quench) of all tests since beam stop:

	2021 Training current (A)	Accumulated time in Aug 2022
RB12	11950	11.5 h
RB23	11600	4 s* + 4.5 h*
RB34	11950	not powered - RF
RB45	11950	not powered - RF
RB56	11600	18 A* from target + 8.5 h

RB67	11600	10 A* from target + 9.5 h
RB78	11600	6 min* + 8.5 h
RB81	11600	11 h + 7.5 h