

Accelerator Complex Status

End week 36 (Tuesday 12 September 2022)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- About 5'800 alarms.
- 492 phone calls (308 incoming, 184 outgoing).
- 81 ODM created.

Events worth mentioning:

- Tue. 06.09, Electrical perturbation on the 400kV line ALBERTVILLE - MONTAGNY LES LANCHES 1. A voltage dip of 13.5% for 80ms was recorded at CERN.
- Thu. 08.09, Main Magnets of SPS in fault. Lightning strike close to CERN. No electrical perturbation recorded on PSEN. Seems to be the same as the [event on 03 September](#)
- Mon. 12.09, Low pressure alarm on compressed air in Preessin. The flow increased from 1000m³/h to 1800m³/h. Emergency compressor started manually. Fire alarms set off in Neutrino Platform. Piquet found a ruptured pipe on-site, which was quickly isolated.

Details: <https://wikis.cern.ch/display/TIOP/2022/09/12/TI+Week+summary,+Week+36>

LINAC 4 (Jose Luis Sanchez Alvarez)

It was a very good week for LINAC 4 with an availability of 99.2% .

Fault events:

- The Einzel lens power supply tripped 10 times (downtime: 25min)
- Chopper (3 min)
- DTL1 modulator (8 min)
- CCDTL0304 modulator fell 2 times (30 min)

PS Booster (Jean-Francois Comblin):

The availability of the Booster last week was 96 %.

Monday morning, we had several trips of POPS-B when we put a 160 MeV MD cycle in the supercycle. The specialists believe that the problem is related to the controller responsible for taking care of current unbalance in the output filter legs. They already found a work around that they validated by simulation and will test it during the TS Wednesday.

Saturday afternoon at 15:30, all 3 injection septa were interlocked by WIC. An access in the machine was needed to change an electro-valve. The total downtime was 3h30.

Otherwise, this week has been rather quiet, due to the long weekend of jeune genevois!

ISOLDE (Alberto Rodriguez):

It has been a good week at ISOLDE. We started delivering 30Mg11+ at 8.51 MeV/u to the ISS last Monday evening and we are planning to stop today at 15:00 when high-intensity beams are scheduled to stop because of the TS2.

The machine has behaved very well in general. We had very few trips of the SRF and room temperature cavities. Although, I should say that we are using only 16 of the superconducting cavities since the other four are not needed to reach the requested energy. The main source of downtime has been related to trips of the target and line heating and the laser ionization side.

Overall, users are quite happy since we started delivering beam a day before originally scheduled and the production rates of the target have been a bit higher than expected.

PS (Benoit Salvant):

It has been a good week so far for the PS - with the exception of Wednesday - with 93.8% overall availability until now.

On the hardware side, the main issue of the week was the need to exchange the operational generator of KFA13 by the spare generator on Wednesday. Recurrent trips had started on Tuesday night (3h without MTE beam sent to SPS) and required the intervention of the SY-ABT piquet on Wednesday morning. The diagnostics and exchange took about 7 hours for the SY-ABT specialists to complete but could fortunately be mostly performed in the shadow of the extended RF feedforward commissioning, so that the effective impact to North Area users remained minimal. Following that intervention, a couple of additional issues appeared: the KFA21 did not pulse due to bad transmission of the start timing in a multiplexer, and the KFA13 voltage turned out to be 2 kV higher than before the exchange.

Wednesday night was also a difficult night as one group of 10 MHz cavities went down (C10_86, C10_91 and C10_96) and C10_86 could not restart. The OP crew switched to C10_11 but TT2 trajectories had drifted after the cavity swap. The circuit breaker of C10_86 was repaired by the HL-RF piquet on Wednesday morning and it could be put back into operation instead of C10_11. BHZ377 also could not be restarted on Wednesday night and required the SY_EPC intervention (1h without beam for SPS users).

To be noted that the SY-EPC piquet had to intervene 3 times for water issues on F16 magnets during the week (for BHZ117 and BHZ167, BHZ377 as well as QDN163). This will be followed up with SY-EPC and EN-CV next week.

One concern conveyed by the SPS transverse damper experts is that recurrent missed pulses from TT2 DFAs yield large orbit excursion in TT10 and SPS, which could lead to potential damage to the SPS transverse damper controls. SY-ABT is aware.

Finally, on Monday, the RF and BE-CEM specialists changed the pulse repeater card that was causing issues on LHC beams last week.

On the beams side, the RF and OP teams started to prepare the 8b4e beam this week.

Besides, a new version of the wire scanner application to measure tails using the q-Gaussian fit was released. An MD on Wednesday probed the impact of PS extraction tune on tails of LHC beams, in view of the commissioning tests along the chain on Friday.

Finally, the OP crews performed continuous tuning to reduce losses on MTE, TOF, EAST and AD cycles along the week.

PS - East Area (>):

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AD - ELENA (Laurette Ponce):

The beginning of the week was calm with both machines very stable. More problem during the week-end:

- problem on the water flow of the C10-25 cavity on Saturday, on site intervention of RF specialist to readjust the flux
- problem with the ELENA beam request server of Sunday morning. Reboot of the timing crate cfv-193-ctmlna solved the problem
- lower than usual transmission in FTA, correlated by ABT colleague to higher losses in FTA following a reduction of KFA71 kick strength to reduce extraction losses. Kick pulse re-increased on Sunday and steering of the line to reduce losses in FTA and get back good transmission. later in the afternoon Sunday, unstable injection in AD, with poor performance at 3.5 GeV. Expert checked stochastic cooling which is OK. To be investigated tomorrow morning with PS.

We had a discussion with the horn specialist as a follow-up of the problem of spark observed on 2 capacitors of the horn cubicles. A consolidation of the capacitors is probably needed to allow to reach nominal pulse of the horn. For the time being, recommendation is to stay with the current we are operated since the beginning of the run.

SPS (Carlo Zannini):

Overall a good week for the SPS. Availability at the moment of writing 87.4% with about 20 hours of total downtime of which ~8 hours are related to SPS issues/faults.

On **Monday**, the planned short parallel MDs (impedance reference measurements and wire scanner test of Carbon Nanotube wire material) took place with very good beam availability. On the other hand, the MD on the loss of Landau damping threshold measurements at 200 GeV was significantly perturbing the SFTPRO cycle and was not played on Monday. In order to minimize the perturbation of the MD on the SFTPRO beam a longer super cycle was needed. As a trade-off to perform the MD studies and minimize the impact on physics the MD was played on **Tuesday** for about 60% of the allocated time. The other MDs (impedance reference measurements in the morning and instability growth rates at injection in preparation of the MD dedicated to the crab cavities instability studies in the afternoon) could benefit of a very good availability all along the day. On Tuesday evening, an electrical glitch caused a trip of the mains. When restarting the losses on BLMR.33108.ILS.QD were significantly higher (however not critical) and it was needed to increase the thresholds to avoid SFTPRO beam interruptions.

On **Wednesday**, the planned RF upgrade for the release of the feedforward took place. The intervention started at 8:00 AM and finished at 16:30. Therefore, some time was needed to recover from the RF upgrade (in particular stable phase adjustment: change of -72 degree with respect to the situation before the upgrade). In the shadow of the RF upgrade there was an intervention of the EPC team to improve the 100 Hz regulation and BLM upgrades.

At the user meeting has been proposed to continue with the empty bucket channeling (EBC) test on the operational SFTPRO beam on September 19 warning that would be very difficult to find a different date for the test. Despite the interest of NA62 to have the EBC on the operational SFTPRO other experiments are concerned that this could just cause additional time lost for physics and they ask to have this test during MD time. It was decided to discuss again at the next user meeting when also Barbara will be present.

On **Thursday**, we had standard physics production cycle. It is worth mentioning that interlocking sparks occurred on ZS3 on Thursday and Friday morning with the nominal gap of 20 mm. The issue was mitigated increasing the ZS3 gap by 2 mm.

On **Friday**, Verena had a look at the automatic spill optimization after the 100 Hz regulation intervention that took place on Wednesday. Adequate settings have been found. More gain is needed on 50 Hz. To be continued after the technical stop. On Friday during the day took place the studies on the transverse tails of the LHC type beams. The first results tend to exclude a major effect of batch spacing and seem to indicate that no significant additional tails are generated in the SPS. However, further studies are needed before drawing conclusions. Finally, a short parallel MD to

prepare the measurements of RF multipoles in view of the crab cavity MDs was also performed. All along the **weekend** standard physics production cycle.

SFTPRO:

- Total intensity of about 4.1×10^{13} protons and sharing adjusted as requested by physics along the week (latest sharing 92/69/133 units on T2/T4/T6)

Main SPS issues/faults of the week:

- Damper fault on Tuesday night: driver amplifier had to be replaced. Run with double gain on module V1 while replacement of driver amplifier.
- ZS3 sparks (mitigated changing the gap)
- Frequent cavity trip (mainly cavity 4 and cavity 6). The overdriving thresholds have been reduced to minimize the risk of damage. Cavity 6 tripped more with the reduced overdrive thresholds. A trade-off has been found by the RF experts to minimize the risk of damage and beam interruptions. Cavity 4 trips significantly reduced after changing the voltage limit from 1.7 to 1.65 on Sunday late morning
- Frequent ADT H-damper trip (could cause additional hardware damage). The issue seems to be related to bad injections from the PS caused by kicker faults (to be followed-up: PS and ABT teams are aware). Gerd on Friday investigated on the operational SFTPRO the possibility of running with one module V1 and double loop gain.

Some follow up for next week:

- Technical stop (TS): cool down from 8:30 on Monday to 8:00 on Tuesday and TS until 14:00 on Wednesday.
- Recover from TS from 14:00 to 18:00 on Wednesday
- COLDEX run from 18:00 on Wednesday to 18:00 on Thursday (5 times 48 bunches at injection from 1.2×10^{11} ppb to 2.4×10^{11} ppb in steps of 0.2×10^{11} ppb or 0.4×10^{11} ppb)
 - Crab cavity in beam parasitically during COLDEX (voltage off, local orbit bump around cavity). COLDEX has priority in case of issue stop bumps and move the cavity out
- MD crab cavity during cool down on Monday
 - high intensity and long flat top at 450 GeV (9-12)
 - Emittance growth with crab at 270 GeV (12-20)
 - Meas. of crab RF multipoles (20PM-1AM)
 - Emittance growth suppression with impedance (1AM-4AM)
- Automatic spill optimization after the improvement of the 100 Hz regulation from the EPC team
- Frequent ADT H-damper trip
- Frequent RF cavity trip
- Discuss test of EBC at the next user meeting.

SPS North Area ():

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AWAKE (Edda Gschwendtner):

This week was quiet, with only laser and BI works.

Start of access after proton run:

- Laser: device safety interlock commissioning
- Instrumentation: transitioned from PXI to BI system for laser-room cameras. Continued commissioning of BI system for streak-room cameras: studying cropping to solve bandwidth issues.

- Transport of FASERnu elements to TAG41 for temporary protection from cosmic rays
- Plan for Week 37: Electrical tests (no access) on Monday PM. Transport of new FASERnu elements on Wednesday.

LINAC 3 (Richard Scrivens):

The source was in general stable with intensity, but suffered more from single shots of low intensity. Tuning could reduce the rate of these to about once every 10 minutes, but could not avoid them completely while keeping high intensity.

The stripper foil broke on Wednesday. The momentum spread from the Linac had been increasing since the previous week, and this was probably the reason. With a new foil LEIR could quickly recover high intensity.

Otherwise the only downtime was a source trip (solenoid power supply) on Wednesday evening.

LEIR (Reyes Alemany):

Here the main activities in LEIR during week 36:

- The steady loss of injection efficiency was finally identified: the Linac 3 stripper foil was degrading rather fast, until it broke Sep 6th. Richard changed the foil (127 microgram) and we could come back easily to the great performance of extracting 10e10 charges (LIU is 9e10 charges)
- Wednesday 7th: joint Linac 3 – LEIR MD for a 97 microgram stripper foil characterization.
- Strong coupling in the transfer lines due to a dipole rotation being analysed. A campaign of re-alignment will be needed during YETS22-23, at least for the rotated dipoles.
- First tests with GEOFF (Generic Optimization Framework) with multi-parameter scan: ramping and debunching cavities phase, e-cooler gun voltage and H/V e-cooler bumps.
- Friday: Multi-turn acquisition tests (BPM readout alignment, kick strength, etc.) .

CLEAR ():

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LHC (Jörg Wenninger & LHC Coordination webpage):

RF cavity HW interventions on the pressure release system completed Tuesday evening.

Cryo purges and pressure tests on Wednesday and Friday morning, begin of RF cooldown (both sides) on Friday. Saturday RF cavities cold (cryo start OK).