

Accelerator Complex Status

End week 37 (Tuesday 19 September 2022)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- About 4'800 alarms.
- 879 phone calls (633 incoming, 246 outgoing).
- 113 ODM created.

Events worth mentioning:

- Mon 12.09:
 - SVC filter in LHC 8 switched ON, caused trip of CRYO in LHC 8. The SVC has been repaired and should now be more stable, and therefore cause less trips of CRYO when turning it on. However the real cause of the CRYO trips lies within the sensibility of the CRYO installation. Actions from CRYO are being taken already and a solution to help making the installation more resistant will be put in place, most likely during the YETS.
 - Fire alarm and trip of POPS, POPS was restarted by EPC piquet, nothing found on-site.

Details: <https://wikis.cern.ch/display/TIOP/2022/09/19/TI+Week+summary%2C+Week+37>

LINAC 4 (Piotr Skowronski)

It was a difficult week in LINAC4, mainly because of hydrogen valve in the source and CCDTL3 klystron, with weekly availability of 82%.

The valve was exchanged preventively during technical stop and only after 3 hours of operation the shot-to-shot intensity stability started degrading. It reached 3% rms and 10% peak to peak, what was beyond acceptable value. On Thursday afternoon the valve was exchanged again, what solved the issue. LINAC4 restarted operation with beam on Friday morning, after 17h hours of downtime, however, with intensity of 20 mA instead of the nominal 35 mA. Over the weekend the intensity was slowly increasing and now it reached 33 mA (re-conditioning)

On Sunday at 22h50 CCDTL3 klystron tripped. The piquet exchanged power supply for solenoid of the klystron, however, it did not help. He tried to contact the klystron expert and his section leader, without success. The expert intervened at 7h30, and quickly managed fixing the issue by adjusting the setting of the problematic circuit. Downtime duration was 9 hours and 9 minutes.

On Thursday PIMS1112 klystron tripped because of a vacuum system issue requiring specialist intervention (33 min downtime). The same klystron tripped on Sunday, 2nd reset was successful (20 min. downtime).

PS Booster (Simon Albright):

It has been a somewhat fractured week for the PSB. I will not report the availability, as the fault tracking requires correcting.

For the PSB, ITS 2 went well. There were many interventions, which included a successful exchange of the R3V LIU Wirescanner, replacement of 13 amplifiers for the Finemet cavities and an intervention on the WIC. Recovery of beam from the ITS went well, with beams back in the PSB at about 1430. Despite the Linac4 source stability problems, operational beams could be provided and there was a gradual recovery of performance. The beam for the LHC VdM scan was also prepared before the source intervention.

After the ITS, there were a several trips of POPS-B. Some of these were attributed to a problem with the WIC that appeared after the intervention. In the shadow of the source valve replacement, there was an intervention to solve the problem with the WIC. Additionally, further tests on POPS-B have been performed and have improved understanding of some ongoing problems that cause trips during operation and when using the 160 MeV cycle.

Recovery from the source intervention went well, with beam back shortly before 1100. Since then, the PSB has had only a few minor events such as interlock and WD resets and performance has gradually been recovered as the Linac4 source has conditioned. However, there has been no beam since late on Sunday due to the CCDTL3 fault in Linac4.

ISOLDE (Miguel Luis Lozano Benito):

It has been a busy week at Isolde.

On HRS we have been delivering Sn beams to ISOLTRAP. This experiment was going for very exotic isotopes and the expected low production rate made things quite complicated.

On the HIE-ISOLDE side we sent stable for Miniball for calibration purposes and in preparation for the next run. They have been taking beam since Friday afternoon with no mayor issues.

XT03 is also preparing for their upcoming run.

The main downtime this week is coming from LINAC4 and PS BOOSTER as you probably already know.

In house we had some problems with the HRS HT power supply losing its timing on Saturday night , some problems when cycling the HRS90 and HRS60 separator magnets but apart from that it was an OK week.

PS (Alexander Lasheen):

The PS operation this week was contrasted between a smooth early week, and a very difficult restart after the technical stop. The present week availability is around 77% with the downtime equally shared between PS faults and the L4 source intervention. **An access for a repair (or replacement) of the C10-51 cavity amplifier is planned tomorrow morning, Monday at 08:00-09:30 (30min RP cooldown + 30-60min intervention depending on the necessity to replace the amplifier).**

The recovery after the technical stop was marked with a series of unrelated events/faults which slowed down the beam recovery. Overall, it took about 2 OP shifts (afternoon, night) in the PS with major efforts from operators, experts and piquet interventions to come back to stable conditions on most beams (except COLDEX). This was immediately followed by the TT2 vacuum fault and the L4 source intervention. The PS operation could resume well during the weekend for all OP beams, following the conditioning and intensity increase of the L4 source.

Here were the main events in the PS after the technical stop:

- An immediate failure of the cavity C10-66 requiring an access to replace the full amplifier. The decision was to intervene immediately after first beams to allow for a prompt access and profit from reduced cooldown time, in accordance with RP. The intervention was unfortunately unsuccessful as the spare amplifier, which was tested and validated in the lab, broke during installation on the cavity (immediate fuse breakage of ventilation unit). The cavity required a second intervention which successfully took place during the L4 source stop. Another cavity C10-51 also faced an issue on Friday evening and is scheduled to be fixed on Monday morning from 08:00
- The ejection bump for all beams were not triggering and TT2 not pulsing following the installation of new timings for tests of dual ejection for the "M-TOF" beam. This was traced to a misconfiguration of the clocks for the new timings and were rapidly fixed on all beam except TOF, which required further in-depth investigation by the expert. The timing were finally reconfigured allowing to resume operation for TOF on the Wednesday late evening. Further investigations are necessary in the lab to understand the root cause of the issue.
- The trajectories in TT2 required some adjustments on all beams and re-steering on EAST destinations.
- The transition crossing on TOF/EAST beams required the intervention of the LLRF piquet over Wed/Thu night.
- The PS-SPS synchronization was found to be jittery and led to important losses at PS-SPS transfer (different injection phase for each batch), impacting the beam delivery for the COLDEX run. Investigations were started on Thursday morning and were interrupted by a fault of a vacuum valve in TT2, which could not be controlled remotely and required an access to be replaced. The search for the jitter was continued on Friday morning and traced back to a bad contact in the PS coarse synchronization module, leading to noise and oscillations in the beam loops. To be noted that the issue was already seen before the technical stop and investigated on and was expected to be fixed, before reappearing during beam recovery. A dedicated observation was put in place to faster identify a new occurrence of this issue, and the installation of new dedicated samplers for LLRF signals is being proposed.

The difficult week was nonetheless marked by good progress on beam preparation for the LHC return:

- The 8b4e beam which was prepared in the PS previously could be sent to the SPS for a hybrid BCMS+8b4e fill after the PS synchronization was fixed.
- The LHCINDIV beam for Van der Meer scans in the LHC was tested in the PS, and could be delivered to the SPS. Although within specs with a 3um emittance in H and V, the beam intensity nonetheless requires adjustments as it changed following the L4 source conditioning.
- An tool for automated splittings adjustment was provided as beta for the operators and deployed through the Tomoscope application and can be tested until the end of the run.

PS - East Area ():

No report.

AD - ELENA (Lajos Bojtar):

Quite a bad week for AD/ELENA this time.

- During the TS we has intervention on stochastic cooling, Quad trim power supply and a BTV in the FTA line.
- Wednesday after the TS had a very difficult and long restart. The quad trim power supply didn't start up, specialist was working on it until late evening. A card in the DI.QDE6010 power supply

had to be replaced, this happened also at the late evening and since it is a safety element, a DSO test was also needed after. Then the beam was injected but lost after the 2 GeV/c flattop, because the stochastic cooling frequency was wrong. The specialist fixed it around 2 am during the night.

- Thursday after all this trouble we had excellent beam with 92% deceleration efficiency. The stochastic cooling intervention had benefits and the emittance is now half of the value before. Also the intervention on the quad trim did something positive, because the losses on 100 MeV/c disappeared.
- Friday the trouble started again, first in ELENA with various control issues.
- Saturday the ELENA ejection line quads went off, but a simple reset was enough. It took a bit longer than necessary to find because of a misleading Oasis issue.
- Sunday the AD stopped cycling many times due to a known central timing issue. Restart of the front-end solved the problem for a while, but it happened again many times after. The specialist is investigating the issue, but it is not yet understood.
- Sunday afternoon the ELENA e-cooler filament went down. Only about 50% intensity is ejected for 8 hours, the time it takes to re-heat the filament.

SPS (Francesco Velotti):

Incredibly busy week in the SPS with the activities per and post-TS. We concluded the week with about 78% availability, and the main source of stops was due to the injectors.

Before the TS:

- Issue in accelerating more than 1 LHC batch - still unsure if this was due to the RF upgrade of the previous week or the delay jitter in PS cavities (now solved)
- Very frequent RF trips interrupted the COAST MDs multiple times
- Horizontal ADT experienced frequent trips on the SFTPRO -it may be due to DFAs trip with no warning. Also found incredibly high gain on damper. Still under investigation

During the TS:

- Issue on BA3 token panel caused the lost of patrol 4 times in 1.5 days - fix finally put in place but not tested
- Hot-spot found on top of the beginning of the MBB.11330
- Y coaxial lines of C3, 4, 6 dismantled and sign of arcing found, mainly on C4 (very frequent trips before the TS). Cleaned and polished in the workshop and re-installed. Arc detector interlock put in place to protect Thales modules. Not clear if this was related to the trip frequency of these cavities
- Water leak found in TT20 and TT60. The one in TT20 was completely fixed and the one in TT60 limited to a very low flux. It will be fully repaired during the YETS

After the TS:

- Issue to injected beam due initially to the MDSH. It was pulsing even with all interlocks OK. Finally had to re-drive to HW all settings - we had no information about any FGC upgrades
- No current in the last 2 MKP switches caused the impossibility to inject. Not straightforward to debug as no signs of problems in MKP. A timing was changed during the TS and caused this.
- All other injector issues made, together with our faults, the COLDEX run very difficult and not efficient. At 15:30 of Thursday decided that there was no point to try to continue to take beam in those conditions. LINAC4 interventions started.

Beam back on Friday morning:

- All issues in the injectors were finally solved
- Beam could be injected after re-adjusting a bit of settings between PS and SPS
- RF team could test the systems after the upgrades and SFTPRO was accelerated right away
- 5 injection of BCMS beam taken (very low intensity due to LINAC4 issue) with basically no issues

- 1 8b4e and 3 BCMS batches injected on LHC1 cycle - after a bit of adjustment needed of the filling scheme, the beam could be accelerated to flat top with no problems
- Friday evening it was noticed that the first BLM on MST in LSS2 was not giving any readings. Ewald and Stephane accessed the machine and replaced the faulty BLM with one nearby collecting just below 60 uSv (Ewald got about 50 uSv as he changed the BLM on the MST)
- Calibration of the BSI readings on T10 (in P42) carried out Friday evening using an activation foil installed during the TS and then removed once the target number of protons were collected. Results to come
- Aperture measurements to assess the aperture reduction at the hot-spot located during TS done. The cycle needed a significant set up - attempted again over the weekend by the shift crew. Verena checked the data and still not good enough. OP to follow up. Running stably since then and at nominal intensity since Saturday evening, except for the last LINAC4 which is still ongoing.

SPS North Area ():

No report.

AWAKE ():

No report.

LINAC 3 ():

No report.

LEIR (Reyes Alamany):

We did not have any beam, or useful beam since Monday 12th at 16:00, when we switched off LEIR for TS. After the TS, the source became stable enough such we could use the beam on Friday at around 10:00. But unfortunately, soon after tank2/3 went in fault due to an issue with the OCEM (initially). Many different things were tried by EPC and none solved the problem. Today Monday they continue investigating and just 3' ago Rolf called me to say they have found the issue. Let's hope tomorrow we can resume operation.

CLEAR (R. Corsini, P. Korysko and W. Farabolini):

ast week, initially foreseen for MD, was dedicated to complete and achieve four experiments still pending which all had an urgent deadline: 1) Achieving the last week irradiation and beam response test of a detector for the LUXE experiment (INFN meeting next week). 2) Irradiating of gafchromic films under various beam condition for the dosimetry studies of our PhD students (FRPT 2022 conference). 3) One more irradiation on Zebra Fish eggs under UHDR and CONV beam condition to investigate the flash effect with VHEE (collaboration with CHUV, hot issue for the project). 4) Completing the irradiation with neutrons for counting latch-up events on electronics, with the CERN R2E group (end of their student period at CERN). All activities were successfully carried out. In addition, a large part of the CLEAR operation team attended on Thursday the CHUV ISREC meeting dedicated to "Clinical Translation of Flash Therapy". Therefore the same day normal operation was stopped, and laserists were able to investigate and solve a recent stability issue, while the RF support group achieved the full conditioning of the MKS15 klystron recently replaced.

LHC (LHC Coordination webpage):

RF conditioning started Monday afternoon, completed Sunday evening.

TS1 stop from Monday morning to Friday late afternoon.

Beam re-commissioning foreseen for Tuesday 20.09.