Accelerator Complex Status

End week 33 (Tuesday 22 August 2022)

Technical Infrastructure (Jesper Nielsen):

Events worth mentioning:

- ***Tue 16/08/22 07:29***: Trip of SEQ8 SVC filter. The filter tripped and caused big instabilities on the electrical network. The restart of the filter was organized, following the procedure, unfortunately the CRYO tripped when switching it back on. 2 days later the filter tripped again, this time the protection relay of the filter was adjusted to accept 5% differential in voltage instead of the initial 3%. When the filter was switched back on this time, it was decided (based on historical data) to try and switch it on without changing anything on the electrical network (normally the voltage is manually lowered from 18kV to 17,4kV, this time it was left on 18kV), but the CRYO unfortunately tripped again.
- ***Tue 16/08/22 14:47***: During works for removing concrete blocks, a digger touched the water supply pipes for the globe, causing a big water leak. All the water supply for globe and idea square was closed until SIG could intervene to repair the pipes.
- ***Thu 18/08/22 00:53***: Battery leak on UPS in EBS11/27. The UPS automatically switched of the batteries, thanks to the BCB braker that was recently installed in the UPS's following the many problems seen recently with leaking batteries. This probably saved the UPS. The leaking battery was replaced in the morning.

LINAC 4 (Federico Roncarolo)

It was a quiet week for LINAC4, with almost 99% availability.

The downtime was dominated by a ~1.5h stop on Fri evening due to a variation of source einzelens voltage triggering two SIS interlocks, which took time to reset.
To reduce the downtime in the future, we'll debrief on if the reset could have done faster.

PS Booster (Foteini Asvesta):

It has been a good week in the PSB with an availability of approximately 96%.
Our longest fault occurred on Monday and was related to R1 RF. It required expert intervention as a carrier board had to be exchanged. The performance of the PSB was degraded, as R1 was missing, for ~2h30min.
On Wednesday early morning a fault on the BTY. QFO119 perturbed the operations to ISOLDE for 1h as the First Line had to come on site.
Otherwise, only minor faults resettable from the CCC disturbed the usual operations.
Finally, in R4 S13 the C3 has been switched off and the RF is currently running with 11 cells as an access is required for repairs. So far this has not perturbed operations.

During the week it was observed that the H- signal on the H0H- monitor had increased substantially since the beginning of the run, pointing to drifting of the injected beam. New injection steering of several operational users, like MTE, EAST and AD, brought the signals down to the usual values.
In addition, the signals for the H0H- monitor have been connected to the ADC (completely transparent for operations). Once the monitoring is set in place they should help with the follow up of any future interlocks.
Finally, a new LHCINDIV user has been prepared for the LHC BSRT tests with emittances varying from 1 to 5 um in both planes.

ISOLDE (Miguel Lozano):

It has been a very quiet week at Isolde.
On GPS we finished with the 1.7 GeV MD at least for the moment. It went pretty smooth. We installed a new target on Friday.
On the HRS side we set up stable beam to IDS and since Thursday they have been taking radioactive Cu isotopes.

The GPS separator magnet magnetic field probe was connected back to the normal power distribution network.
The oscillations observed after connecting this device to the interrupted network disappeared as soon as we went back to the normal network.

Other than that not much to report from the operations point of view.

PS (Alex Huschauer):

The past week has been an excellent one for PS operations with an availability of almost 95% up to now. The main downtime came from an access on Wednesday morning, which became necessary to replace the amplifier of the C10-96. The cavity became faulty during a test to push the SFTPRO intensity beyond 2.5E13 p and investigations are ongoing to better understand the limitations. In the shadow of the intervention, the KFA71 front end was rebooted, which resolved a communication error that had previously led to radiation alarms due to missing pulses. Since then this problem hasn't reappeared.

During MD studies with the BGIs it was realised that also the second gas injection valve is faulty. Unfortunately, there's only a single spare available and discussions are ongoing to decide on the one to be replaced. Additional spares have already been ordered, but will only arrive after the TS2.

On Thursday morning the BI experts re-calibrated the F16.BCT212, which is a special device as it has a PS and SPS acquisition channel so that it can be used on the SPS SFTPRO Larger. The agreement between PS and SPS readings has significantly improved and is now better than 10E10 p.

Thanks to the very few problems during the previous week, we could spend quite some time on the preparation of different beams:

- A 36b BCMS beam has been prepared for the LHC. The OP team can easily switch between the 48b and 36b configurations by loading an LSA tag and removing/adding R1 in the PSB. This beam has been taken by the LHC for the first time Sunday evening for fill 8149.
- An LHCINDIV beam with a wide range of transverse emittances, i.e. 1-5um, has been prepared by the PSB and the PS for BSRT calibration in the LHC.
- Thanks to the quick progress of Linac3/LEIR, ions were already back in the PS last Wednesday, 10 days ahead of schedule. Both EARLY and NOMINAL beams were brought to the flat top, but not yet properly extracted as the 80 MHz cavity still needs to be tuned for ions.
- Coming Wednesday a dedicated CERN Shielding Benchmark Facility (CSBF) run will start. Therefore, EAST beams with a wide range of intensities (5E9 - 6E11 p) have been prepared throughout the week.

PS - East Area ():

No report.

AD - ELENA (Lars Joergensen):

It has been another good week at the Antimatter Factory with only a few minor issues.

We had a number of trips of the power converter for the AD Horn - Typically 3-5 per day. This issue was eventually solved by the experts.

We also had a few problems with a sparky Hminus source at ELENA. The discharge would cause a vacuum spike that would close the safety valves. The valves can only be re-opened by the Vac piquet.

Thursday evening Gbar reported the beam had moved 1 mm horizontally and 2 mm vertically. It was eventually found to be caused by an incomplete roll-back after the MD on Wednesday. The four corrector magnets around the electron cooler retained an residual 0.4 A.

SPS (Verena Kain):

Week 33 was a quiet and relatively good week for the SPS. One major fault that took a long time to resolve, caused the availability to be however only 82 %, below the canonical value of 85 %. This fault was a break down (burning through of several components) of one amplifier of cavity 1 (Siemens) and caused about 6 h downtime on Tuesday evening and another 6 h downtime for the repair during dedicated MD time on Wednesday. During the night from Tuesday to Wednesday, the intensity of SFTPRO had therefore to be reduced to 3.5e+13 instead of the current required intensity of 4e+13 at flattop and the LHC could only be filled with 4 instead of 5 BCMS batches at ~ 1.15e+11 ppb.

Despite the rather limited time with beam after the amplifier repair, the MD teams exploited the remaining time as efficiently as possible - 4 MDs in parallel, 2 per beam type. Promising tests of automatic function optimisers for longitudinal blow-up on the high intensity BCMS beam (1.7e+11 ppb, 1 batch) as well as transmission around transition for the fixed target cycle were carried out. “Loss free" transport to T4 with a new optics was set up as input for the ECN3 task force. The beam could be successfully steered, unfortunately not all measurements could be done then to qualify the beam in P42 etc. The last MD concerned cross-checking the longitudinal impedance model with the high intensity BCMS beam through the ramp. Here only the first step could be carried out. Because of the time lost it was proposed to ask for dedicated MD time in week 34.
MTE with barrier bucket in the PS was tested as well on Monday during parallel MD. No issue to accelerate it. The cycle with only part of the acceleration and shorter flattop was however missing several settings and caused significant impact on the beam availability to NA while setting it up. Transition crossing is not fully optimised yet, but should be good enough for the next test planned on Tuesday. It could also be used as another test for the automatic transmission optimiser. To be discussed...

Phase stability investigation of the ~ 10 Hz component in the slow extracted spill started as input to new EPC algorithms. Unfortunately the perturbation around this frequency is very broadband. The study will be continued in week 34.
To help the 100 Hz correction at the presence of big phase jumps, the optimisation algorithm is now set to global optimum search, which means it takes longer to converge, but should find the optimum unless cut by exceeding the maximum allowed iterations. By end of next week we should see whether statistically this improves the situation. Overall for this run until now the 100 Hz spill component is only sufficiently well corrected for 83.7 % of the time. The goal was at least 85 %.

Empty bucket channeling is in preparation to help there. For Monday's coordination meeting, a plan together with physics coordination will be prepared to see when and how to test/deploy it on the operational beam.

With the higher intensity on fixed target, the damper as well as cavity 6 are frequently tripping.

The scraping on the LHC beam could be reduced again to around 6 % after the energy matching and steering in the transfer lines with still the majority of the scraping needed in the horizontal plane. Not clear whether the "tail less" BCMS version from the PSB made any difference.
The 36 bunch version of BCMS was quickly checked. On the SPS side only the injection buckets had to be adjusted. The LHC fill Sunday evening used 36 bunch batches.

It was planned to test dedicated filling with the operational BCMS filling. Due to the low availability of the LHC during day time this week, this test had to be postponed to week 34.

Upcoming:
- AWAKE will start its next run on Monday
- Dedicated MD on Wednesday: SFTPRO2 with 5e+11: splitting efficiency and loss free transport to T4/T10; potentially also LIU BCMS
- Dedicated filling test for LHC filling
- Test transmission optimisation during barrier bucket MD on Tuesday?

SPS North Area ():
No report.

AWAKE ():
No report.

LINAC 3 ():
No report.

LEIR (Nicolo Biancacci):
Main activities:
- Tue 16/8: setup of L3MONIT cycle for Linac3 energy monitoring in LEIR (Schottky)
- Wed 17/8: EARLY to PS.
- Thu 18/8: Tests on multi-turn acquisition system.
- Fri 19/8: NOMINAL to PS.
- Weekend: -
- Mon 22/08: Tests on multi-turn acquisition system, LEIR in BPT.

Highlights:
- Beam from Linac3 very stable.
- Extracted LEIR intensity stable at spec (9e10 charges)
- Machine mostly untouched → probing long term drifts (>3d).

Main issues:
- Frequent trips of CRF41 on HV control. Being followed up by SY/RF.
- Electron cooler PC replacement failed → kept operational spare in place.

Next:
- Cont. on multi-turn system debugging.
- Stray field measurement in TL.
- Cont. on TL optics measurements.
- Setup MD cycles

CLEAR (R. Corsini and V. Flognfeldt Rieker):

Last week CLEAR restarted after a two-week maintenance shut-down. The week was dedicated to testing of optical fibers with and without scintillators, intended for FLASH dosimetry, in collaboration with the University of Bern. Apart from a slight problem with a solenoid power converter and some laser issues, the machine started nicely after the shutdown, and we could deliver beam to the users from Tuesday through Friday. A few longer accesses required for initial setup, alignment, testing and film installation, while mostly short accesses for swapping of fibers.

LHC (Jörg Wenninger & LHC Coordination webpage):

The week started with a fill ended by another heater discharge in IT R1. The problem was finally traced to a water flow issue in the RQX.R1 converter.
On Tuesday the compensator of P8 tripped leading to issues with pulsing TI8. During the restart of the compensator the cold compressor of point 8 tripped. The re-connection only worked at the second attempt, leading to a long cryo recovery (total off time ~18 hours due to the compensators).
The fill that followed was dumped after 10 hours during the Wednesday afternoon thunderstorm when the QPS heaters fired on many Q9 and Q10 circuits as those are very sensitive due to long cables. The bad series then continued: a late evening inspection of a UPS in UA23 revealed a leak of acid that could only repaired the next morning. Machine off for the night of Tuesday to Wednesday.
Om Wednesday morning intervention on the compensator of point 8, and again cryo cold compressor lost during switch on. Fortunately the re-connection was efficient, and beam could be injected in the evening.
The weekend was quite efficient despite dumps by a **UFO in 12R1** , by a BBLR and by the QPS. On Sunday evening a first fill with 36 bunches.
A very strange UFO between Q4.L1 and TCT.L1 dumped fill 8142: the UFO time scale was ~2 ms, it was therefore missed by the UFO buster (too slow event).
UFO dump count: 23 , UFO quench count : 1