

Accelerator Complex Status

End week 43 (Monday 1 November 2021)

Technical Infrastructure (Jesper Nielsen):

Statistics:

- About 4'700 alarms.
- 680 phone calls (460 incoming, 220 outgoing).
- 119 ODM created.

Events worth mentioning:

- Tue. 26.10:
 - Trip of 18kV transformer, EMT303/7R, in LHC7, triggered by a faulty temperature measurement in the transformer. The transformer was switched back on by the piquet, further investigations will be done during the YETS then the transformer can again be cut.
 - Patrol lost in BA80, due to access card problem
- Wed. 27.10:
 - Patrol lost in BA80, due to access card problem
 - Repeated alarms received on sump pump FTDP-00511 BA3. Access given to verify if there is a leak in BA3. Piquet found 1 of the sump pump discharge pipes leaking back into sump. Faulty pump isolated - running on 1 pump until access to repair pipe. Trend for repeating high level alarm.
 - E-logbook (accelerators) down. IT was contacted by TI (A. Wagner), but the server not with them. Called best-effort BE-CSS, server not with them as well. Whole application under the responsibility of its developers within BE-OP.
- Sun. 31.10, Change of time to wintertime: E-logbook stopped working / alarm on SUSI DAQ/EHN1 zora access jec comms problem during time change. The JEC problem was fixed by restarting the service in TIM.

Details: <https://wikis.cern.ch/display/TIOP/2021/11/01/TI+week+summary,+Week+43>

LINAC 4 (Giulia Bellodi)

It was a fairly smooth week for Linac4 with a beam availability of 98.8% so far.

There were only a couple of short RF and watchdog trips during the week.

Then on Sunday morning RAMSES became unavailable with a Rad Mon communication error, losing all monitoring of the CPS machines.

The shift leader cut all beams waiting for the piquet RP to intervene (40' downtime).

Later on Sunday there was a recurrence of the FGC_BUSY_WITH_LOGS error while restarting PIMS5-6 cavities from a trip and it took about 45' to restart.

PS Booster (Chiara Bracco):

Very good and quiet week for the PSB until Saturday when the problem with the extraction kicker, that I mentioned in my previous email, appeared and operation had to continue in degraded mode. Beside that, there were only a couple of erratics of the ring BLM FEC which triggered the PSB4 BIC (BLM FIC Ring1&2 and BLM FIC Ring 3&4). A software watchdog on all BLM FEC sends an interlock if the system is offline for 6 sec. The root cause of the problem is not understood and BLM experts are monitoring. It might be required to replace the CPU of this FEC but, since the interlock can be cleared out and operation continue, the intervention will be done during the YETS.

Beam for HiRadMat was prepared, optimised and characterised also in the PS. The target emittance of 2.3 μm in both planes is now achieved and we wait for the last measurements in the SPS.

ISOLDE (Miguel Lozano):

It has been a good week at ISOLDE.

We started the week setting up for the 61Zn at 7.5 MeV/u to ISS from GPS.

We were ready one day ahead the schedule but unfortunately we had some issues with one of the EBIS timing frontends developing a memory leak.

Once the problem was gone users took beam and they have been running since then.

On Saturday Booster lost one of the rings so the proton beam intensity has been slightly below 2 μA since then.

Users reported today that the target production is lower than when we started so some investigations about it are ongoing.

On the HRS side we irradiated a MEDICIS target and an ISOLDE target for the winter physics.

PS (Frank Tecker):

The PS had an average week with an availability of about 88%. Luckily most of the faults did not impact the SPS and the LHC beam tests, where the availability was 97%. The operators also managed to reduce the impact of some faults by differently setting up the beam.

Major issues (>1h):

- On Tuesday, PI.KFA45 had module 3 in fault. The kick for the TOF beam could not be provided (larger than for other users), and EAST_T8 was degraded. The operators took up injection steering from the PSB and managed to set up TOF injection with smaller kick!!! The kicker was repaired the next morning. This resulted in only 3 1/2 h downtime for TOF despite the kicker being down for 14h.

- C10-96 needed expert intervention during the week-end and caused 9 1/2 h of degraded beam for the AD with 3 out of 4 bunches.
- The unavailability of beam from PSB ring 2 due to an extraction kicker problem on Sunday causes degraded beams and 5h of unavailability of TOF beam. We managed to set up the TOF beam coming from PSB R3, so TOF operation could be resumed.
- F63.BHZ04 caused 3h20 of downtime for EAST_N
- EAST beams could not be provided on the week-end during 2h10, as the T9 area was not safe.
- a communication problem with the REMUS radiation monitors caused 1h07 downtime for all users.
- the patrol of IRRAD needed to be redone on Wednesday
- the logbook server was down for one night, so no entries could be created. Restarted in the morning by Rodolphe.

The temperature in the central building reached the 1st interlock level of 26 degrees. CV intervened and will watch closely if an intervention is needed.

For the TOF beam, it could be identified that a 10MHz cavity trip produces a smaller horizontal beam size at the target.

The SIS interlock was adjusted to cut the beam in this case but the interlock is not working due to an issue in the FESA class of the SEM grid.

Wire scanner WS65H is stuck, luckily not in the beam area. An attempt to move it confirms a mechanical problem.

A changing beam position for EAST_N could be identified: when EAST_N was played directly after EAST_T8, the beam is to the very right on TMMTV0009. The reason was that T8.BHZ03 was wrongly pulsing on EAST_N when after EAST_T8 due to REF.ECONOMY.MODE not being enabled.

The beam for HiRadMat was set up based on the beam from the PSB with emittances of 2 mm mrad. After initially giving too large emittances at extraction, it could be set up with 2.3 mm mrad in H and 2 mm mrad in V.

The ILHC75#3b ion beam was accelerated to the flat-top.

Setting up of a beam decelerated to 1 GeV for aperture measurements was started.

An MD for the B-train showed that following the same LHCIndiv user the MRP at the injection plateau was different by +/-1.5mm depending on the position in the supercycle.

PS - East Area ():

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AD - ELENA (Lajos Bojtár):

Relatively good week so far, two interventions during the weekend.

- The horn failed Sunday morning, the specialist came and resolved the issue.
- Long intervention Sunday evening by myself. There was several problem at the same time misleading me for a few hours. Base and Alpha complained having bad beam. Found that the ELENA orbit changes a lot from shot to shot. Suspected some ring power supplies having bad regulation. Tried to check that, but all OASIS signal for those PCs were flat. Called R. Murillo to check the ring power supplies with the PowerSpy EPC tool. He could not confirm nor exclude neither the possibility that a ring power supply having trouble with the regulation, but confirmed the OASIS problem and will follow up tomorrow. Late found some elements in the ejection line off. This made me understand that the orbit system gave false data, looking like real. After resetting the ejection line elements the beam was back.

During MD:

- Attempts to improve the AD to ELENA injection line matching, without success due to non-working tools.
- Attempt to find a better working points in ELENA. The current one seems to be the best so far.
- BTF measurements in the H and longitudinal plane for 3.57 GeV/c stochastic cooling.

SPS (Francesco Velotti):

The SPS week was characterised by the last LHC beam test week and the 2nd week of ion commissioning. The overall availability was rather good and hitting the 2018 numbers once again for the 3rd week in a row.

Starting with the main events:

- LHC beam test
 - The LHC managed to perform all the foreseen commissioning steps, going to a ramp to 3.5 TeV, declare stable beams including frictions, and also finding a new ULO
 - PILOT beam was mainly delivered for the different tests and, towards the end of the week for the extensive investigation of the aperture restriction
 - Interference of the last 3 correctors of TI8 was seen on the LHC orbit - the reason was because these 3 correctors were before used in DC and now, with the FGC upgrade, were cycled as all the other converters. Once the economy mode for all of them was turned off the LHC orbit feedback could cope with their stray field and the issue was

solved. We now have to ensure that this correctors are always operated not in economy mode. EPC to follow this up.

- Scraping of INDIV and PILOT was tested but it seems that the parking position is too close to the circulating SFTPRO - the TIDP was at rather large settings, so, to protect the scraper in parking it was moved in towards 2018 values.
- Ions commissioning
 - This week started with the long LHCION2 cycle in the SC to continue from where it was left off
 - Exploiting a stop of about 3h, a first FW upgrade was deployed to allow the progress in commissioning
 - By the of the week, 3 total stops for upgrades of the LLRF and its controls were given
 - All this resulted in successful completion of slip-stacking of 8 bunches and their acceleration to flat top with slightly more than 50% transmission
 - Here a short video showing the fast BCT traces along the ion cycle with slip-stacking on: <https://be-op-logbook.web.cern.ch/elogbookserver/GET/showEventInLogbook/3399016>
- SFTPRO
 - The NA physics week was rather calm and suffered by not too long stops
 - The collimator XCSV.022.213 in BA81 suffered by severe mechanical problems making impossible to open from remote. After accessing, the collimator was blocked open and operation could be resumed.
 - During the whole week, the wobbling magnets power supplies showed readings jittering by a few As - first line checked them a few times but the tolerance seems to be too tight - it needs follow up.
 - The spike at the start of the spill came back and we need to re-adjust the tune at the start of the extraction - a more robust fix needs to put in place as the tune functions is adjusted at every SC change and hence the chance of producing a faster extraction at the beginning is rather large
 - Due to an issue on the PSB ring 2 extraction kicker, the intensity delivered on the targets was reduced.
- Generic issues and other activities
 - BA80 patrol was lost 3 times this week adding up to about 4h downtime
 - A pump in BA3 was found to be faulty and now all the load is on the spare one
 - Work on TT10 issue seen as dispersion mismatch and incorrect KR proceeded. Discussing with magnets experts, 3 quadrupoles in the suspected region were replaced during LS2 - measurements will be organised before the YETS to assess the situation
 - Longitudinal blow up studies continued in the shadow of the LHC beams
 - Parallel MDs also populated the SC
- Follow up and next week
 - Next week HiRadMat will take place with the last 2021 experiment
 - Dedicated scrubbing should start on Monday as soon as the PSB ring 2 will be back in operation and cover about 10h (or at least until the MKDV will allow the injection and storage of 1.2×10^{11} ppb)
 - In the shadow of this, the NA organised to access at 8:00 on Monday
 - Large emittance version of the standard HiRadMat beam will used
 - Access in BA3 needed (about 1h total) for HOM measurements with beam
 - Bends wobbling issue to be checked
 - OP crew to change QF for QS to test LEM for a day or so
 - EPC to do an FGC realise to fix the issue of the link between dipoles and quads in case of trips.

SPS North Area ():

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AWAKE (Giovanni Zevi Della Porta):

Access after proton run

- Rubidium vapor source: Shutdown after proton run
- RP Survey after proton run: Access System issue prevented RP veto removal, so RP survey used emergency handle (patrol loss). Access problem solved later that day. Patrol will be re-done when we need it.
- Cabling for vacuum window: several days activity. SPS/AWAKE vacuum window will become a vacuum valve. New window to be installed upstream (towards SPS), to reduce proton-induced noise on AWAKE diagnostics
- PXI software upgrade test. Avoids buffering 10Hz images, and only sends trigger to a camera if it has received the previous image.

Plan for Week 44: cabling for BPM tests foreseen in Nov13 proton run. Other small interventions.

LINAC 3 (Detlef Kuchler):

- This was an excellent week. Stable beam.
- Only two small issues
 - Wednesday morning the source microwave generator tripped. As this was with a similar fault as the in week before we are chasing this up with the manufacturer to better understand the issue.
 - On Friday afternoon the RFQ tripped, but could be reset without problem.
- The routinely energy measurements were done.

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LEIR ():

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CLEAR (Roberto Corsini):

Last week was dedicated to the preparation of dosimetry experiments, both for CHUV (a full test should take place this week) and in collaboration with the CERN R2E Monitoring and Calculation Working Group on the use of RPL pellets for high dose rate dosimetry. Some beam optimization was performed, allowing also to continue the training for the new PhD students. On Thursday, a visit of some of the CERN resident artists took place as well. On Friday the installation of the C-Robot system and the water phantom in the in-air test stand of CLEAR for the CHUV dosimetry experiment was completed.

Full reports can be found as usual here: <https://indico.cern.ch/category/10682/>.

LHC (Jörg Wenninger & LHC Coordination webpage):

The first nominal bunches were injected Monday without any issues (injection tunes, Q' of 10). The ADT was setup for one new low noise BPM at Q8 the same day. On Tuesday, after orbit cleaning (K-modulation offsets), 3 bunches per beam were brought into collision with collision tunes, Q' of 10 and ADT on. Lifetimes started around 4 hours, improving with time. In all IPs the beams collided immediately and the rates could be quickly optimized.

The collimators were aligned around the orbit and loss maps were performed, indicating a suspicious loss point in [B1V](#) at location 21L3. Wednesday 27.10 saw the first fill of stable beams with 3 bunches/beam. The filling scheme was subsequently changed to 4 bunches/beam to avoid parasitic collisions in ATLAS/CMS due to the absence of the crossing scheme with bunch intensities of 7-8E10 to remain within 3E11 total intensity. The longitudinal position of the collision point was adjusted by

shifting beam 2 by 1 bucket (plus some fine adjustments). During the 5 nights with stable beams ALICE regularly switched polarity. Emittance and ATLAS non-linearity scans were performed during those stable beam fills.

The global apertures are good, and the IT1, IT2 and IT5 local apertures are as expected. Local aperture scans in 21L3 (beam 1) revealed however the presence of a thin object at the bottom of the vacuum chamber roughly 7 sigma below the nominal beam line. With a bump of +5mm in X and +2.5mm in Y the available aperture is increased to 11 sigma in vertical.

With the gain in time from the early start, a ramp to 3.5 [TeV](#) could be tested. The first attempt was smooth but dumped by a FMCM trigger on RD1.LR1 which is related to a strange voltage regulation noise of the PC, observed on the RD1 and RD34 circuits. On Saturday the first post-LS2 ramp to 3.5 [TeV](#) was performed, with all feedbacks maintaining orbit and tunes well under control.