

Accelerator Complex Status

End week 44 (Monday 7 November 2016)

TI (Jesper Nielsen)

I was a busy week.

Some of the main events:

Wednesday 02/11: EDF 400kV intervention. The intervention was quicker than foreseen and CERN was repowered at 13:30.

Thursday 03/11: Power cut of the pulsed loop for the SPS. The fault was quickly isolated to a cable between the BE and the BA2. The SPS was repowered on "antenna" with the 18kV loop open and EDF will come in to do measurements on the cable.

Friday 04/11: Evacuation alarm in ATLAS: During a maintenance on the fire detection, a technician from ATLAS tested a sensor that was not inhibited.

Sunday 06/11:

- SR8 400V tripped LHCb dipole, compensators and MSI B2 tripped. The breaker tripped on over current.
- Electrical perturbation, confirmed by EDF, tripped all accelerators.

The complete report can be found at:

<https://wikis.cern.ch/display/TIOP/2016/11/07/TI+summary+Week+44,+2016>

LINAC2 (Francesco Di Lorenzo):

The RF group has checked on Tuesday the problem about the problem of the RFQ.

During the power cut on Wednesday they have changed the ignitron of the RFQ and tank1, after this reparation we didn't get any problem about the RFQ and tank1

- During the power cut we inverted the pipes inside the source of the cooling system
- After the power cut, at 15.00 o'clock I asked to control room to start the linac2 and 3. They confirmed that we could start both machines. At 16.00 o'clock beam has started to run, but we saw that the intensity of the beam was a bit low.
- During the night there was an instability of the beam and this problem has been solved on the Tuesday morning, to increase the cathode current from 48 A to 50A, after that the we didn't get any problems, in fact the intensity is completely stable and it has started to increase in these days
- On Friday we stopped both machine around the 11 o'clock because there was a problem of the cooling pump system after 30 minutes the problem has been solved and at 11.30 the restarted both the machine Linac2 and 3.
- Until now everything works fine

LINAC3 (Francesco Di Lorenzo):

On Tuesday night the RF group has stopped the RF to avoid a suddenly power cut

- On Wednesday we refill the ovens inside the linac 3 source.

- We re-start the RF on Wednesday in the afternoon around 15.30 o'clock and the Lianc3 has been in setting –up until Tuesday morning.
- On Friday we stopped both machine around the 11 o'clock because there was a problem of the cooling pump system. after 30 minutes the problem has been solved and at 11.30 the restarted both the machine Linac2 and 3.
- After the re-start we got a problem about the buncher that has been solved in 30 minutes
- No problem until Sunday night when, around the 22.00 the rf generator inside the source has got a fault that has been solved in 1 hour.
- Until now everything works fine

LEIR (Django Manglunki):

On Monday 31/10 one of the SEMgrids in the injection line, ETL.MSF10, showed a problem due to lack of compressed air. As it is located in the switchyard, the intervention had to wait for a PS stop.

On Tuesday 1/11, the NOMINAL beam was delivered to the PS and the SPS during the day, then LEIR was turned off at 20:00 in anticipation of the power reduction needed for the EDF/RTE intervention at 6:00 the next day.

On Wednesday 2/11, in the shadow of the electrical intervention, the LINAC3 source was refilled, the compressed air restored on ETL.MSF10, and LEIR was accessed for inspection of the Btrain measurement coils. The machine was restarted in the afternoon after TI gave the OK. It took ABT and EPC interventions to restart the extraction septum SMH40 and one magnet in the ejection line EE.BHN1020

The LINAC3 beam was available on Thursday 3/11 at 8:00. It took a while to get it accelerated and extracted due to controls problems on several power supplies (ITE.BHN10, ER.QDN1030). Also for some reason the electron cooler functions were found disabled on the EARLY beam.

On Friday morning, the LINAC3 team took the beam for a dedicated MD. In the shadow, an intervention took place on the LINAC/LEIR water station. The machine was turned off before the water was stopped, but restarting it needed the intervention of the EPC standby and the BI specialists, as collateral trips of the HV supply RF cavities and the cooling pump for the ecooler had resulted from the water intervention. The transverse damper had tripped too but could be reset remotely. The beam was ready at 15:00. In the afternoon the software and hardware of the extraction pickups was rolled back as the new version still did not work after the 3rd attempt. The next attempt will be performed around Easter. At the end of the day, Alexander Huschauer fine-tuned the NOMINAL beam, reaching over $8.3e8$ ions/bunch at extraction. This beam was left running over the week-end to monitor the evolution of the performance.

On Sunday, the EARLY (single bunch) beam started to be delivered to the LHC for setting up the p-Pb run. At 21:00 an electrical perturbation (glitch on 400kV) tripped the RF cavity ER.CRF41 which could be reset from the CCC.

PSB (Jose-Luis Sanchez Alvarez):

This week, we had a major issue: Wednesday, EDF did an intervention on the 400KV network. Downtime was 11h.

We also had couple of technical issues:

- Since the beginning of the week, we observed some drift on the external synchro frequency. We suspected a malfunction of the Highland generator. Eventually, Alan found the external 10Mhz clock has drifted by $\sim 1.2\text{kHz}$. The fact we use the same 10MHz source for LL clock, it can probably explain why we also had occasional problems synchronising with the PS several times in the past.
- We experienced issues with the SIS. Specialist had to restart the server. It caused a downtime of 50 min for Isolde.
- Again, we observed a slow drift of the current of the septum BT4.SMV10.
- The last trouble, extraction kickers tripped with LV-Interlock. Some humidity was found on the leak detector by the specialist downtime 1h03.

ISOLDE (Alberto Rodriguez):

Below the main points of the week at ISOLDE:

- Very good week from the operations point of view for ISOLDE. All the parts of the facility were stable and there were no major problems to report.
- On Tuesday, we finished delivering beam (9Li at 6.8 MeV/u) to the Scattering Chamber experiment located at the end of the second HIE-ISOLDE HEBT.
- That same day, we started preparing for the next experiment (66Ni at 4.5 MeV/u to the end of the first HEBT line). We finished with the linac shortly after the EDF intervention on the electrical grid on Wednesday afternoon. The low energy part of the machine was prepared on Thursday and Friday morning. We were ready to deliver beam to the Miniball users on Friday afternoon (half a day ahead of schedule). However, due to some problems in the experimental station, users couldn't take the beam until later on Friday evening. We profited from a delay to do precision measurements of the beam energy and the time structure of the beam on slow-extraction mode.
- In addition to HIE-ISOLDE, we irradiated a target installed in the HRS (for a radiation test for the European Spallation Source) on Wednesday and Thursday.

PS (Frank Tecker):

The PS had a very good week despite the EDF power cut, with an average beam availability of 91%.

The PS recovered quickly after the power cut, and an MD for an improved regulation of a power converter for the PFW could be performed during recovery.

The only problems besides the about 11 hours of beam stop due to the power cut came from

- Kicker KFA21 losing 2 hours of MTE beam,
- the PSB extraction kickers causing 1 hour of downtime,
- 35 min from a water pump in the LINACs/LEIR water station,
- $\frac{1}{2}$ hour for an RF check at the LINAC2 source,

- and the PS septum PE.SMH57 blocked EAST beams extraction for 20 min.

The low intensity beam with 18 bunches of 2.1×10^{10} protons per bunch and 100ns spacing with triple splitting at 1.4 GeV has been delivered.

The requested integrated intensity of 1.9×10^{19} protons for nToF was achieved on Sunday.

AD (Lajos Bojtár):

Very good week for the AD. There were only a minor problem with the access system for ATRAP, this was resolved in 30 minutes.

SPS (Hannes Bartosik):

The week started smoothly with North Area physics and AWAKE commissioning. On Monday afternoon the fixed target beam was interrupted shortly by the DSO test of the primary ion interlock. Unfortunately, the DSO test could not be completed due to complementary protection mechanisms already in place. It is rescheduled for November 14.

The 10 hours dedicated MD on Tuesday was devoted to emittance growth and transmission studies with the long LHC ion cycle. Thanks to the efforts of colleagues from BI, the Beam Gas Ionisation monitor could be tested. Clear signals could be observed in the vertical plane. BI is investigating how to improve the signal amplitude in the horizontal plane.

In parallel to the EDF intervention on Wednesday, it was planned to exchange the QF120 quadrupole since EPC had localised the earth fault responsible for the QF glitches close to this magnet. However, it was finally not necessary to exchange the magnet, as during inspections of the busbar a damaged insulation and strong signs of sparking between the busbar and the busbar cover were found. The problem was solved by enlarging the hole in the busbar cover leaving more space for the busbar and replacing the insulation. After this intervention, no more glitches of the QF circuit could be observed so far. A big thanks to all people involved in this long search for localising this earth fault and also resolving it successfully! The remaining issue for the fixed target experiments is now a strong 25Hz component in the spill, which seems to be even stronger after the intervention and is clearly measurable on the current of the QF circuit. Changing to the QS spare power converter did not improve the situation. EPC is investigating.

On Thursday a fault on an 18kV cable between BE and BA2 caused about 1 hour downtime for the North Area. Operation could be resumed after a reconfiguration of the network by EL. In the afternoon the LHC ion pilot beam was extracted to the TEDs and the 100 ns proton beam was re-checked in preparation for the LHC p-Pb run.

Friday was devoted to the 24 hour MD for COLDEX. The restart for physics on Saturday morning was rocky: Unusual losses in LSS6 were encountered with the fixed target beam just before transition crossing. After a few hours of investigations it was figured out that the problem was related to the main

quadrupole power converter configuration. In the night before COLDEX the SPS was running with QS-QD for investigations on the 25 Hz ripple, which requires a different setting on the tunes in H and V. On Friday morning, before starting with COLDEX, the mains configuration had been changed back to QF-QD and the corresponding tune functions on the SFTPRO cycle were re-loaded, but not tested with beam. The problem was resolved by switching back to the QS-QD configuration and the corresponding tune trims.

The electrical glitch on the 400 kV network on Sunday evening tripped two cavities. The beam was back after around 1h. Otherwise the LHC pilot proton and ion beams were delivered to the LHC for p-Pb commissioning.

LHC (From the 8:30 meeting):

Following the efficient intervention on the 400 kV transformer last Wednesday the cryo situation was not as bad as initially anticipated. This meant that ELQA only had to be done on 3 sectors, which was completed by Friday evening.

At the end of the afternoon of Saturday, the technical stop ended. A reasonably successful, but also difficult weekend followed.

The first pre-cycle took place around Saturday midnight following some delay due to interventions on a faulty power converter.

The injection of beam was delayed due to electrical problems in point 8.

The first beam with p-p was injected around 04:00 and the first ramp started around 05:30. Around 07:15 the beams were in collision and by 09:00 all experiments provided luminosity. This was followed by cogging tests Sunday afternoon with 25 bunches per beam. Some trips of power converters led to an intervention by the EPC piquet, causing some further delay.

The perturbation on the 400 kV line Sunday evening did not affect the LHC, but the LINAC3 and SPS.

Sunday night loss maps at injection were made and Monday morning loss maps at the flat top were ongoing after which the cogging effort will continue. Then, after finding collisions with p-Pb, the TCT alignments will be done.

Next:

- Collisions and TCT alignment with collisions.
- Loss maps with collisions and flat top together with an asynchronous dump test
- MKI2 setup and ADT setup

Stable beams should be possible by tomorrow provided all goes well.