

# Accelerator Complex Status

## End week 22 (Tuesday 4 June 2018)

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### TI (Jesper Nielsen)

During Wednesday and Thursday a total of 3 electrical glitches were observed, impacting more or less the operation of the machines.

On Thursday a 03:52 during an access in LHC, an alarm was received on a sump pump in UW25. A local power cut was the most probable reason.

Details: <https://wikis.cern.ch/display/TIOP/2018/06/04/TI+Summary+Week+22>

### LINAC2 (Jean-Baptiste Lallement):

Linac2 had a rather good week. On Thursday, operation was shortly perturbed by a glitch on the electrical network and an issue with subscription in the SIS. The Linac was down for 50 minutes in total but most of them in the shadow of other PSB downtimes... On Saturday morning, a MEBT buncher cavity tripped and had to be restarted (5 mins downtime).

### LINAC3 (Jean-Baptiste Lallement):

Linac3 was pretty stable this week. Following a request of the LEIR team, the stripper foil was exchanged on Thursday morning, leading to a loss in intensity in the order of 20 % at the end of the linac.

### LEIR ():

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### PSB (Bettina Mikulec):

Excellent week for the PSB with 99% availability.

The weekly run was interrupted three times by resets after electrical glitches.

In addition a few trips of the R2 and R4 CO<sub>2</sub> cavities occurred due to temperatures slightly above the threshold, which is being followed up.

The RF team connected a second power amplifier for the Transverse Feedback System in the horizontal plane to all rings, which caused small issues for R2, traced back to glitches in 2 radial pickups and solved thereafter. This upgrade will be useful in particular for optics MDs.

Phase noise blow-up and White Rabbit B-train reliability runs are ongoing.

### PS (Heiko Damerou):

An average week for the PS with beam availability of almost 94%.

The only longer downtime (6h50) was caused by an issue with the converter of the PR.WFW pole face winding during the night from Tuesday to Wednesday. As switching to the spare converter by the power piquet did not resolve the problem, an intervention by the expert was required. A broken auxiliary power supply for a local distribution of Bdot stopped

the compensation of the main magnet current for the pole face winding power converter regulation.

Additional downtime was caused by three restarts of POPS (0h40), at least one of them due to wrong programming, and a bad contact on the 40 MHz RF system in SS77 (0h45).

A variant of MTE beam with  $h=1$  synchronization in the PSB prior to extraction to the PS has been tested. This scheme allows to unambiguously track the bunch numbering at the PSB-PS transfer and avoid the need to switch the harmonic of distributed RF signals for the transfer.

The LHC-type beam with 100 ns bunch spacing has been revived in the PS. The magnetic cycle is different with respect to other LHC-type beams as the triple-splitting takes place at flat-bottom.

### **ISOLDE (Miguel Lozano):**

It has been a very quiet and nice week at Isolde.

CRIS took potassium beams from HRS during all week and yesterday afternoon IDS started taking Indium from GPS.

No mayor issues to report. Smooth operation and happy users.

### **AD (Bruno Dupuy):**

- Wednesday : No beam from 8H00 to 18H00 due to dedicated CPS MD. At 20H00 the AD extracted beam start decreasing. At 0H00 I was in ACR to apply a new horizontal orbit correction. Again the DR.HHV2904 has a new value on 100 MeV/c FT4B flattop. The E-Cooler energy must be adjusted after this correction.
- Thursday : We apply on FT4A the correction previously sending this night on FT4B. For several weeks now, we have been confronted with a variation of the horizontal orbit at 100 MeV/c more rarely in the vertical. Corrections always rotate around the same element. DR.GSDHZ2904. we regularly correct this horizontal bump around the electron-cooler. Added to this, the variations of position in both planes on the extraction line. From 14H30 to 15H30 A. Sinturel fixes a water leak on Scholastic cooling cryo-pump previously detected.
- Friday : The ring power-supply DR.BHZTR48.49 was down. FirstLine fixed this. The beam was stopped 30 minutes.
- Saturday : Many complaints about position fluctuation of 3 mm on the horizontal plane. CPS crew try to reduce this fluctuation without success (From 23:00 to 0:00). I was called at 0:00 for local investigation. A new AEGIS steering was recorded. Horizontal orbit variation and electron-cooler energy were also adjusted. But it was impossible to remove these fluctuations completely in both plans. Later in the night, the cavity C02 was not resettable by the CPS crew, so the specialist A Jbar solved remotely the problem. (Beam interruption 15 minutes).
- Sunday : The ring power.supply DR.QUAD was restarted by CCC crew.

Conclusion:

Intensity extracted is upper than the nominal values (3.3E7 antiproton). The bunch length at extraction is now at 177 ns.

But we have lots of instabilities sources. Optics on 100 MeV/c, and on the extractions lines.

It becomes very difficult to provide a stable beam for the experimental areas.

The orbit jumps and instabilities at extraction are now daily.

### **ELENA (Tommy Erkiesson):**

A brief report with the main points from last week:

- Pbar commissioning on Monday, Wednesday and Friday morning shifts.
- Re-steering Pbars through AD to ELENA and correction of coherent injection oscillations to obtain similar efficiencies as previous week.
- Quite some time spent on tune measurements/corrections throughout the cycle to reduce losses, tunes have now been measured further along the cycle.
- Enlarged range for tune corrections via high-level parameters has been implemented and tested.
- Beam profile measurements indicate vary large transverse emittances already at injection plateau, this is not understood.
- Suspect erratic optics settings in AD-to-ELENA transfer line, initial tests with reversed polarities in two quadrupoles (wrong polarities mistakenly entered earlier?) did not improve the situation.
- Electron cooler heat run tests performed on all low-voltage circuits including the cathode filament. To be completed with also the HV/electron beam switched on.
- First electron beams generated in the e-cooler at very low energy levels, beam can be steered on to the collector and outgassing reduced.
- First tests with e-cooler solenoids on seem to indicate that the polarities are correct and that the orbit distortion (of Pbars at injection energy) can be corrected with the compensation solenoids. This is also the case with the “Kyoto style” correctors switched on.
- H- source started up at 85keV after replacement of the insulation transformer with the unit used last year.
- H- injected at 85keV, RF adjustments and tune measurements.
- Tune excitation kicker tank will be X-rayed to investigate suspect mechanical problems with the electrodes inside.
- Further tests of transfer line SEM:s but no beam profile seen yet, data can be acquired from the system but several issues remain with the detector & electronics.

### **SPS (Kevin Li)**

This was a difficult week for the SPS. We had planned good beams for LHC, lots of stable spills for the NA, successful MDs and completing the full HiRadMat FlexMat program within the allowed limits. It did not all exactly turn out this way.

On Monday we had a first bigger issue with the BQM right after noon which finally required an access around 15:00 to check the attenuator controller. In the shadow of

this, an update on the BLM software was made as well as the deployment of the new RBAC rules for the BA2 FGCs.

After coming back from the access, the SIS was interlocking on the BLMs (BA3 dump inhibit). After some failed attempts to work around the problem, it was finally decided to roll back to the previous software version and to fix the issue later during the week. The fix was finally deployed on Friday including integration into the SIS. Tuesday night there has been no beam from the PS and Wednesday we had the dedicated MD for the crab cavities. After coming back from the MD the power converter MBE2103 would not restart. After longer investigation it turned out that the power converter transformer has taken serious damage. Since there is now spare and the damage can not be repaired the extraction line will need to be reconfigured. The completion of these works is foreseen by Friday next week. The DSO test will need to be redone after the reconfiguration. During all of this time there is no beam for the NA.

This blow for the NA, however, turned into an advantage for HiRadMat and the FlexMat program which required shots of high intensity 288 bunches which would have been incompatible to run in parallel with NA physics with the degraded Zs. Thursday evening the HiRadMat team moved in and, in an intense and nearly uninterrupted measurement session, we managed to successfully complete the full FlexMat program within three days, moving into the weekend, but all in the shadow of the NA downtime.

MDs were performed throughout the week, most notably the crab cavity MDs which continued with their program testing higher intensity beams as well as taking a beam through the ramp. Thursday we continued taking high intensity beams on LHC50NS. A strong blow up was observed in both planes and it became clear, that the machine very likely needs some scrubbing to be able to accommodate the high intensity beams. This was planned for the weekend and could finally be started on Sunday early morning.

Beams to the LHC were successfully delivered. On Thursday after midnight we had another bad injection which quenched the LHC magnets. We have now carefully raised the chromaticity along the ramp and at flat top by a considerable amount while at the same time keeping an eye on the emittances before extraction to the LHC. We have also asked for regular monitoring of any coherent activity at every LHC fill (AutoQ). Studies of the BCMS beam stability are planned for next week checking also the set up of the transverse damper. Moreover, we will investigate the possibility of protection measures to prevent extraction of such unstable beams in the future. This will be challenging, as our current knowledge and observations indicate that the instability is extremely fast while the detection and reaction time remains finite.

At least from the Sunday LHC logbook entry we can read: "We had to wait 20 minutes for the cryo to be ready but we had an injection process without a single missed SPS cycle". Let's hope for the best.

## LHC (Jorg wenninger & David Nisbet)

Standard operation continued over the week, but the overall efficiency was not good due to a large and diverse number of issues. The weekend was again impacted by a 20 hour cryo stop in point 6 and a quench on the inner triplet right of point 1. A third 16L2 storm on Thursday was again overcome by inserting a 987b fill that provoked some non-lethal 16L2 activity until the situation calmed down after around 1 hour at flat top.

Vdm cycle commissioning performed on Tuesday: 2 nominal bunches to collisions, TCT alignment (injection, flat top, collisions).

The 90m cycle was also commissioned with probe bunches, the beat-beat at 90m of around 20% was corrected to 5%.