

Accelerator complex status

End week 45 (Sunday 9th November 2014)

TI (Jesper Nielsen)

Weekly summary: <https://wikis/display/TIOP/2014/11/04/TI+summary+week+45%2C+2014>

The SF6 cooling towers were stopped for planned yearly maintenance, and the special backup towers for CRYO were put in service.

Linacs (Detlef Kuchler)

The linacs had a very good week.

- On Linac2 there were only some resets to be done.
- On Linac3 we did the maintenance of the source on Monday and Tuesday. And we could give back the beam to LEIR one day ahead of the schedule.

ISOLDE (Erwin Siesling)

All in all a good week for ISOLDE with as usual a rather dense schedule.

GPS:

Running with a TiC target (#527) which was put on the front-end successfully last Monday. Stable beam tuning to LA1 finished on Tuesday-evening with a good transmission of 92%. Mass-scan and proton scan done by Wednesday-afternoon followed by TISD (Target and Ion Source Development) tests & yield measurements. Physics at LA1 line (37K half-life measurements) started Thursday-afternoon and continued successfully over the weekend. Users seem very happy and obtained good statistics.

Technical points/Issues:

- Filters for the GPS20 Turbo Pumps were removed on Tuesday (Giovanna Vandoni TE-VSC) - according to plan.
- The Turbo Pump TP22 in sector GPS20 had a faulty controller on Tuesday - fixed (Jose Ferreira TE-VSC)
- During proton scan there were control problems for the PSB BTY elements. Subscription to the INCA server seemed to fail - solved (Eleftherios & CO).
- Extraction high voltage tripped 3-4 times - 'normal' and a reset did the job (except on Thursday when for an unknown reason the HT went in interlock to ground and manual re-arming/restart was necessary).
- Slow scanner application - was solved by a reboot of the workstation..

HRS:

Target change to the UC target (#521) was moved due to technical problems with the target production from Tuesday to Thursday.

Few issues during target-change and setting up but stable beam tuning through the HRS separator and RFQ cooler was achieved according to schedule on Friday. Very good transmission (close to 100%) through the separator and cooler now that the problem with the 'forgotten' Multi-Poles has been eliminated.

Technical points/Issues:

- Fan for the Turbo Pumps at the HRS10 sector (Front-End) failed. We can run without it but the fan needs changing during the shutdown.
- The controller of the membrane gauge VGM1 for the HRS10 sector has problems. We managed to get it working for the target change but it needs replacing. Vacuum team will take action (Jose Ferreira TE-VSC)
- Shutter as well as clamps signals were not showing the 'open' positions - after re-calibration OK. (Christophe Mitifiot EN-STI-ECE)
- HRS RILIS laser window was found to have a 'coating' on it and has been replaced Thursday-afternoon. (The intervention takes now 15 minutes instead of 1/2hr and is much simpler with the window holder being outside the magnet (intervention/replacement window done by myself)).
- Target cooling water flow for HRS was somewhat low and tripped the target heating during setting-up. Slight increase in flow was done to keep things well within the margin.

For this week:

Protons to GPS for yield measurements in the morning in parallel with protons to HRS for Medicis air-activation tests (protons on HRS convertor with Medicis target behind).
Afternoon setting-up HRS stable beam to the tapestation (CAO line) to prepare for proton scan.
Evening/over night HRS stable beam tuning (COLLAPS experiment) followed by LA1 physics at GPS.
PSB has been asked to have GPS and HRS proton beams in parallel ready for Monday. Exact numbers of pulses will be communicated on Monday-morning.

Many thanks to Miguel Lozano being my back-up for covering during the HRS laser window intervention and some HIE ISOLDE obligations (we had last week the different meetings: HIE-Steering Committee, ISOLDE Collaboration Committee and INTC meeting..)

LEIR (Maria Elena Angoletta)

Owing to the Linac3 intervention beam came back to LEIR only on Wed Nov 5th. The machine was then restarted and optimisation MDs took place afterwards. The beam remained available for PS to take. On Monday Nov 10th (tomorrow) there will be no beam from Linac3 due to the usual Linac3 MD. The machine is expected to restart on Monday after 16:00.

AD (Carlos Oliveira)

Here are the main issues of last week:

- 1) AEGIS magnet (5T field) affecting steering of ALPHA line. When AEGIS switch the magnet ON/OFF, vertical position on ALPHA line must be corrected. I had to setup two versions of the steering. One with AEGIS magnet ON and another one with AEGIS magnet OFF.
- 2) The stability of extracted beam is not OK yet. It fluctuates on the horizontal plane. All experiments complained about This. I had to re-steer the AEGIS line once. The instability is not there all the time. We suspect a orbit jump at extraction. Kicker and septum seems to be harmless.
- 3) CO2 is going down at least once per day. The problem comes from the new HV power supply. Experts didn't find yet the solution for this.

Booster (Bettina Mikulec)

Very busy week (seems to be a common theme since the 2014 startup...) with machine/beam adjustments and many MDs.

Issues:

- Serious controls issues started Wednesday morning and lasted until the afternoon (no heart-beat; FESA errors; Lost Updates; very slow response of controls system). CO investigated and in the end had to restart the PSB INCA server, which was completely overloaded. For ISOLDE this meant that the interlock cut frequently the beam because of missing AQN updates of the end-of-line magnets.
- The missing LLRF sampler and synchronisation signals were resurrected by M. Jaussi on Wednesday.
- Work was done throughout the week by the RF specialist on the longitudinal blowup of the LHC25ns beam.
- Friday early morning the SPS complained about the intensity distribution along the LHC25ns batch. The operator found a problem with a corrector magnet used to define angle and position at extraction. With the help of the piquet on the phone he could solve the problem (bad contact; a cable had to be exchanged).
- The PS complained about changing trajectories at PS injection. In the beginning of the week a problem with a specialist setting of the extraction pickups could be corrected, which gave wrong readings. There are still a few pickups not working as they should (one of the reasons are radiation-damaged cables to be replaced). Throughout the week the trajectories to the PS had to be corrected almost on a daily basis. During the weekend measurements were made to check whether one equipment in the line was pulsing with the CCV of another cycle; this seems not to be the case. Currently we are checking the trajectories during each shift.

During the last Technical Stop RP confirmed that the hot spot in section 10 became even hotter (~ 2 mSv/h measured). ABP studies and closed orbit measurements clearly show that this is related to the large orbit excursion (mainly in vertical), and the available orbit correctors are not strong enough at higher energies to compensate. Before the winter stop we are proposing to move one quadrupole, which should efficiently correct the vertical orbit excursion, and during the winter stop 1-2 more magnets should be moved in addition. The timing of the required 3h intervention will be discussed during the FOM tomorrow.

PS (Jakob Wozniak)

All operational beams have been delivered rather normally throughout the week.

On **Monday** Gabriel, Ana and Guido put a B-Train correction in place to fix the problems with the fluctuation of the B field at injection. The compensation is done on the preceding cycle (with the energy matching between PSB and PS done by Steve) and copied to all the LSA cycles.

On **Tuesday** POPS was down for 1h30 hours due to a problem with command redistribution from main controllers to the local ones. The ZT8.DHZ01 power converter was fixed. Now it pulses and follows the GFA.

On **Wednesday** night there was a problem with low energy quadrupoles PR.QDW06, PR.QDN10 PR.QDW18 et PR.QDW28 affecting slightly the beams for SPS. They got repaired on Thursday afternoon.

Also on **Thursday** there was a problem with F16.QDE220 tripping with temperature when the RMS current is above 250A caused a downtime of 1h. The magnet is designed for 500A so there is a problem with its cooling. We continued to have problems with it over the weekend as well. Intervention will be needed this week to fix it. During the night POPS went down with a fault in IGBT1 which is a known command problem being currently investigated and it was down for 4h40min until Friday morning. The possible cause might be a signal reflection in the VME bus of the main controller. A "shielding" card was put in place to remedy the problem. In a parallel an additional card is being tested that can dump the VME bus traffic when the trip occurs.

On **Friday** the problems came from the radial loop problems causing 1h30 min downtime due to a faulty pulse repeater PX.SBI exchanged in CR13. This timings was only received intermittently by the radial loop, so it got stuck at the sign of the gain of the previous cycle. In the afternoon two 80Mhz cavities were causing problems and got to be repaired in preparation for the ion beam next week.

During the **weekend** we had downtime of 1h due to SMH16 impossible to restart. We were also troubled by the timing issues causing the impossibility to change the supercycle sequence. Also a problem of veto on BHZ377 caused a 1h20 min downtime for SPS beams. During the weekend the parasitic TOF beam was re-established on EAST1 cycle.

All the necessary interventions will be organised to shadow the PSB stop of 3h that is planned to take place this Wednesday.

SPS (Hannes Bartosik)

It was a very exciting week for the SPS dedicated to the scrubbing run. Overall, the beam availability from the pre-injectors was fairly good and significant vacuum conditioning of the SPS arcs was achieved thanks to the scrubbing. Towards the end of the week, 4 batches of the nominal LHC beam with about $1.15e11$ p/b could be successfully accelerated to extraction energy with good transmission and transverse emittances of about $3 \mu\text{m}$ measured at the end of the flat bottom. In addition to the standard 25 ns beam, also the doublet beam was setup and used for scrubbing at injection energy.

The critical machine elements during the scrubbing run were the MKP4 injection kicker and the new TIDVG high energy internal beam dump. Further conditioning of both elements will be needed, in particular for decreasing the high baseline pressure level at the MKP4. During the scrubbing run, software interlock levels close to these elements were raised in accordance with the equipment specialists.

In more detail:

- After the setup of the scrubbing cycles on Monday, the COLDEX experiment was moved to in-beam position during access in order to record data during the scrubbing run. About one hour was lost at the restart due to problems with the mains.

- In parallel to scrubbing, the first part of the setup of the 200 MHz LL RF on the LHC filling cycle was performed on Tuesday.
- Wednesday was dedicated to an MD on the new 800 MHz LL RF. In the evening, the setup of the doublet scrubbing beam with a single batch was performed. The doublet beam induces clear pressure rise in the arc dipoles without a-C coating, while neither the vacuum in TIDVG nor that in MKP4 reacted to it. This is due to the fact that doublet beam has lower e-cloud thresholds in dipole fields and higher in field-free regions (with respect to the nominal 25 ns beam). The fact that no dynamic pressure rise was seen with this beam in the a-C cells also demonstrated that the vacuum rise observed in these cells with the nominal 25 ns beam is actually caused by the electron cloud in the uncoated interconnects. Four hours of downtime were caused by a problem with the BEQ3 compensator.
- On Thursday, the LHC mastership-dynamic destination and LHC-SPS rephasing tests were performed in parallel to scrubbing. Problems with overheating magnets in the TT2 line were encountered due to the high duty cycle of LHC beams (especially when injecting 5 batches on the scrubbing cycle).
- On Friday the setup of the 200 MHz LL RF on the LHC filling cycle was continued. In the evening up to 4 batches of the LHC beam were accelerated and dumped at high energy in order to further condition the TIDVG, which exhibited a very large outgassing with beam dumped on it., eventually hitting the (already extended) interlock threshold.
- Further setup for multiple injections of the doublet beam together with optimization of tunes and chromaticity was performed on Saturday. Four batches of doublet beam could be injected on the long flat bottom scrubbing cycle.
- Sunday has been mainly devoted to beam qualification (measurements of emittance, lifetime, bunch lengths) in different operating conditions.
- On Monday morning, COLDEX will be moved out on and physics operation is planned to resume at 7am.