

Accelerator Complex Status

End week 45 (Monday 14 November 2016)

TI (Jesper Nielsen)

- Thu. 10/11: Several restarts of the Cooling water of BA2 because of vacuum interlocks.
- Fri. 11/11: The 18kV cable between BE and BA1 has been repaired and put in service.
- Sun. 13/11: Water fault on a power converter in UA87, which caused a beam dump of the LHC. Water pressure has been increased and two fittings have been changed.
- Mon. 14/11: Stop of NA62 cooling circuits because of a fault on a flow meter. EN-CV-DC is looking for replacing this flow meter by a radiation resistant meter.

The complete report can be found at:

<https://wikis.cern.ch/display/TIOP/2016/11/11/TI+summary+Week+45%2C+2016>

LINAC2 (Rolf Wegner):

The week started quite bad for Linac2:

- Monday evening a pre-driver amplifier for tank2 had to be exchanged, 90 min down time.
- Tuesday and Wednesday 36 hour down time to recover from 3 major issues:
 1. A tuner on the RFQ broke. As a temporary fix the broken tuner was moved into its nominal position and blocked in place. The 2nd tuner keeps the cavity on resonance. So far the solution has been working well.
 2. A connector of a high voltage trigger cable broke. Sparking transmitted the trigger signal with random delay, causing the RFQ and tank1 amplifiers to frequently pulse too late for beam acceleration.
 3. The memory of the PLC controlling the high voltage modulator got corrupted Tuesday evening. Its program had to be re-loaded.

Since Wednesday afternoon very good and stable running.

The Linac2 source has been stable all week.

The intensity to the PSB was typically between 130 and 135 mA..

LINAC3 (Rolf Wegner):

Linac3 is running pretty well.

The intensity at the end of Linac3 (BCT41) was typically between 38 and 40 uA.

LEIR (Steen Jensen):

Issues

- Tuesday: Nothing to report
- Wednesday: Nothing to report
- Thursday: Transverse damper down, and alarms not shown in LASER led to 1h45 without beam - fortunately while there was no beam request from LHC.

- Friday: The alarms issue was fixed efficiently by Luca Arnaudon and Ylenia Brischetto, tested with simulated errors. A test with real errors will be scheduled on occasion (requires machine access).
- Saturday: Nothing to report
- Sunday: Nothing to report

Activities

- NOMINAL delivered to LHC as requested
- NOMINAL optimized longitudinally (S. Hancock) => $\sim 9E10$ extracted.

PSB (Elena Benedetto):

Apart from the problems in Linac2, a very quiet week for the PSB, smoothly producing OP and MD beams.

Toward the end of the week, work on LHC-100ns to equalize Rings performances and to improve the already good (<10%) stability, after the increase in intensity requested on Wednesday.

A lot of MDs took place: i.e. hollow-bunches, tail-repopulation, wire-scanners/SEM grid studies, tests on the new BTMS, in addition to checks without beam on the B-train reference magnet.

ISOLDE (Emanuele Matli):

Pretty smooth week at ISOLDE after the resolution of the Linac problem.

Minimal took data with ^{66}Ni all week until the target broke Saturday afternoon ending the physics run a bit earlier than expected.

Target failure was expected and we installed a backup target on HRS and set it up during the week.

It was not possible to set up all the machine with the new target during the w/e but it was used Sunday to make a collection of ^{66}Ga for calibration purposes.

PS (Heiko Damerou):

Despite the 37.5 hour downtime of Linac2, during which only ion beams were delivered to the SPS/LHC, the PS had a quiet week with an average (proton) beam availability of 78%.

On Wednesday afternoon no beams could be delivered to the SPS during 20 minutes due to a water issue with the power converter of the extraction bumper PE.BSW20. Beams had to be stopped on Thursday evening for 35 minutes, as the spare 10 MHz cavity C10-11 did not start following an un-resettable fault of cavity C10-46. Both cavities were fixed by the specialist.

The 18 bunch proton beam with 100 ns bunch spacing has been delivered for several LHC fills.

In parallel, a multitude of MD studies, covering the new B-train, hollow bunches on the flat-bottom, space charge studies using double harmonic $h7/14$ and working point studies for integer tune $7/7$ optics, took place. A variant of the MTE beam is being pushed to the maximum intensity to explore possible limitations. An intensity of $2.3E13$ ppp has been reached, but losses are yet unacceptably high.

Some resets on the 10 MHz cavities C10-86 to C10-96 and switching to the spare cavity were required during the night from Sunday to

Monday, before the proton beams were cut at 6h00.

AD (Lars Joergensen):

It was a very good week at the AD. We had some downtime due to the problems in LINAC2 and PS, but otherwise we only had two incidents of reduced beam at the AD.

The most interesting happened Thursday when we had a radiation alarm in the AD when we had no beam!! This inhibited further beam and while we were trying to figure out what was going on we had two further radiation alarms - also with no beam.

After some investigation it turned out that the PS to SPS beam in TT2 were experiencing some losses exactly in the area closest to the AD. There was no alarm for the TT2 because the losses there were well below the threshold for alarm there, but because the thresholds are set so low in the AD this was apparently enough to trigger a high level alarm in the AD on the detector closest to the TT2 line (PAXA0604).

Friday we had some problems with the scrapers due to a problem with the axis referencing.

All in all, a very good week at the AD with very stable beam delivering 3.5-3.6E7 antiprotons to the experiments AEGIS ATRAP and ASACUSA.

Another noteworthy event was the one year birthday of the 5 antiprotons in the BASE experiment reservoir trap on Friday. I believe this is the first time ever that antiprotons have survived that long.

SPS (Django Manglunki):

Not a great week for the SPS, with only 66% availability for fixed target beams. Fault rate was dominated by Linac2 beam unavailability and vacuum interlock on the high energy dump (TIDVG).

A long Linac2 beam down time period started on Monday 7/11 at 20:00. It was still possible to supply Pb ions to the LHC for setting up during that period.

Tuesday 8/11 around 22:00 a fire alarm went off in the North Area. It was a real fire caused by a plastic bache laid on a bakeout testbench.

On Wednesday 9/11 the protons came back at 13:00, allowing to eventually start the dedicated MD, and the vacuum piquet was called to block open the fast valves in BA2, BA4 & BA6 for the duration of the MD. The MPS tripped first at 16:30 and resetting it took 30'. It tripped again at 17:00 and it was not possible to reset SMD10. The EPC specialist was not available and the EPC standby replaced SMD10 by the spare, SMD14. At 18:00 the MD was over and the machine switched to physics. It took one hour to get the vacuum piquet back to unblock the fast valves. Once the fixed target cycle was reinstated, the beam was lost at injection. After readjusting the tune over the flat bottom it was found the problem was due to the spare power supply (SMD14) not following the reference current. It was removed and SMD10 put back in the configuration, which allowed delivering the fixed target beam at 22:00.

Thursday 10/11 was mainly devoted to the LHC p-Pb beams, both pilots and and trains. In the morning at 11:00 the EPC specialist confirmed the problem on SMD14, and fixed it. SMD14 can be used as a spare again. At 11:30 there was a problem to remove the VETO for AWAKE: when the area is closed with the TIS Veto and the laser is still in test mode, the key cannot be released to switch "Test

mode TAG41" in order to take the proton beam. At 23:58, a trip of MST and MSE caused the full fixed target beam (2×10^{13}) to be dumped at high energy. This caused the vacuum at the level of the dump to rise just above the set threshold of 2.7×10^{-7} Torr.

Even after waiting 3 hours, during the night it was not possible to put the fixed target beam back as each time the remaining 3% of the beam was dumped, the pressure rose above the interlock threshold.

On Friday morning the interlock threshold was raised to 3×10^{-7} Torr, to allow producing the low intensity LHC beams (both p and Pb). Due to spurious temperature spikes on the dump, it was feared that there was a cooling failure, so an inspection with a camera-equipped robot took place in the afternoon. No water leak was found, confirming that one of the temperature probes was faulty. At the end of the day it was decided, in agreement with the EN/STI and vacuum specialists, to raise the vacuum interlock threshold to 4×10^{-7} Torr. Fixed target operations resumed at 17:00.

On the positive side, the SPS has started to deliver a very good ion beam to the LHC, with 2×10^8 ions/bunch, and normalized RMS transverse emittances around $1.2 \mu\text{m}$. For the LHC protons, the batch spacing of 200ns is at the limit as the two bunches surrounding the injection kicker rise time are badly kicked. As one of them is non-colliding in the LHC, it may be possible to change the filling pattern, using 300ns batch spacing for the protons. This is being followed up.

The fixed target proton beam was stopped at 6:00 on Monday 14/11, and setting up of the fixed target ion cycle at $13 \text{ AGeV}/c$ has started.

LHC (From the 8:30 meeting):

After a week of recovering from the technical stop and revalidation of the machine the end of the week and the weekend showed excellent running with very good availability of the accelerator complex, resulting in a stable beam ratio of 89% since Friday midnight.

On Wednesday and partly in the shadow of the LINAC2 issue, the dump kicker generator was changed after an attempt to clean it following issues related to sparking.

On Saturday morning fill 5506 with 200 bunches only colliding in ALICE was dumped after 37 hours of stable beam, which is a new record. This luminosity was levelled to $8 \times 10^{27} \text{ cm}^{-2}\text{s}^{-1}$

With a turn-around time of only 3 hours the next fill went into stable beams around 14:00 with 700 bunches and collisions in all experiments. The beam was separated in ATLAS and CMS to increase the life times as planned.

On Sunday the beams were dumped due to a water fault on a power converter (RCBXV2.R8) in UA87.

Some discrepancy between the intensity measurement of the FBCT and the BQM was observed for the ion beams.

The New Zealand earthquake was clearly observed on top of the tidal orbit, as it was perturbed slightly for about 3 hours.

Plans:

Tuesday the beam will be dumped early afternoon for a VIP visit in the LHC and a LINAC3 source re-fill. Protons will be available until 12:00 with an interruption until 17:00 for the RP survey in the injectors.

In case ions would not be available again at 17:00, then as backup plan the 6.5 TeV cycle can be used for measurements and tests in view of its setting up. During the VIP visit the interlock BPM thresholds will be changed, requiring a small revalidation step afterwards.