

Accelerator Complex Status

End week 49 (Monday 7 December 2020)

Technical Infrastructure (J. Nielsen):

- A reasonable week for TI.
- Statistics:
 - About 6500 alarms
 - 1057 phone calls (735 incoming, 322 outgoing)
 - 150 ODM created
- Events worth mentioning:
 - Mon. 30.11 @ 10:36: Evacuation triggered in BA5 due to welding smoke. An IS37 was created but not yet deactivated (30 IS37 to do during the morning)
 - Wed. 02.12 @ 08:00: Due to the IT intervention of Monday, impact synchronization was out of order Tuesday around 16:50. Wednesday morning most people were not allowed to enter in machines, Problem was fixed during the morning.
 - Thu. 03.12: BEQ2 and BEQ3 switched ON around 12:00 (SPS machine SVC)
 - Fri. 04.12: ME9 Filter switched ON between 9am and 10am
 - Sun. 06.12 @ 17:58: Evacuation BA2 due a human error during works for the SPS access control system. Fire Brigade acknowledged the alarm
- Details: <https://wikis.cern.ch/display/TIOP/2020/12/07/TI+week+summary%2C+Week+49>

LINAC 4 (B. Mikulec):

This week Linac4 was prepared to send beam to the PSB on Monday 7/12. It was an eventful week with several issues.

The 2 previous weeks, beam could only be sent to the LINDMP and a new Linac4 phasing had been performed following an interesting phasing MD.

Main points of last week's operation:

Monday:

- Monday morning **access in Linac4** in parallel to the PSB access to exchange once more a wire scanner that had a short circuit after the exchange the previous week.
- During the routine PIMS11/12 TOF measurement it was noted that amplitude and phase have changed; there was actually a **problem on PIMS0708** (change of circulator current) → a cable was fixed to avoid touching the sensitive potentiometer

Tuesday:

- **Source gas injection slightly increased on Tuesday to stabilise the source** (first adjustment since 12th of October)
- Chopper rise- and fall-times re-confirmed (beam-based measurement)
- Profile measurements taken in L4Z to re-confirm emittance after Linac4 phasing
- **Problems with the debuncher phasing after Linac4 phasing, as the TOF gave inconsistent results**
- **Could not perform BSM measurements beginning of the week due to a defective ADC channel in the SIS33 board**; as there was no spare available, a similar ADC board was 'borrowed' from M. Bozzolan; settings were adjusted on Thursday; since then BSM measurements were again possible

Wednesday/Thursday:

- **PIMS11/12 TOF measurements and trajectory changes indicated that the beam energy was too high.** After lengthy investigations and a partial rephasing attempt starting from PIMS05/06 on

Thursday, the **issue was traced back to a small pre-driver amplifier** (between the LLRF system and the amplifier at the input of the Klystron, which amplifies the LV signal from the LLRF drive to a suitable level for the Klystron amplifier) leading to oscillations of the forward power. R. Borner exchanged the amplifier and it was decided to stay with the original phasing.

- Side remark: it was also found that the phasing, usually done with low-intensity beam, gives slightly different results when using the nominal intensity. To be followed up, but in terms of absolute energy there is sufficient margin to compensate with the PIMS11/12 amplitude.
- Thursday there was a **level 3 recovery of the RFQ** (hard breakdown triggering a cluster of breakdowns) → waiting time 20 minutes to restart.

Friday:

- **Source and RF were stopped from 8-10am to switch on the Meyrin ME9 compensator.** Central timing reboot in parallel (another reboot required in the afternoon).
- M. Bozzolan **calibrated the L4T BPM distances with beam to provide consistent TOF measurements between different pairs** → **debuncher phasing done and propagated to the different optics.**
- **LBE profile measurements for LBE emittance reconstruction after Linac4 phasing; nice profiles and emittance.**
- Needed specialist to restart PIMS07/08 after a trip.
- Some issues with the ZERO cycle that is played when there is an External Condition from the PSB should still be solved (timing/watchdogs).
- Settings of all operational users were re-checked and the machine prepared for Monday morning (including detuning of the debuncher).

PS Booster (A. Akroh):

- We've started the week by the clean-up the Booster together with HSE-RP, SMB and EN-ACE. It was a really tough task as announced at the previous FOM, but at the end we're happy to operate a brand new machine;
- As a consequence of the Magnet Consolidation Campaign, The BLMs in the Ring had to be reconnected/ tested and the WIC in the rings as well → everything is OK.
- POPS-B restarted finally on Wednesday evening because of a bad manipulation from TE-EPC first line which caused 3/5 18kV CEPAM damaged during the unlock out procedure → POPS-B recovered (EN-EL) since then and FI/BIS output tested (BE-OP).
- BI.BWS issue due to the software version which was installed in a control card → Solved;
- BI.BVT10 problem to restart the 3 power converters due to WIC: found out that one of the water valves was closed → Problem solved;
- Q-Strips Dry-run performed with Gian Piero and Michi: Same implementation than BI.BSW (Functions to Function Lists)
- Simulated B-Train reset implemented by Anthony Beaumont → we added the parameter in the knobs/workingsets
- The majority of BIC inputs tested successfully → RF unconformities still have to be solved
- SIS new version deployed, and almost all the permits that are necessary for the restart are available. The PSB Stray Field compensation is available.
- Test of the New TFB during an AC-Dipole machine development → Piotr. S & Gerd. K
- Few issue discovered with the BI.KSW hierarchy propagation from the high level KNOB to the hardware:
 - Firstly, there was a (-1) which caused the current calculated from the position, inverted → Solved;
 - Secondly, we discovered that:

- BE-OP + BE-CO correctly implemented the make rules / hierarchies in LSA database to convert from a position in MM to a current in AMPS dispatched to the 4 KSW magnets;
- TE-ABT also implemented this conversion in FESA, which was not required in the specification established before LS2, thus during the tests we couldn't send the calculated currents to the hardware (~ 400 A) because it was accepting only MM.
- Fortunately thanks to M. Hostettler who put a temporary solution in place to work around this issue while ABT sort this out, we could perform some test which were successful
- BE.BSW are now correctly configured and the delay internal to the generators which indeed were not use, have been removed and the delays are controlled via a delay (LTIM) in the Mk-controller FESA class.

The remaining major issue concerns the 0 turn which trip the Linac4 source, and this not completely understood, we still have to see how to implement this properly with all the ingredients that we have (Timings, External conditions, BCTs measurement, WatchDog...).

PS (K. Hanke):

In general the commissioning advances well. Many more test to be done. More CCC activities will come, like dry runs for KFAs, setting management etc..

- Magnet tests completed. SWY and PSR, Main Units and auxiliary. In Jan'21 TT2 and n-TOF
- TT2 vacuum repair ongoing. Tuesday and Wednesday two days stop for SPS-DSO tests
- Additional n-TOF fences are installed. Zone is safe and patrol done.
- TE-EPC has started commissioning of n-TOF circuits
- Several access last week:
 - Finemet has two amplifier to be fixed
 - 10 MHz amplifier
 - BI checked the wire scanner (no problems to be reported)
 - BFA9 runs for three hours (no problems to be reported)
 - SMH42 and BSW42 synchro pulse tests (no problems to be reported)
 - MU69 water pipe leaking, has been replaced
- New WIC soft deployed
- KFA45 and 71 in remote control. First test were promising, will continue this week
- YASP LE correction. YASP gives an K for every magnet. But in reality there are two in series. To be checked with ABP
- First test for LE WP adjustment from high level parameter. Looks promising but more tests are needed.
- SMH57 and F61/62 line commissioning well advanced.

ISOLDE (A. Rodriguez):

- Last Monday, we finished the low A/q stability tests we started the week before. We also completed the Ir and Ce beam contamination measurements we had planned.
- On Tuesday, we changed the GPS target in preparation for the measurements later in the week. In parallel, we started preparing some of the linac systems for the warm-up of the cavities and our colleagues from the WISSARD experiment powered up their superconducting solenoid for several tests they needed to do (the field they produce affects the injection into the linac, so both tasks need to be scheduled separately)
- During the rest of the week, F. Wenander and H. Pahl from ABP with the help of Niels worked on the characterization of the performance of the new electron gun with a 205Tl beam coming

from the newly installed target. The results were remarkably good. ABP has done an excellent job with this new gun.

- In parallel, we finished preparing the rest of the linac system and started the warm-up of the cavities.

ELENA (Laurette Ponce):

The week was marked with some issues but also beam deliver to Gbar.

- There are still problems with the Iseg power converter of the ion switch (pulsed one), so we stayed with the old FUG, preventing extraction to ALPHA. The plan is to install them back on Wednesday and keep it as long as it holds.
- On Friday, we had a stop due to bad conductivity of the source cooling water (circuit linked to the AD cooling and filling of AD RF cavity was on-going).
- Gbar started deceleration tests, on-going.

LINAC 3 (D. Kuechler):

Monday

- Oven refill, the newly developed crucible with a beak was used, since Wednesday morning it was not necessary to tune the oven power (normally it is around one time per day with the standard crucible), source is quite stable since Tuesday morning
- Second test of the oven ramp GHOST module, still some small issues to be followed up
- The controllers for the 4 pumping groups of the source were exchanged
- Air distributor on valve ITL.VVS10 changed, this should solve the issue with the not responding valve
- Smear tests to detect lead contamination were done; inside the source cage, where we store the lead bricks during source maintenance, an increased lead level was measured, to be followed up.

Rest of the week

- More measurements with the movable puller
- Continuation of the commissioning of the RF cavities with beam, issue with the drift of the phases could be solved

new problems

- Valve on the lower turbo pump in the source extraction found to be leaking when closed
- Vacuum gauge IP.VGP02 readings changed suddenly by two orders of magnitude, gauge is part of the source interlock chain, as it still gives some reading decided to keep it running for the moment (otherwise the source would have had to be vented) → both issues will be solved during the plasma chamber installation in weeks 1/2 in 2021.