

Accelerator Complex Status

End week 31 (Sunday 10th August 2014)

TI (Peter Sollander)

Short summary from TI in the usual place:

<https://wikis/display/TIOP/2014/08/04/TI+Summary+week+32,+2014>

The only notable problem was the Cryo pump oil leak in point 6.

LINAC3 (Giulia Bellodi):

It was a quiet week for Linac3. An MD took place on Monday to estimate the impact on the ventilation system of pulsing the machine at 5Hz with Pb29+ settings.

Data is being analysed, but no critical behaviour was observed during the length of the tests.

LEIR (Maria-Elena Angoletta):

Excellent progress this week, which included bringing back to operation many tools such as YASP and that culminated with a tiny beam of 1 E9 charges being captured, accelerated and synchronised at extraction on Wed evening. This was the high-point of the week (I might be “slightly” biased on this :-), but we were all very happy about it). Unfortunately, this “high point” was compensated by many “low-points” both before and after it.

The biggest problem consisted of unexplained changes in the machine, so that the beam was not anymore injected into the machine (no alarms, red in workingsets or similar), we tried to improve the situation often without much success, in desperation we reloaded the exact same archive we had when the machine stopped working (but that had previously worked) and ... voila', we got beam again. Pretty confusing.

In addition, during the week as well as on the weekend we had several problems with many power converters that got either frozen (and stopped working) or “incommunicado, i.e. they kept working correctly but could not be controlled anymore. The Piquet PO intervened several times and, in addition to solving each time the problem, started to take some diagnostics info, to be submitted to the controls expert when he comes back from holiday in less than 2 weeks time. That is great, still much time was lost because of this.

In chronological order, the main events of the week go as follows:

- On Monday the 9-years-old LLRF crate was changed (Wiener to ELMA), to try to solve the issue of the LLRF CPU (cfv-363-all1) freezing up. After much suffering (due possibly to a bad cable), by Monday evening the LLRF was back to operation. Even since the CPU never froze again and could be restarted at will. Unfortunately at least once per day some LLRF processes go bananas with a SIGBUS error. RF control experts are working on it.

- On Tuesday there was an access by BI to fix noise problem on ER.MTRF12. A problem with the radial PUs signals passed on to the LLRF was solved, meaning that the radial loop could actually be used. Following this and changes in the preset value of the Btrain, we managed to capture and accelerate a very tiny beam (with phase and radial loops) on most cycles. The beam was lost at injection later on in the evening and nothing could be done to solve the problem.

- On Wed a problem with the orbit frontend, whereby no data were acquired, was identified and experts started to work on it. Apart from that, around mid-morning and without actions on our side the transmission line got back to its performance. Beam could once more be reliably captured and accelerated. The extraction reference frequency was changed to match the (not yet adjusted) extraction frequency value and the beam got synchronised. This was extremely satisfactory, even if the beam intensity was pretty low (about $1E9$ charges accelerated and synchronised).

- On Thursday the orbit data acquisition problem was solved, thus allowing us to measure for the first time the closed orbit with YASP. A suspicious variance was found in the ER.BHN current at injection, which we thought could explain why sometimes we got beam injected and/or cooled in the machine and many other times we did not. Then something changed in the machine at the end of the afternoon and we lost all beam.

- On Friday the hypotheses of an unstable magnetic field at injection got confirmed and the day was mostly devoted to try to compensate for eddy currents and to have a flat magnetic field at injection. However, improving the unstable field to make it flat ($B_{\rho\dot{\sim}0}$) at injection, did not improve neither the injection nor the beam survival in the machine. Reverting all values ($B_{\rho\dot{\text{dependents}}}$) back to values from the day before (where beam was lost), brought beam back for unexplained reasons. Very confusing.

- Over the weekend there were again problems with power converters (EI.BHN10, ER.QFT24, ER.QDN1030, ER.QFT24, ER.SMH11) that sometimes recovered after going locally and doing a reset, and sometimes did not. Not only confusing but also time consuming.

LINAC2 (Giulia Bellodi):

It was a very quiet week for Linac2. The only issue we had was with a radiation monitor (PAXS23) setting off an alarm at times when ISOLDE requested high intensity beams.

Since this monitor is at a new location, we cannot compare with past records. We're following this up with our RP colleagues and we'll discuss this week whether any of the alarm thresholds currently used need adjusting.

PSB (Alan Findlay):

This week was mainly spent slowly increasing the beam intensity for the users, trying to get stable beam from R4, starting to set up splitting for the SFTPRO cycles and fixing the various things that broke.

We managed to get the nominal $400E10$ per ring for the AD user, and there was a copy on the MD3 user to help the PS with their setting up. On Wednesday, for no good reason, these two cycles started triggering the BLMs at the point of extraction (but also further down the line), so we tried in vain to find the reason for this. We ended up having to move all 4 rings by $\sim 4\text{mm}$ in vertical to get them out of the machine without triggering the BLMs, so Celine then had to re-steer the beams down to the PS, where they had to re-adjust their injection. This had to be done for both cycles, and we're sorry that we can't provide an explanation and that the PS had also to re-steer. The positive side of this is that re-steering done by Celine greatly reduced the losses in the line, so we were better off in the end.

BTYQF0184 dropped out several times a day taking out the ISODLE beams, often only a reset was required, but we also called in FIRSTLINE to take a look. At one point they made a change in the HW, but this didn't offer much respite. Eventually we asked FIRSTLINE to investigate with the specialist, and they changed a number of bits 'n' bobs and the supply has been stable since.

The RF controls team delivered the alarms to LASER for both the TFB & cavities this week, which were tested and were working fine.

The spitting for $h=2$ on the SFTPRO2 cycle was started again, and the code changes made by Maria Elena appear to have worked well, with $\sim 250E10$ split on R3. However, the cycle this is based on needs to be updated to have all the improvements we've implemented, so this will have to be done before the intensity can be increased and the other rings commissioned.

The efforts to increase the maximum intensity for ISOLDE continued throughout the week, with $2600E10$ operational by Friday. R4 remains our "sick puppy", but we've noted an unexpected angle at injection that we can't change, as well as a strange working point required to get the beam injected and captured. This we'll continue to work on this week.

On Sunday we suffered a number of breakdowns that stopped the beam, the most time consuming being the BT.QN010, where the PiPO had to intervene several times on the cooling circuit. After a total of ~ 2.5 hours he had managed to get the cooling system back up and the beam was transferred once more.

Overall, only two mysteries and a gentle improvement in all our beams, so we've had a lot worse weeks.

ISOLDE (Didier Voulot):

ISOLDE is finally running, this week with physics on both separators: isotope collections on GPS for medical applications and CRIS on HRS. Quite a few interruptions this weekend with target trips on GPS and separator problems on GPS and HRS. Apart from that the machine, including the RFQ cooler, is running. Tomorrow afternoon an intervention is foreseen on the tape station.

PS (Ana Guerrero):

Quite a busy week for PS.

Yesterday evening a vacuum leak in SS79 was detected and repaired by the PIVAC. A clamp was broken between the ionic pump and KFA71-79. There was air contact. The pumps have been working all night but this morning there was still too much oxygen to perform a leak test.

The PS can now deliver the three operational beams EAST, TOF and AD with nominal intensities. On Thursday afternoon the nominal AD beam could finally be delivered with very few losses. A transverse instability developing along the flat top was detected and corrected by increasing the chromaticity. Further measurements showed that the beam was initially situated in a zone of negative chromaticity. One of the suggested possibilities for such a displacement is the current 6mm beam radial position along the flat-top which still needs to be understood.

On Friday the TOF intensity could be raised to $650 \cdot 10^{10}p$ with very few losses at transition. Another transverse instability has been detected and should be studied more in detail. The check of the gamma jump quad polarity remains to be done. For the moment a change of the radial position at transition allows the extraction of TOF nominal intensities.

On Thursday an access of 2h was needed to repair a 10MHz cavity (C81). Also on Thursday the beam was down during 1h30m due to a problem in an RF crate.

The B measurement with the FMR puts in evidence jumps of ± 2 Gauss at 1100Gauss depending on the preceding cycle. Furthermore the use or not of the PFWs 8-loop on a preceding cycle showed a jump of 7.7Gauss. The acquisition of the B-train does not see any of these jumps.

There are recurrent issues of amplitude jumps and frequent resets for KFA21.

The 1-turn feedback loop has been commissioned for the AD high intensity beam.

The multiple element fast extraction has been commissioned for the current operational beams and works well for the nominal values provided by ABP.

The orbit measurement is now operational. The issue at extraction for beams with harmonic changes has been solved.

AD (Tommy Eriksson):

- Mo 4/8: Still solving timing problem for PS to AD cycle synchro.
- Tu 5/8: 1:st beams ($3E12$) on target with Horn pulsing, Horn effect confirmed using radiation monitors (!). Beam goes around $\frac{1}{2}$ of the AD circumference only.
- We 6/8: 19:00 circulating beam established after polarity change of 2 new orbit correctors in the ring. Good lifetime.
- Th 7/8: RF C10 problems: system 2 is down, system 1 gives 170 kV only (should be 550 kV). Proton intensity increased to $8E12$. Set off radiation alarm in AD hall when temporarily increasing to $15E12$. Phase relation of production beam bunches wrt. C10 RF looks stable ! Start on stochastic cooling set-up.
- Fr 8/8: C10 system 1 up to 500kV = enough to test stochastic cooling. Debugging stoch. cooling systems.
- Sa 9/8: After much debugging and HW installation completion, first signs

of stochastic dp/p cooling. Many problems with AD cycle pause/un-pause, BE/CO timing experts remote assistance to find work-around.

- Su 9/8: Injected beam's Horizontal emittance is only 50pi, should be >150 pi. Vertical is 150 pi. => Dogleg restriction or ring orbit/aperture problem. No more beam from PS as of 17:30 and until now.

General remarks:

- Instrumentation is very limited, many systems (BCT, Schottky analysis, orbit etc.) do not yet work.
- Main remaining items: CO2 + deceleration setup, electron cooling set-up, ejection lines set-up.
- Progress has been quite slow, we are now seriously considering delaying the physics start which is foreseen for next Tuesday 19/8.