

## Accelerator complex status

End week 42 (Sunday 19<sup>th</sup> October 2014)

### TI (Peter Sollander)

On Thursday night, 19:03, there was a major incident in the main Meyring electrical substation, ME9, in building 212.

An 18kV breaker failed, short circuited and caught fire. The fire brigade was quickly on site and could put out the fire, but the Meyrin site was in the dark for several hours until EN-EL could restore power around 22:30. This long power cut caused a long interruption of the injectors that could not start until Friday afternoon.

<https://wikis.cern.ch/display/TIOP/2014/10/20/TI+summary+week+42%2C+2014>

### ISOLDE (Lefteris Fadakis)

#### Monday 13/10/14

**GPS** - Monday afternoon the new target was in place (#518) with Ar bottle connected to valve 3.

**HRS** - Several filters below the turbo pumps were changed in the morning. Piston changed on HRS front end.

#### Tuesday 14/10/14

**GPS** - Issue with YCA0.BFC0680 that reads always 0 even when IN. Experts were contacted. We had to continue with the set up to IDS, without this faraday cup. In the afternoon the set up was finished and started proton scan then yield checks. After a few hours the YCA0.BFC0680 is working again. No intervention was done by the specialist.

**HRS** - Trying to start pumping down the target but shutter does not open. Responsible was contacted and issue was resolved. HRS10 could be pumped down.

#### Wednesday 15/10/14

**GPS** - IS577 starts taking 33Ar with limited intensity due to target restrains to 750E10 ppp.

The beam tuning had to be checked because the profile and intensity were not as good as yesterday. In the evening requested maximum intensity per pulse (3E13 ppp) and working with 35Ar.

**HRS** - Cooling down the target to be ready for tomorrow's target change.

#### Thursday 16/10/14

**GPS** - No protons for 1h in the morning due to Linac intervention. For the most of the day things running smoothly until the power cut. Around 21:00 went to ISOLDE to check for any damage then at 22:30 the power came back. Pascal

Fernier and Miguel Benito came to help me with restoring everything. The cooling water for the targets was not working. There was a small leak in the water station room behind the ISOLDE control room. Equipment group came quite fast and resolved the situation.

At 23:30 we found out that the controls for the vacuum were giving fake readings due to a problem in one of their servers. The vacuum experts were contacted and found a 24V power supply broken which was replaced at 1:20 but unfortunately the problem in the PVSS server was still there. At 1:30 we were notified that nothing can be done and we left.

**HRS** - A target was placed on HRS as a back up in case the users were not happy with GPS.

New target in place (#515), it was slowly heated to nominal values but was decided not to set up HRS since the users were very happy with the GPS target. Also the target should be in place on Wednesday and at that point there was not enough time to do a proper set up.

#### Friday 17/10/14

**GPS** - Sensitive systems were kept off in fear of any more power cuts.

A serious compressed air leak was found on YGPS.BFC5580 and the equipment group was contacted.

At 16:40 we got back the controls for the vacuum. Started restoring the vacuum for ISOLDE. At that time it was at around  $3E-2$  mbar.

Several FEC were down and a couple (cfc-197-bisobeam and cfc-170rplc) could not be restored to a good state by simply restarting. Equipment group was contacted.

Started heating up the target and line. This target required the Ar bottle and the PLC that controls the valve was not working, equipment group was contacted and after 1h the problem was fixed by re deploying the program to the PLC.

At 21:47 we were ready to give beam to the users! Only thing missing was to do a patrol of the HV room. Went to take the patrol key from the TRAKA box and the box would not open. It had a message "low battery", we changed the plug of the power cable but the situation did not change. It would take the expert for the box 1h to come to ISOLDE so I called the booster and they had a spare. I went to the CCC and took the key, patrolled the HV room and gave the users their beam. At 23:30 the expert came and said there was a software problem that will be fixed on Monday. Users continued taking beam till early in the morning.

**HRS** - A serious compressed air leak was found on YHRS.BFC6900 and the equipment group was contacted.

#### Saturday 18/10/14

**GPS** - Users continue taking beam throughout the day. A few times protons were stopped from the booster for just a couple of minutes. In the afternoon no protons for 1h due to LINAC issue.

## Sunday 19/10/14

**GPS** - Users continue to take beam with no surprises (until the time the mail was sent).

## LINACS (Giulia Bellodi)

**Linac2** operation was stable in the first half of the week.

On Wednesday a scheduled tube replacement on a LEBT buncher caused 1hr downtime.

On Thursday morning another (unscheduled) RF tube replacement took place on Tank3. This was complicated by the observation of clear signs of overheating in the piece to be replaced and the presence of many sparking marks in its housing. It was thus decided to replace the whole amplifier body (3 hrs of beam downtime).

Recovery from the power outage (around 19h on Thursday evening) was a lengthy one.

By 2am the source was restarted and we would have been ready to send the beam down the Linac but could not restart the RF due an access veto in the PSB switchyard (missing condition on BT.BHZ10, which was only re-established around 9am). Then we were advised to wait for TI to finish some electrical interventions with chance of more perturbations.

Upon restarting the beam at around 14h on Friday, it was soon noticed that the temperature of the RF structures had lowered overnight to 17deg (from the standard value of 23deg). After some CV investigations and a tunnel access it was found that the Tank3 water purge valve had been left inadvertently open the night before causing the drop in temperature. A low temperature interlock had been triggered on the water station but went unnoticed and was not acted upon. Temperatures in the tunnel recovered nominal values only around 20h and we were finally able to pass the beam.

Support from many specialists, and from the RF group in particular (Vince Cobham and Johannes Broere), was critical during the restart.

Operation was fairly stable since: Tank2 dropped again on Saturday evening, and had to be locally reset by the PSB operator. (about 1hr beam downtime).

**Linac3** had also stable operation in the first part of the week.

Recovery from the power outage was more straightforward, and beam was re-established by 3am on Friday morning.

Since then however, Tank1 has been tripping off very frequently (every 3-4 hours), with the need of a local reset each time.

RF specialists will be informed.

## LEIR (Django Manglunki)

The injected intensity had been improved over the previous 2 weeks, so most the week was devoted to improving the extraction settings, in between the many

breakdowns (Linac3 RF, LEIR Low Level RF front-end, various power supplies, extraction kickers, and global power cut)

On **Monday 13/10** took place the weekly Linac 3 MD, during which D.Bodart/TE restarted a polarity measurement campaign on dipolar correctors and sextupoles requested by ABP. All measured magnets show the correct behaviour, but not all sextupoles can be measured, as the skew ones are inserted between two main quadrupoles. D.Bodart is measuring identical magnets offline.

On **Tuesday 14/10** the Low-Level RF front end computer (cfv-363-all1) started again to behave erratically, remote reboots ineffective, it had to be locally turned off/on for a cold reset. The same day ER.QFT24 had to be restarted by the TE/EPC piquet.

The CPU (RIO3) was changed on the LLRF front -end on **Wednesday 15/10**, OK since then. The crate mains 240V is in the mean time being monitored by TI for a few weeks.

On **Thursday 16/10** morning TE/ABT piquet had to intervene on one of the extraction kickers (KFH32), and after the access the TE/VSC had to be called to open two valves which refused to open remotely. The AMDNOM beam, normally reserved for MD was used to deliver beam to the PS and SPS as it had been optimised already over the previous weeks. Optimisation of the extraction settings (bump & kickers) was continued on that beam.

At 19:00 the general power cut tripped the LEIR machine. Jerome restarted overnight and most functions were up and running by 1:30.

On **Friday 17/10** the rest of the machine was restarted by piquets and specialists (electrostatic & magnetic septa, transverse dampers, electron cooler), but many simultaneous breakdowns & power supplies trips (ETL.BVN10, EE.BHN1020, ITE.BHN20, EE.QFN10) needed the constant presence and interventions of the TE/EPC piquet. Eventually beam was injected, accelerated and extracted at 18:30. At that point the MD beam AMDNOM was copied to the operational beam ANOMINAL. The lifetime gradually improved as the residual pressure dropped, since several pumps had been off during the power cut.

Optimisation of the machine was continued on **Saturday 18/10** afternoon; at 16:30 the machine had recuperated the situation from before the power cut, with  $2.5 \times 10^9$  ions/cycle extracted on the operational cycle ANOMINAL.

On **Sunday 19/10** morning the main magnet power supply (ER.BHN) tripped and had to be reset locally. The electron cooler had also tripped but could be reset remotely.

On **Monday 20/10** during the weekly Linac3 MD, J.Schipper (TE/ABT) will have to enter LEIR again for a short intervention on the kickers.

## AD (Carlos Oliveira)

### Cavity C02 has regularly a level 2 fault

It's the new High Voltage power supply that is often in fault.

Matthias Haase, the cavity specialist, doesn't find any obvious reason for this.

He needs help from the power supply specialist but he seems to be very busy somewhere else.

### **The CERN blackout of Thursday**

We were able to deliver beam to our users only Sunday from 13:00. We received the first beam from the PS Saturday at 14:00.

The main issues we had to recover beam were:

- a) Injection kicker problem on Saturday. The kicker specialist had to come.
- b) The stochastic cooling pickups were inside and were "killing" the beam. These motorized pickups need air compressed to stay outside and we lost central air-compressed with the power cut.
- c) The front-end controlling our GEMs (grid pickup) on extraction line was down and I couldn't reboot it on local myself.

We need the GEM for doing the steering of the line.

I found this problem Saturday night and couldn't have help for this until Sunday end of the morning despite of all the phone calls I did.

I had someone from the CO that tried to help but he had no spare parts to fix the front-end.

### **Vacuum pump failure on extraction line**

Closed all the vacuum valves Sunday night. The vacuum piquet had to come.

The responsible for this equipment had to replace it Monday October 20.

He replaced the same pump within 3 weeks.

### **BOOSTER (Alan Findlay)**

A nice, quiet week at the PSB, almost nothing to report apart from a few minor beam down times that you probably didn't even notice.

We started setting up the LHCPROBE beam, but we noted a problem with the longitudinal blow-up which is an essential ingredient for this longitudinally shaved beam. By Thursday evening we had identified a bug in the generation of harmonic number 16, which just happened to be the one we wanted, but we could shift to 17 to continue setting up the beam while this is understood. All the fine tuning of this beam remains to be completed next week, beam permitting.

We went into "energy saving mode" on Thursday evening and gently got our equipment back online until we were given the go ahead from TI around 14H15 on Friday. 20H00 the LINAC team gave us the beam, a couple of problems were solved by Jose and the piquets then we had beam accelerated, albeit badly! It looked as if the TFB was the culprit, so the PiLLRF was called in around 23H00. He did all that he could with the limited documentation he had, but by 02H30 started trying to find a specialist to help him and unfortunately found me. We

diagnosed that the head amps for the pu's weren't powered, when we finally found the supply switched it on and high intensity beams were back by 03H45. Michael, the PiLLRF, remained for another hour to solve a problem with the R4 radial loop.

Saturday morning the BLMs needed to be fixed but as the usual expert was on holiday, C. Zamantas sought the information he needed to solve the problem and had them back by 14H30. I passed by in the afternoon to fix the Tomoscope and improve the capture for the high intensity users. We required the ejection trajectory measurement for the LHC25 beam, but specialists were difficult to find. The first person available couldn't find the solution, but L. Soby passed by in the evening and fixed them by replacing a NIM PSU. During the night shift Jose worked on the LINAC and capture settings for GPS & TOF and got good intensities for both (3100E10 & 800E10)

Sunday the PiLLRF was called for a synchronisation problem for the first batch of LHC25, but he found the extraction reference frequency was wrongly programmed so quickly corrected it. We lost 1.5 hours of PS beams due to BTP.QN050 which required PiPO to change an ADC to fix.

### **PS(Gabriel Metral)**

La coupure électrique du site de Meyrin Jeudi 19H, a été le problème principal de la semaine.

Perte de la patrouille du PS Switch Yard. Remise en état de cette chaîne de sécurité très compliquée (les conditions de remise en route du BT.BHZ10 et des vetos générés par la chaîne de sécurité devront être revus).

L'autorisation de redémarrer nos machines (service électrique) nous a été donnée Vendredi à 14H30 (coupure de 19H30)

Retour des faisceaux TOF, EAST et SFT 34Heures après déclenchement (samedi 5H)

Retour du faisceau AD 42Heures après le déclenchement (samedi 13H) (le beam control de cette opération a été plus long à remettre en route que les autres)

Dimanche matin, problème avec les moniteurs de radiation (mise hors service du PAXP303 par le piquet RP). 2H d'arrêt des faisceaux. En parallèle, intervention du piquet Kicker pour KFA71 (100 'ratés' dans les dernières 24H) et pour QKE73 (changement de soft du G64 => mis conforme à QKE25)

Les faisceaux type LHC ont été repris à partir de dimanche midi après intervention du piquet RF (la synchro ne marchait plus)

Le diagnostic et réglage de la RF PSB est très difficilement faisable par les équipes d'OP. Ce système est une boîte noire pour l'OP depuis le démarrage. Pas mal de problèmes sur certains faisceaux (ex : SFTPRO caractéristiques longitudinales très différentes pour les 4 anneaux PSB)

OP a accepté de figer le User timing EAST2 pour l'opération T8 (restriction avec CESAR)

La semaine avait commencé par l'uniformisation de l'éjection des faisceaux LHC. On a alors découvert une mauvaise implémentation dans la boucle de phase H84 qui introduisait un jitter de 35 degrés d'erreur à l'injection SPS. Une modification de ce système va être implémenté dans l'arrêt technique du 29 Octobre.

Les physiciens de la Zone TOF nous demande a ce qu'on ne programme pas 2 USERS TOF consécutifs : leur système d'acquisition ne peut pas suivre pour le moment.

## SPS (Verena Kain)

### Summary

We started the week with stable running for fixed target physics. Towards the end of the week significant down time was accumulated with Linac 2 RF tube problem all Thursday morning and the general power cut Thursday night.

Since Tuesday the LHC pilot cycle (currently with indiv beam) is in the SPS super cycle for heat runs of the transfer line power converters and extraction test preparation. The extraction pre-pulses are arriving correctly at the extraction kickers with the correct dynamic destination. Interlock testing and setting up of the BETS have started for the transfer lines. Monday or Tuesday next week we will try to extract to the TT40/TT60 TEDs.

On Wednesday the SPS coast was tested first time and with a lot of success. Beam stayed in the machine at the first coast attempt. A few controls issues with BI acquisitions need to be followed up and certain SIS interlocks need to be updated to work during coast mode.

Thursday during day time, the cycle for Ar18+ was tested in the SPS. Injecting the beam into the SPS was not straight forward. It was lost in the injection channel. Injection was only achieved on Sunday afternoon during a period where protons were not available from the booster and the ion cycle was played again in the SPS.

Thursday evening at 19:03 the SPS was hit by the general power cut. Most ring circuits tripped together with RF and kickers. The UA9 equipment also lost their reference positions. The SPS could however recover quickly and without major difficulty. The SPS injectors had many more issues and beam was back only at ~ 3 am in the night from Friday to Saturday, still unstable for some time. Since then the SPS is running stably again.

### Miscellaneous

During the MD on Wednesday the faulty collimator in H6 north area was inspected. It will have to be exchanged. The point in time for the exchange is not decided yet. It will depend on the user requirements. Possibilities are either the scrubbing run or the Christmas stop.

MST tank 1 in point 2 is heating more than in previous years. This is probably due to the different absorber geometry of the TPST. It has been exchanged in LS1.

The temperature probes also seem to be heating with 25 ns. But here the effect is similar for the different tanks and not only localized in tank 1.