

Accelerator Complex Status

End week 38 (Monday 25 September 2017)

TI (Jesper Nielsen)

Reasonably quiet week with an issue on the chilled water production in BA3 and the circuit 360 in BB3 that stopped due to a low flow alarm interlock on Monday. On Saturday the TIM server was down for part of the night, no alarms from many equipment. The problem was traced back to a server with a full disk, which was fixed Sunday morning.

Details: <https://wikis.cern.ch/display/TIOP/2017/09/19/TI+Summary+Week+38>

LINAC2 (Detlef Kuchler):

- ITS3 on Tuesday, all foreseen interventions completed: air filters maintenance, source HV column cleaning, removal of dust sensor, installation of N2 feeding cable at tank1 intersection, control of tunnel cooling
- Thursday night: At 23h vacuum pressure spikes in Tank1 triggered an RF interlock on all tanks, not immediately resettable. RF expert was called on site. A reset of the tanks and restart of operation was possible after 30 minutes. The problem re-appeared just before 5am, but this time RF reset worked immediately. On Friday morning the vacuum team carried out investigations on an ion pump near Tank1, which was found to have gone off during the night a couple of hours before the Interlock. Upon inspection in the tunnel the ion pump was found to be faulty and was switched off. The quality of vacuum in the DTL should not be compromised by this. The RF interlock connected to the faulty pump has been moved to a different pump right next to it.

LINAC3 (Detlef Kuchler):

The plasma chamber, the complete extraction system and the gas bottle of the ion source were exchanged. The beam was back on Friday afternoon. The source is still not very stable as it needs a bit more conditioning.

LEIR (Marie-Elena Angoletta):

LEIR was stopped on Monday September 18th for the injectors' technical stop and did not receive any beam until Friday September 22nd owing to Linac3-related activities. LEIR was smoothly restarted on Friday 22 September afternoon and a small beam was available during the weekend for both EARLY and NOMINAL users.

Two successful LLRF MDs for upgrading the LEIR LLRF according to the LIU MD requests were carried out on Friday 22 (after the machine restart) and on Sunday 24 September.

Two main LLRF capabilities were deployed and partially commissioned.

First, the possibility to operate the LLRF at $h=3+6$: beam has been captured and accelerated (with radial and phase loops) at $h=3+6$. The synchronisation algorithm must still be modified to be able to synchronise an $h=3$ beam with an $h=1$ extraction reference and hopefully this will be delivered soon.

Second, the LLRF has been upgraded to be able to operate the two cavities at different harmonics. The aim is to be able to add an additional third shaping

harmonic via the second cavity to improve the space charge situation as was also done with the Finemet test system in the PSB. In the PSB this is done (for MDs) at $h=1+2+3$ within the same cavity and in LEIR the idea is to capture at $h=2+4+6$ with two cavities.

Unfortunately the second cavity CRF43 went into non-recoverable interlock error immediately after being switched ON during the Sunday MD. The HLRF experts are informed and will hopefully solve the problem soon.

Regular machine operation is not affected as this year's operational cavity (CRF41) keeps working reliably (thanks God for small favours!).

PSB (Alan Findlay):

Overall a pretty reasonable week for the PSB, with just a few issues getting the beam stable after Tuesdays interventions.

The week was dominated by the technical stop, but David confirmed that all planned interventions were completed.

The replacement of the R2 H wire scanner was completed and works once more, and the installation of the prototype wire scanner in section 4 was completed successfully. The machine was restarted around 17H30, but the wire scanner installations required vacuum recovery times that dictated the length of the PSB beam stop. By 02H00 on Wednesday morning the ops crew saw the vacuum was at the correct level to restart with beam. Three rings came back up with only minor issues, but the beam was lost at capture in R4, so the supervisor/equipment specialist came in to investigate. A data link problem on the LL HW meant the beam control did not work, so with the help of the RF controls specialist, this was checked and then rebooted, which got the crate back up and the beam accelerated. The RF specialists were not happy however and then around lunchtime the R4 LL crate crashed several times, confirming their worries. It was decided to roll back to a previous version of the firmware, which took 15 minutes without beam, but the LL crates were stable after this.

The COLDEX beam was checked, adjusted and delivered without issues.

The ops crew started to use the Injection Optimizer application to improve clones of some of the high intensity beams, showing that the injected intensity and extracted intensity could be improved for the same number of turns. These improvements will be applied to the operational beams soon.

ISOLDE (Erwin Siesling):

It has been another very good week at ISOLDE from the operations point of view. No major issues so far.

At HRS the target change was carried out on Monday and setting up of the beam started for the VITO experiment. Some difficulties were faced with setting up bunched beam through the HRS ISCOOL (RFQ) on Thursday. We had been running at 40kV previously and changing to 50kV was not straight forward. The injection and ejection elements of the ISCOOL don't scale linearly with the change in energy. However with combined efforts we managed and Thursday-afternoon stable beam tuning to VITO continued with the radioactive run (Na beams) starting later that night. They have been running very smoothly all the way since.

At GPS /HIE ISOLDE one more day of ^{94}Rb with a 6.2MeV/u energy at a reduced proton current ($0.5\mu\text{A}$) was sent from Wednesday until Thursday-morning to the Miniball experiment after which at the Low Energy part of ISOLDE a few collections (without protons on target) of long lived ^{226}Ra at the GLM line were carried out.

Friday the target change at GPS was done according to schedule. Stable beam setting-up has started for the next HIE ISOLDE run and will continue on Monday.

Technical:

- The Technical stop on Tuesday has been pretty much transparent for ISOLDE.
- Only two trips of REX RF amplifiers (7 Gap1 & 3) and once an SRF amplifier (XLH2.CAV3) on Wednesday during the HIE ISOLDE run for Miniball. The machine has been remarkably stable during the whole run considering all 15 SRF amplifiers are running at high gradient. Also on the REX side things have been very stable.
- A turbo pump controller needed replacing at REX Trap on Wednesday-morning (Abel Gutierrez TE/VSC).
- For some time now some of the convertors for the electrostatic elements in the MSW/CAO sector would drop off. Sometimes there could be days in between. Julien Parra-Lopez (TE/EPC) has had a look and replaced some of the old lemo's and connections on the inhibit/vacuum interlocks and things seem to be stable now.
- The convertors for one of the elements in the HRS sector (HRS.QP330-Vert & Hor) drops off from time to time (can be days in between). The power supplies have been changed but the effect is still there. This might be related to a cable problem or short in the machine. To be investigated.
- Few interruptions of protons from PSB but causing very little downtime.

PS (Denis Cotte):

Une semaine dans la moyenne pour le PS avec une disponibilité faisceau de presque 89%.

En prevision du TS3, les faisceaux haute intensité ont été stoppés lundi à 16h, les autres faisceaux vers 5h sauf le faisceau COAST pour UA9 coupé à 7h30.

Les accès du TS3 ont commencé après le Survey RP vers 8h30 jusqu'au soir vers 18h30. L'intervention nécessitant le plus de temps avant retour faisceau étant le changement du FWS64V.

Les conditions de vide pour le faisceau sont revenus vers 3h du matin mercredi.

Deux problèmes majeurs ont retardé le redémarrage mercredi matin :

- _ un processus RF manquant sur la machine « cfv-353-allbc4 » que le spécialiste de la class FESA a redémarré.
- _ le câble d'alimentation d'un « pulse repeater » du Centre Anneau trouvé déconnecté.

Ce dernier empêchant des timings de synchro d'être produit, les cavités C20\40\80 MHz ne pulsaient plus. La production des faisceaux LHC multi-bunches pour COLDEX était impacté pendant un peu plus de 4h.

Quelques brèves interruptions du faisceau (<15 minutes) jusqu'à vendredi à cause des machines en amont du PS (PSB et Linac2).

Vendredi dans la nuit, tous les faisceaux sur les « beam control » autre que H8 présentait des pertes et des erreurs de phases importantes. Un « pulse repeater » défectueux du Centre Anneau a dû être changé. Environ 3h30 sans faisceau pour AD et LHC.

Enfin, Samedi des problèmes sur l'anneau 1 du booster impactait tous les faisceaux à l'exception de TOF et EAST pendant 1h45.

Du côté des bonnes nouvelles, le faisceau 8b4e a été pris au LHC tout le weekend sans soucis.

La ligne T11 de la zone nord a été mise en route pour l'expérience CLOUD.

Le PS a de nouveau deux « Fast Wire Scanner » disponibles dans le plan vertical.

La régulation des « Pole Face Winding » semble bien meilleurs depuis le technical stop. Depuis Mardi, il n'y a pas eu de déclenchements de ces convertisseurs.

AD (Bruno Dupuy):

Technical Stop:

The work was divided into 3 simultaneously conducted work groups, whose reports are summarized here:

- T.Koettig (TE CRG CI) and M. Filipe Abreu Fernandes (BE BI PI) carried out operations on the transformer BCCCA (Cryogenics parts and Electronics components).

- A.Newborough (TE MSC MNC) and A.Sinturel (TE VSC BVO) carried out inspections of the machine, as well as the preparatory work for the next shutdown and for LS2.

- A.Frassier (BE BI EA) and J.Cenede (BE BI EA) found during the electron-cooling inspection poor conductivity on the demineralized closed circuit of the collector. A conductivity greater than 0.5uS (micro-Siemens or $\mu\Omega^{-1}$) five times greater than the normal, that required emergency change of resin filters (unexpected but brilliantly executed).

The AD beam was available on Wednesday morning. This period dedicated to the injection of antiprotons for Elena. It was disturbed by a problem on the Horn PLC upgrade. This time was not lost, it was used for a setting of the protons on the target through the screens (usually very disruptive for the users).

The beam for users was very stable with a nominal extraction (more than $3E7$ antiprotons per extraction).

Only known events:

A horizontal beam variation for ALPHA, corrected by an extraction kicker adjustment and FL preventive intervention on DE0.DHZ45 power supply.

Elena:

It should be noted that the sessions of Wednesday morning and Friday morning (injection of antiprotons into Elena) brought significant improvements to

capture and deceleration of the antiproton beam (RF team Maria Elena, John, Michael).

SPS (Verena Kain):

The week started with a 24h UA9 run before the injector technical stop. The run was successful despite some difficulties at the beginning where trims during COAST were not possible anymore as non-ppm actions are treated differently now in quasi-ppm situations. The LSA team was very reactive and provided a fix during the day. In the night the UA9 team was able to see the channeled beam by two crystals one after the other, which was a very important result.

Tuesday was technical stop. The survey team found that not quadrupole 523 had sunk, but 518. The single polyurethane jack was completely collapsed. During the technical stop all economy modes were enabled in the main circuits again by the EPC team, the BCT3 class was renovated from FESA2 to FESA3 and the SIS was upgraded.

The economy modes were tested already Tuesday evening with the EPC controls expert and declared operational.

The COLDEX run could only start early afternoon on Wednesday due to an issue with the PS RF systems. The COLDEX team took 288 bunches with up to 1.5×10^{11} per bunch until early morning Thursday. The MKP PFN 6 experienced many trips. Unfortunately it was only noticed very late that even though only 4 injections were programmed in the beam and the MKP application, 5 repeats were declared in the CTIM working set. So, the PFNs were charging with the pre-pulses systematically not coming for the last two injections.

Many issues were detected with the new BCT class and the SIS. The SIS did not allow certain ways of declaring the selectors for the subscriptions anymore and the BCT based interlocks were giving wrong results due to the change of the sampling frequency. All applications using the BCT, as well as the SPS QC needed fixes. It took about 2 days to find (hopefully) all problems. The Larger pages did not work anymore either due to the BCT class change and could only be fixed Friday afternoon.

The fixed target beam start had to be delayed on Thursday to about lunch time because of a water leak on a magnet in TDC2.

Due to the orbit change in the horizontal and vertical plane with the alignment of QF.518, substantial steering was required in the transfer lines to the LHC. The steering the SPS extraction regions should be re-visited.

Preparing the high intensity beams in the SPS was not straight forward after the TS. The experts needed to work on the 800 MHz software and power after the TS to keep the beams stable through the ramp. During the weekend the SPS delivered 12 bunches and 8b+4e, the standard version.

Friday morning the LHC Xe ion cycle was tested without beam to be ready for taking beam the coming week.

Since the TS, the SPS is running with dynamic economy enabled on all high energy cycles.

LHC (Enrico Bravin and Jorg Wenninger):

TS2 ended Thursday morning when the cryogenic conditions were recovered in the triplet. An Earth fault on circuit RB.12, due to a loose Earthing cable on the DFB, delayed the restart until Thursday midday. The first beams were back in the early evening, but the beams were found with huge separations (up to 20 sigma in ATLAS) in IR1, IR2 and IR5. Fortunately, the DOROS BPMs at Q1 could be used to steer then beams back into collision. The aperture was checked to be ok, the TCTs and TCLs were aligned and the RPs were aligned. This was followed by around 6 hours of RP taking. Friday evening the machine was ready to start the loss map campaign that lasted until Saturday Morning. The first ramp up fill with 51 was delivered Saturday afternoon. The ramp up went on smoothly though 600 & 1300 bunches, the first nominal fill with 1916b of 8b4e started midday on Sunday.