

Accelerator Complex Status

End week 45 (Monday 12 November 2018)

TI (Ronan Ledru)

Tue 06/11/18 at 22:43, Power failure in EHN1 Kompass area. Local emergency stop was activated and trip power supply for several "barrack". Ti operator on site and fixed problem according with EN-EL-OP piquet

Wed 07/11/18 at 05:47, Trip of SPS beam caused by loss of communication with BA2 WIC which tripped the mains. TE/MPE, SPS DSO and EN-EL-OP called to fix the faults in different parts of the emergency power chain

Thu 08/11/18 at 07:23, Electrical disturbance on RTE network caused PS beam dump (SPS and LHC already stopped for other reason). RTE confirmed a voltage drop about -17,6% in Creys/Genissiat network during 70ms

Details: <https://wikis.cern.ch/display/TIOP/2018/11/12/TI+week+summary%2C+week+45>

LINAC2 (Detlef Kuchler):

The last week of Linac2 was nearly perfect. We lost only 10 minutes on Thursday morning due to a power glitch.

LINAC3 (Detlef Kuchler):

The source tripped also on Thursday due to the glitch (46 minutes lost). On Friday some source instabilities had to be tuned away. But in general, only some days after the repair, the source was delivering a incredible good beam (intensities out of the linac most of the time over 30eμA, good stability).

The main event happened on Saturday: Around 8h lost due to a repair on tank3. It took so long as tank2 and tank3 are power by the same high voltage power converter and the diagnostics was difficult to find out which part of the chain was the broken one.

LINAC4 (Bettina Mikulec):

94.9% availability.

Week dedicated to rephrasing of the linac after exchange of several cavity control loop modules to the upgraded version.

Monday: PIPO repaired solenoid and the RF team exchanged once more the 20 kV source high-voltage capacitor following its explosion.

Tuesday: ABP started a test of a gas regulation loop that could become part of a future 'Autopilot' application. R. Borner exchanged the remaining old versions of cavity control loop modules, which required a rephasing of the linac.

Wednesday: rephasing of the linac started and continued until the end of the week; fine-tuning still ongoing.

Over the weekend running stripping foil tests.

LEIR (Maria Elena Angoletta):

LEIR has been providing EARLY- and NOMINAL-type beams to LHC during week 45, although the road was often quite bumpy.

Thanks to the hard teamwork of the LEIR supervisors and experts, LEIR managed to recover LIU performance for NOMINAL beams already on Tue 6 November afternoon, with almost $12E10$ charges accumulated and $9E10$ extracted.

This good result was short-lived because something happened at 2 am on Wed morning – a change of energy distribution was suspected - and the LEIR performance dropped significantly. By changing Linac3 parameters and re-optimising LEIR ones it was possible to recover the original EARLY performance by Wed lunchtime, with about $1.7 E10$ charges extracted. The NOMINAL performance was recovered soon afterwards and nearly $11 E10$ charges could be extracted.

On Thursday 8 morning an electrical glitch affected Linac3 and LEIR did not get beam for about one hour. The source then was a bit fluctuating during the day but LEIR could overall keep a good performance .

On Friday at 14:00 the Linac3 current dropped. The Linac3 supervisor was called and managed to recover 32 microamp (as observed on T41) by the end of the working day. Later on some NOMINAL beams in the supercycle started to show a bad capture, and the situation got worse from 21:15 onward. The LHC fill was as a consequence half of the expected intensity. This problem on NOMINAL was traced back to excessive cooling that was making the beam unstable and was resolved before midnight by reducing the ecooling.

On Saturday morning at around 7:00 the Linac3 stopped providing beam. RF and EPC experts tracked the problem back to the RF amplifier feeding Linac3 Tank 3. The problem was fixed during the morning and beam was back to LEIR at 13:50.

No further problems were experienced at the time of writing.

During the week, RF setup to operate LEIR by using the spare cavity CRF43 and beam optimisation MDs were done. The results were then transferred to the operational users (MDEARLY to EARLY and MDNOM to NOMINA) so that operation could profit from the progress obtained.

PSB (Jean-Francois Comblin):

It was another excellent week for the Booster with 99% availability.

There was only a few resets and an electrical glitch that required the intervention of the power piquet.

The MD schedule has never been so busy, even during the week-end. MDs and data collection continued until the last minute.

The beam was stopped at 8AM Monday morning.

ISOLDE (Simon Mataguez & Alberto Rodriguez):

It has been a busy week at ISOLDE with beams delivered to four different experimental stations. GLM, GHM and LA1 have been taking several Actinium isotopes from the GPS target since Wednesday. In parallel, we used the HRS target to provide ^{33}Ar and ^{32}Ar to the WISArD experimental station (a.k.a. WITCH) last Thursday evening.

PS (Denis Cotte):

The PS had a good week, delivering the scheduled Operational and MD beams. This last week of proton beam for 2018, PS availability is around 89.1%.

Nearly half of the downtime resulted from the injector side. (p+ and Pb)

On the PS side, the downtime was mainly due to the ejection bumper BSW22. (~4h45 with no beam in TT2).

Like last week, the origin of the failure was water drops coming from the roof of the building 365. This power supply is now equipped with a rain protection.

On Wednesday, an access to the PS-Ring was done in order to replace an amplifier on the cavity C10-11 before starting dedicated MD session. (~1h30 with no beam)

There was no ions in PS for about 9h this week (~1h on Thursday and ~8h on Saturday), due to Linac3 issues.

During the weekend, we had several short beam interruptions because of PATP511 (RP monitor). Piquet RP has been called to solve a sensor issue on it.

Today, we stopped all proton beams in PS at 8am.

Final intensity on target for TOF in 2018 is $2.31E19$ pot. This is 6.5% higher than the established goal.

Ions beams were delivered to SPS/LHC all along the week. There was also plenty of MD beams in the PS all over the week until the last day of the proton run.

AD ():

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ELENA (Christian Carli):

Quite successful last week of ELENA commissioning and operation for GBAR before LS2.

It has been possible to reduce the losses along the second ramp down to 100 keV. From Wednesday on, the maximum possible RF voltage (500 V possible with one FineMat gap far more than needed for ELENA) has been reduced (lower gain of power amplifier) aiming at reducing possible RF noise, which had been discussed as a possible limitation. On Friday, harmonic numbers larger than $h=1$ were possible after an update of the LLRF system and have been tested for the second ramp and for rebunching at 100 keV. The observations made have to be carefully analysed to understand the reason(s) for the improved efficiency along the second ramp.

Some observations made with bunched beam cooling using harmonic number $h=1$ at 100 keV on Wednesday (with higher intensity available) indicate that limitations due to direct space charge detuning. This was one of the motivations for tests with higher harmonics. Switching to harmonics $h=4$ (nominal value for ELENA operation) allowed to reduce these losses and to obtain four bunches with about half the design intensity (preliminary - to be checked).

SPS (Kevin Li)

Week 45 was the last week of protons for the SPS together with first ion physics for the LHC. Availability was a mediocre 80%.

Major down times were on Tuesday as we lost of the mains which appeared coming from a WIC interlock after loss of communication in BA2. This could temporarily fixed but was followed by other issues with systems in BA2 originating from the same fault. Finally the source of the problems could be traced down to a blown fuse of an 80V power supply. After replacement the machine was back. On Friday the beam to the North Area was cut due to a trip of the MBE2103 on a cooling fault; fortunately there was no major fault on the actual device but rather a wrong input signal that kept causing an interlock. After expert investigation this could be fixed. Other faults came from the extraction bumper of the PS and on Saturday a bigger problem with a Linac3 RF amplifier.

On the positive side, since Tuesday afternoon the SPS has been ready to provide nominal ion beams to the LHC. Despite problems and instabilities with the source, the Early beam was ready for extraction to the LHC on Monday. The orbit at extraction for B1 was found to be off by 8mm, after correction the losses improved significantly. B2 needed a new TCDI alignment which was done in the evening. On Tuesday the long cycle (LHCION1) was prepared and by the later afternoon was ready to be used.

Another short cycle with a single injection of 4 bunches has also been setup on LHCION4 and is used by the LHC for single injection tests and as a "PILOT" beam cycle. Some further optimization of the long cycle were done over the weekend such that now the single bunch intensity is brought close to $1.6e10$. There have been problems with the settings of the extraction interlock BPMs which also occurred again on the weekend and still needs some follow up.

The UA9 coast on Wednesday was completed successfully as were the T6 target tests. The DSO tests for the FT ions were done on Thursday in the shadow of the PS access for the extraction bumper. Furthermore, test were done for the new prototype wire scanners, the horizontal wideband feedback kicker and the new ALPS; the ALPS test revealed problems with the acquisition timing which are being followed up. The BPM migration has been completed in BAs 2, 3 and 5. The new linkrules for MBE2103 have been deployed.

North Area, AWAKE and MD users have all eagerly taken the last protons of this year.

LHC (J. Wenninger & E. Metral):

The toughest week of the year !

Ion capture and TL setup and partial revalidation took place on Monday. First collisions with ions were seen Tuesday in the early morning. Issues with the shape of the loss patterns in IR7 raised questions on the collimator alignment. The issue was studied extensively and it was concluded that the hierarchy was correct and that the

loss patterns were due to particle showers. Due to ions leaking out from IR7 creating important losses in IR6 (B2, TCSP) and IR1 (B1, TCTPH), one B2 TCSP jaw was opened by 2 mm in IR6 while one B2 TCP jaw was opened by 0.5sigma. Cycle, collimation and crystal setup was completed Wednesday night, leading into the usual loss map campaign. The first physics fill with 64b tool started Thursday evening, but unexpected losses on the B1 TCTPH at the end of the squeeze required another collimation test on Friday. To cure those [EoS](#) losses, the TCTPH in IR1 was opened by 2 sigma to 11 sigma (aperture at 12.5-13.5 sigma). The machine was revalidated with LMs and asynchronous dump test at end of squeeze and in collision. The first 260b fill went to stable beams Friday night. The number of bunches was increased to 460 Saturday night, with ALICE levelled to 10^{27} cm⁻²s⁻¹. In the 260b fills it became apparent that the ALICE luminosity was a factor ~2 below expectations. Emittance scans in the IRs revealed that the beam sizes in both H and V planes were larger by a factor ~1.4 in ALICE. For practical reasons the usual early beam bunch was replaced by one 4b train as probe beam in the LHC. Main perturbations of the week were of course the source stability following the intervention in the previous week. By Thursday however the performance of the injector chain was again excellent. On Saturday morning a fault in an RF amplifier led to ~8 hours without beam.