

# Accelerator Complex Status

## End week 43 (Monday 29 October 2018)

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### TI (Jesper Nielsen)

Some alarms related to the first rain since a long time and on Wed 24/10/18 22:24 SF2 cooling towers valve in alarm and soon after low pressure for CRYO. Installation put in manual by TI operator to close the valve that had not closed correctly and in parallel fill slightly the level to not trip on low level. Piquet informed about the intervention and a control of the filters is planned for tomorrow. On Fri 26/10/18 13:54 the BA6 cooling for beam dump tripped, TI was notified by SPS operators, no alarms were seen since an alarm was already active for maintenance works.

Details: <https://wikis.cern.ch/display/TIOP/2018/10/29/TI+Summary%2C+Week+43>

### CLEAR (Alessandro Cursio):

The first two days of operation (Monday and Tuesday) were still dedicated to the Strathclyde University users. The aim was that to demonstrate the possibility to tightly focus a hundreds MeV electron beam in water. The experiment has been performed by using water phantoms. The users have collected successful data for two different beam energies (200 MeV and 160 MeV), and for different depths in water of the beam waist. At the end of the experiment they were happy for the quality of the data collected and for the success of the experimental idea.

On Monday evening, the experiment of the Strathclyde users had a few hours break, in order to provide time for irradiation to an another group from Uppsala.

They wanted to irradiate 60 GHz receiver and transmitter devices. Experimenters were so enthusiastic that they are going to ask for another test on 120 GHz electronic boards.

Wednesday, Thursday and Friday were dedicated to the group of the Manchester University. The aim of their experiment was again to demonstrate the tight focusing of the beam in water phantoms, but also doing it at four different energies, different depths of focusing, meanwhile detecting visible Cherenkov light for finally making a correlation between the amount of this light and the radiation dose on the phantoms. Until now the experiment has been completely performed for 200 MeV and 160 MeV beam energies, and half completed for a third energy (100 MeV). If everything ok, next Monday it will be completed for the 100 MeV energy and next Tuesday for 50 MeV. Users happy by now.

### LINAC2 (Giulia Bellodi):

Linac2 had an excellent week, with 100% beam availability.

### LINAC3 (Giulia Bellodi):

Linac3 had also a very good week. An oven refill took place on Thursday and beam has been very stable since. Taking advantage of the beam stop on Thursday, some new thicker (125 and 150 ug/cm<sup>2</sup>) GSI-made foils were installed for tests before the start of the physics run.

### **LINAC4 (Bettina Mikulec):**

Very good week for Linac4 in terms of availability (98%).

The frequency of the RFQ trips decreased after adjustment of the voltage limit following the klystron/modulator intervention the week before.

On Thursday the RF team started investigating the Kalman filter to fight beam loading in the cavities (feed-forward algorithm), which will be essential for good beam quality at PSB entrance. The final tests can only be done during the LBE line run next year.

The Bunch Shape Measurement 1 system is again working after exchange of HV boards.

The optimum phasing of CCDTL5/6 is still being investigated.

Currently the Linac4 source is down (voltage source fault of the RF HV power supply) - the specialists are working on it...

### **LEIR (Simon Hirlander):**

LEIR had a good week, which was characterized by MDs. Only one major fault concerning the extraction BPMs occurred, which needed access to be fixed. On Thursday the Linac 3 oven was refilled, and bringing LEIR back to operational mode on Friday (26th of October) did not show any significant problems. The transfer line LEIR to PS for the Nominal cycle was optimized yielding an efficiency of 95%. The weekend (w43) was calm, and LEIR was running stable. On the MD side, there was a study on LLRF commissioning the possibility to receive in real time over fiber the orbit position, the IBS+SC studies of a cooled bunched beam were continued and tests, trying to compensate the stray fields, were carried out.

### **PSB (Alan Findlay):**

The PSB week can only be described as excellent with better than 99% availability. Very busy for the team trying to manage the hefty daily MD program, but no serious issues to report.

There is a reported PS-PSB synchronization issue for the MD\_LHC25\_8b4E\_A\_PH user that will be followed up by the experts this week.

There are also issues when mapping cycles, but the experts are aware and available to investigate if we experience the same problem.

Many, many PSB MD's were also carried out, keeping the whole team very busy.

### **ISOLDE (Emanuele Matli):**

it has been a quiet week at ISOLDE with GPS and HRS running in parallel without major issues. GPS delivered beam to GLM while HRS was shared between VITO, IDS and ISOLTRAP.

### **PS (Frank Tecker):**

An excellent week for the PS, with beam availability of 98.6%. There was a lot of activity for the LHC MDs and for ion setup, and all the requested beams could be provided.

On Sunday, the PS reached the predicted integrated intensity of  $2.17 \times 10^{19}$  protons on target for nToF, about two weeks earlier than foreseen.

The only significant problem was a simultaneous trip of POPS and some PFWs on Friday, that caused 44 minutes downtime. In addition, there were still several trips of the PFWs due to their regulation and due to rms current.

Another problem was encountered during the preparation of the ion beams, with longitudinal problems after transition. This was caused by a wrong stable phase program due to broken adapter cable for the detected voltage on harmonic 21. The new amplifier on the C11 cavity was still showing some issues and is being followed up by the experts.

### **AD (Lajos Bojtár):**

The AD was running this week well with good intensities. There were occasionally low intensity shots due to work on the injection kicker. Sunday evening an intervention was needed to adjust the e-cooler cathode voltage, the ejection kicker timing and steering in the ejection line.

Apart from these smaller issues there were no major HW problems.

### **ELENA (Sergio Pasinelli):**

Due to a fault on the 400Hz converter (we have received a spare from Jülich (it arrived at CERN, but it is not yet at ELENA) and also due to sparks in the isolation transformer the source was not available during the week.

Due to ALPHA installation, we have had PBAR beam in ELENA Monday from 8h to 15h. During this period we spent time to simplify all functions in last ramp. This work increase the efficiency of the deceleration on this ramp from 40% to 65%.

We also have had the first calibrated measurement with the longitudinal PU in the LNE50 line.  $5 \times 10^6$  particles are seen by the PU.

Investigation was done in RF in order to understand the longitudinal blow-up during the capture at 35MeV/c. An HLRF driver amplifier was replaced by 16 dB attenuator. Also some precision measurements were done on the RF Cavity.

Vacuum team has replaced a LNS primary pump.

Friday we have negotiated Pbar beam for 2 hours with Alpha in order to check the influence of the Penning Gauge permanent magnet on the machine tune. Vacuum team has removed all the permanent magnet for the tests.

Unfortunately we spent more than 1:15 hour to recover beam in ELENA. The cause was due to a wrong phase loop due probably due to a change in cabling path between LLRF and HLRF.

An effect was seen on the tune. More investigation are needed!

Masaki should be at CERN during the week-end and he should install the head amplifier on the second SEM in the LNE50. Tests will be done Monday morning with him.

### SPS (Francesco Velotti)

Also this week we didn't get bored at the SPS. Pretty good availability in terms of faults, but NA physics was significantly impacted by the LHC MDs.

The beginning of the week was devoted to the preparation of the special beams for the LHC, mainly the very high intensity ( $2e11$  p/b)  $4 \times 12$  bunches. This setting up has seen RF experts working very hard to stabilise it and to make it ready for the injection in the LHC.

The SPS dedicated MD was longer than usual, with the 13h used for the test of the prototype of a SHiP-like target for future FT experiments. The dedicated time had to be share with the LHC as well, as the LHC MD block 4 started the same day. In the end,  $2.4e16$  POT were accumulated on the test target in TT25 (T6). At the same time, test of using a Si bent crystal to reduce losses at the ZS was also carried out, for the whole duration of the MD. Again,  $\sim 40\%$  loss reduction at the ZS was observed and confirmed the results from the first MD.

During the whole week, a few issues were reported on our RF system. We had several short problems, where only in 3 occasions the piquet had to intervene directly. The one to follow up is the fact that we observed TX5 not delivering any power, but all the surveillance systems didn't see this. It took quite some time before the issue was found and solved.

After the dedicated MD, the losses on QDA.219, which were increasing constantly since last week, had reached thresholds. After quite some time investigating, the orbit was found to be the cause. After re-flattening the orbit at extraction on the vertical plane, all went back to normal and NA could take finally beam.

The other 2 longest stop where cause, directly and indirectly, by the ZS. First, Friday we had to deliver  $8b4e$  beam to the LHC, hence the SE was stopped to avoid the ZS sparking. This cause in total  $\sim 4h$  of no beam for the NA. Then, over the weekend, a short circuit in the ZS PS needed the piquet intervention in order to restart with physics.

The LHC MD beams were much simpler during the weekend, hence this proceed without major hiccups. We had also a few trips of the mains due to a door that vibrates.

On the bright side, we managed to deliver  $1.85e11$  p/b in trains of  $4 \times 12$  bunches to the LHC - it was tried to go higher, but lack of time and (probably) unrelated RF issues made this test stop.

### LHC (Matteo Solfaroli & 8:30 meeting):

The proton physics run ended Wednesday morning, followed by the extended MD4. The 2018 integrated luminosity reached  $66 \text{ fb}^{-1}$  and the total integral for Run 2 has reached  $160.1 \text{ fb}^{-1}$ , bringing the total integrated luminosity for the LHC to  $189.3 \text{ fb}^{-1}$ .

The MD program is executed according to schedule with high machine availability with only minor issues.

