

Accelerator Complex Status

End week 33 (Monday 21 August 2017)

TI (Jesper Nielsen)

Despite some cooling related issues at the start of the week and a power glitch on the 400 kV on Friday end of the afternoon the week was good.

Details: <https://wikis.cern.ch/display/TIOP/2017/08/21/TI+Summary+Week+33>

LINAC2 (Rolf Wegner):

A difficult week for Linac2 for RF, the other running well.

- Buncher 1. Starting last Saturday (12 August), Buncher 1 had missing pulses, frequent and random. During those pulses, the entire RF pulse was fully reflected and not arriving at the cavity. A number of components of the amplifier have been replaced which showed abnormalities (a number of control modules, high power directional coupler, amplifier output coupler). Furthermore the amplifier for the master timing has been replaced. Those actions have cured the problem on Wednesday 12:30. Since then only 6 missing pulses in 5 days – a normal behaviour, seen over the past years.
- RFQ. On Saturday afternoon, a failure of an auxiliary power supply in the RFQ amplifier stopped the Linac for nearly 4 hours (in parallel with an PS access). The fault was hard to find since no error indicators are available in the rack.
- Debuncher DB10. On Sunday morning a major fault of the Debuncher DB10 stopped the Linac. A number of components of the high voltage supply were found broken and have been replaced (anode rejection filter, high voltage resistor, diode bridge, capacitor). The amplifier tube was exchanged twice, since the first tube (brand new) was faulty.
- In the night to Monday, several trips of the Buncher 1 preamplifier and the Debuncher amplifier occurred. A follow-up is ongoing.

The source spark rate seems to be normal, 19 flashovers have been recorded in 7 days.

LINAC3 (Rolf Wegner):

Linac3 is running quite well.

2 trips of the Thomson generator last week.

Slight beam intensity fluctuations were seen. Thursday afternoon the reason was found to be a small fluctuation of the rise time of tank1. A few control modules of the amplifier were replaced. The situation improved, however the 2 tubes of the tank1 amplifier need to be exchanged in the coming weeks. That will solve the problem fully. The beam intensity is typically between 30 and 40 uA.

LEIR (Maria-Elena Angoletta):

Summary of the summary: everything is OK, good progress with MDs and a recurring problem with the high voltage part of the CRF43 Finemet cavity. HLRF experts are working on it but operation is not affected whilst waiting for it to be repaired since we are now using the second cavity (CRF41) as the operational one.

Summary:

- Monday 14 August: MDs with high intensity beams.

- Tue 15 August: Dedicated Linac3 MD. No beam for LEIR.
- Wed 16 August: HLRF MD. A new application to control the HLRF is deployed and validated. This displays additional diagnostics information that can help in case of troubles. Unfortunately the high voltage part of the CRF43 cavity (spare cavity) got faulty and expert intervention is needed.
- Thursday 17: beam to SPS.
- Friday 18: BPMS MD. The power glitch that affected other machines brought down only the CRF41 cavity, that could be restarted remotely without problems.

PSB (Gian Piero Di Giovanni):

It was a complicated week for the PSB.

Most of our downtime was unfortunately due to issues related with Linac2:

- The week started with the issue in buncher1 from the previous Sunday causing low intensity shots from time to time. In the following days few stops were required for different tests. On the other hand, as operation could continue in degraded mode we planned the interventions in order not to affect LHC fillings. The problem was resolved on Wednesday after a 2-hours-long intervention during which the directional coupler, the amplifier output coupler, the capacitors of RF anode voltage rejection filter of buncher1 were replaced. The Linac2 and PSB teams will still keep an eye on buncher1 and the Linac2 RF is planning for tests during the next TS.

- On Saturday afternoon the Linac2 RFQ stopped delivering enough power. The Linac2 RF team reacted quickly and the issue was fixed by replacing an auxiliary power supply. LHC was operating in stable beam during the 4 hours downtime.

- On Sunday morning at 4:15 the Linac2 debuncher was out of order. The Linac2 RF team promptly came on site. In order to fix the problem they replaced the high voltage resistor and its support, the tube, and the diode bridge together with the high voltage capacitor. The downtime turned to last about 10 hours and unfortunately it directly affected LHC which had just dumped the beam 30 minutes after the Linac2 problem had shown up.

My big personal thank you to the Linac2 Supervisor, the RF team and the PSB/PS operators because despite the many problems, they were always reactive and supportive of operations and did their best to fix the issues as quickly as possible.

As a side note yesterday night both Linac2 buncher1 and debuncher went in error few times stopping the beam, but in all instances a reset worked and the downtime was of the order of few minutes.

The PSB itself experienced few downtime:

- On Wednesday morning for about 1 hour we were not able to control the machine because of networking issues with INCA/LSA service which were fixed by BE-CO support.

- A network glitch on Friday evening causing several equipment to trip and which needed about 10 minutes to recover from.

- A trip of one of the recombination kickers, BT2.KFA20 which required the piquet intervention to replace a timing cable and caused about 1h45 downtime. During the week we had some minor issues with the extracted vertical trajectory of R1 drifting, which was always brought back in order by tuning the recombination septum, BT1.SMV10.

Couple of BI issues showed this week:

- A timeout error for the WS of R3V which appeared in the week-end and will require the expert intervention today to reset it home.
- The 3rd vertical SEM-grid which shows a systematic alternate pattern in the transverse profile. The BI experts are aware and working on it but a fix has not been found yet.

As always a lot MD activity throughout the week.

ISOLDE (Alberto Rodriguez):

It has been a very good week at ISOLDE with little downtime due to problems of the equipment in the facility. We have been conducting several important activities in parallel:

- Set-up of the HRS separator and delivery of several very exotic isotopes of Krypton and Argon to the ISOLTRAP experimental station
- Set-up of the GPS separator and delivery of an isomeric state of ^{111}Cd to the GLM line for several solid state and biophysics experiments
- Beam commissioning of the XT03 high energy line and initial preparations for the delivery of $^{15}\text{C}^{5+}$ at 4.3 MeV/u to the scattering chamber this coming week

Other than the problems with linac2, we had some small issues with the tape station, the power converters of the HRS separator dipoles and with one of the electrostatic quadrupoles. Our colleagues in EPC controls had to work pretty hard to solve a problem with the field regulation of the power converter of the XT03 dipoles. And, we had to organize an intervention to install a new set of carbon stripping foils and to replace another set that failed.

PS (Heiko Damerau):

With about 79% the beam availability from the PS was well below an average week. The major part of the downtime was however due to two major faults of Linac2, amounting to in total about 20 hours.

No beams could be transferred from the PS to the SPS any more on Tuesday morning and a cable for the warning timing PEX.WSPS was found cut in building 354.

During the first half of the week the injection septum was not pulsing on rare occasions. This problem disappeared once additional timing pulse repeaters were installed on Tuesday afternoon.

On Thursday morning a trip of the modules 10 to 12 of KFA71 (SS79) caused a vacuum spike. An access for a short inspection of KFA71 was organized later that morning which caused in total 1h50 downtime for all

users. Module 12 (SS79) will stay disabled until the injector technical stop in September.

On Friday the operations team found that the interlock that should prevent the TOF bunch from being extracted towards EAST did not work any more. This was apparently due to a bad contact in the distribution of the dump trigger timing (PX.SD48TRDC), as local investigations by the BE-CO specialist fixed the problem.

For all beams 2h30 and for the MTE beam 2h30 more were lost due to a failure of one magnet of the octupole family PR.ODE. An access was necessary on Saturday and the magnet piquet identified insufficient water flow due to a valve in the ring not fully opened for the magnet in SS50.

The operational MTE beam for the SPS has been migrated to the production scheme using new multi-harmonic RF sources on Thursday. Apart from minor fine tuning in the SPS, this has been largely transparent. Also the TOF and EAST beams were tried with this new production scheme, but the users decided to keep the standard cycle to complete a long series of data taking. The migration is now scheduled this week.

LHC-type beam with 25 ns bunch spacing was delivered for Q22 studies in the SPS with an intensity of more than $1.7E11$ ppb and excellent longitudinal parameters using the coupled-bunch feedback with the Finemet cavity.

AD (Bruno Dupuy):

Monday 14	
7H00 - 15H00	ADE MD period. - Access for intervention on BCCCA (Beam Cryogenic Current Comparator version A). - Transfo. DE.BCT7049 calibration. The value was wrong more than 10%. - Optimisation of FTA line (before the target) without relevant effects.

Tuesday 15	
11:26 - 12:46	DR.QUAD-TRIM3 was malfunctioning. The power supply doesn't follow the signal generator. Back to normal after First-Line local reboot.
21:53 - 23:59	The Power-Supply DR.BHZTR48.49 switches between zero and the consigne value every 10 seconds.

Wednesday 16	
07H00 - 15H00	This period was dedicated to the injection of antiprotons from AD to ELENA. During scrapers MD, lots of micro-channel plates (MCP) detector studies for future beams profile measurement was made.

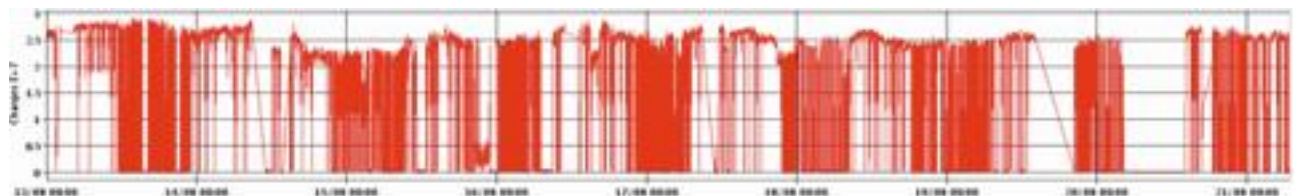
	(see https://ab-dep-op-elogbook.web.cern.ch/ab-dep-op-elogbook/elogbook/secure/eLogbook.php?lgbk=31&date=20170816&shift=1)
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Thursday 17	
11:15 - 13:13	Cavity C02 down due to broken cable on the resonator (AVR). Fixed by the specialist (A.Jibar).
12:52 - 13:15	The fast pulsed convertor (MegaDiscaP) DI.BHZ6045 was down. It's very long to restart this equipment because only one command must be sent by AD cycle (113 sec). Furthermore the ramp is limited at 300 Amp by cycle. So a restart take (12 x 113 sec) more than 22 minutes for a simple RESET (in the best case)
15H00 - 16H00	The BASE experiment no longer receives a trigger on BTV. A.Guerrero fixed this issue.
Remark 23H00 - 07H00	Very bad beam, many instability during the ALPHA night shift. The extracted beam fluctuates between 2.5E7 and 1.4E7 antiproton. The injection power-supply DI.QDE6010 shows significant variations in acquisition. This disappears after a reboot.

Friday 18	
7H00 - 15H00	This period was dedicated to the injection of antiprotons from AD in ELENA. The RF specialist works to improve the RF capture. (See https://ab-dep-op-elogbook.web.cern.ch/ab-dep-op-elogbook/elogbook/secure/eLogbook.php?shiftId=1089280).

To conclude, the extraction intensity is not satisfactory. Likewise, the FTA line (before the target) is not nominal. The settings are very different from the references and require a constant adjustment. The problems of the injection CPS chain contributed to this instability.

Here is the variation of intensity over the week, where we observe a very significant day/night oscillation (look only at top values, often extraction is disabled by experiments).



SPS (Karel Cornelis):

A busy week in SPS. AWAKE operation continued, interleaved with frequent LHC filling, which was in a semi scrubbing regime. In the beginning of the week there was some trouble with the mains (SMD10 and SMD12). After a second iteration of repairs everything was perfectly running as from Tuesday evening and the only drop of the mains since then was Friday afternoon caused by a

thunderstorm and without damage. On Wednesday the commissioning of the Q22 cycle continued and, on the ship cycle, studies were done with damper noise assisting the slow extraction. On Thursday we discovered an orbit change due to the sinking of a quadrupole (5.23). During a short access, a support was installed to stop the sinking. The weekend was rather black from the injector side. Several hours were lost for fixed target on Saturday because of a failure of the MTE octupoles followed by a problem with the RFQ. Sunday a long stop was caused by the LINAC source followed by a problem with a distributor kicker.

LHC (Massimo Giovannozzi and Jorg Wenninger):

Following the frequent dumps during the previous weekends, the number of bunches was lowered to 970b and the train length to 96b. The intensity could then be ramped up to 1740b during the week in steps of around 200b. At each step at 6 least hours of stable beams were collected. Attempts to reach 1930b failed however, as the beams were dumped by 16L2 losses. One fill of 1930b lasted for around 3 hours before dump by 16L2. This was however followed by a black series of dumps at 1930 and 1740 bunches until operation could resume with a fill of 1550b. Following that fill the number of bunches could again be lifted to 1740b.

Note that in view of mitigating electron cloud effects, filling schemes with trains of 48b only had been prepared by LPC. In particular a filling scheme with 1748b (trains of 48b) was used once during the black series of dumps and was not dumped by 16L2 losses, but by a glitch on temperature sensor of a collimator.

In parallel to those difficulties OP-LHC managed to debug the ADT-AC dipole coupling measurement with a series of tests at injection and at the end of the fills (measurements in adjust). The fill length was increased to around 12 hours to produce luminosity. the integrate luminosity is now at 17.5 fb⁻¹. This morning a water cooling issue on a turbine in point 6 that was solved before 08:30.