

Accelerator Complex Status

End week 29 (Monday 24 July 2017)

TI (Ronan Ledru):

<https://wikis.cern.ch/display/TIOP/2017/07/11/TI+Summary+Week+29>

LINAC2 (Richard Scrivens):

On Monday an issue with a pulse repeater caused incorrect BCT acquisition, leading to the Watchdog continuously cutting the beam.

A high source flashover rate is being correlated against environment conditions

LINAC3 (Richard Scrivens):

On Monday the RF phases could not be controlled, and was fixed on Tuesday by the RF control team.

Erratic beam transmission on Tuesday was traced to RF levels on the RFQ, leading to a tube change on Wednesday

LEIR (Nicolo Biancacci):

- Monday:
 - Recovery from BHN20/30 recabling procedure -> beam only in the afternoon for Joint LEIR/LINAC3 MDs.
 - Difficult restart : Exchange module in EI.QDN10 PC.
 - Joint LEIR/LINAC3 MDs to study the effect of Ramping and Debunching cavity on momentum distribution.
- Tuesday:
 - NOMINAL cycle setup f multiple injections.
 - Unusual injected intensity fluctuations -> LINAC3 RF intervention: identified RFQ RF tube to be changed.
 - Beam to the PS with re-matched optics -> first tests with 100% transmission!
 - Small water leak issue on RF LEIR: quickly fixed by increasing pressure.
 - Few trips in LINAC3, quickly fixed, then beam to the PS for EARLY to SPS setup still with old transfer line optics.
- Wednesday:
 - LINAC3 RFQ intervention, exchange of a RF tube in RFQ (8:50 – 10:30)
 - Continuation of Nominal cycle setup -> ecooler current increased from 200 mA to 300 mA to boost cooling time.
 - RF studies on EARLY and NOMINAL beam: flat bunch produced in NOMINAL with $h=4$, RF voltage calibration accuracy measured down-to 1% in EARLY.
- Thursday:
 - EARLY to SPS
 - Fixed BPM reading in EE, ETL, ETP lines.
 - 7 injections in NOMINAL -> working on injection and capture efficiency.

- LLRF MD
- Friday:
 - EARLY to SPS
 - NOMINAL optimization
- Saturday/Sunday:
 - Smooth operation (only a Main Quad and RF C41 trip)

PSB (Alan James Findlay):

Overall not a bad week for the PSB, with 96% availability.

Monday the wire scanner team confirmed that the R2 V scanner needed a 15 minute access to reset the home position, so they were put on the access list. A L2 watch dog timing problem took out the beam for 80 minutes, a pulse repeater was later changed to solve the problem. The change of an electro valve during the night for septum BE.SMH15L1 required an access by the specialist and took 3hr20mins to fix.

The LHCINDIV_VdM beam was prepared but found to be slightly lower in horizontal emittance at $E_h \sim 2.2 \mu\text{m}$, but this was taken by the PS where it was blown-up to $\sim 2.7 \mu\text{m}$, with a further 10% blow-up expected in the SPS, this was deemed good enough. Tibor prepared another cycle where he had set up a quick method to blow-up the beam transversely if this was required by the users, so this is also ready.

Work on the BPMs (and applications using them) continued throughout the week, with progress being made for the MRP, above all for R4.

Friday BE2.KFA14L1 tripped taking the beam with it, but after 1 hr 40mins and a replaced timing card by the piquet, the beam was back.

Saturday there were a couple of glitches on the electrical network, but only minutes of beam downtime were lost. However, BTY.QF0153 tripped later in the night, robbing ISOLDE of their beam for 70 minutes while the Firstline fixed the issue.

ISOLDE (Miguel Luis Lozano Benito):

It has been a very good week at ISOLDE.

The initial plan was to deliver beam today but things went pretty well and the $^{144}\text{Ba}^{33+}$ at 4.2 MeV beam was delivered to users (Miniball) on Thursday afternoon. This beam was extracted from the target in form of $^{144}\text{Ba}^{19\text{F}}$ and the molecule broken up at the EBIS. They have been running smoothly during the weekend with good rates. Some unexpected contaminants have been seen at miniball (^{144}Ce , ^{144}Nd , ^{144}Sm , ^{144}Pm) but they can live with them. We are planning to change the energy this afternoon down to 3.4 MeV as part of the schedule.

Only minor issues during the weekend. Target and line heating tripped twice and some cavities also.

PS (Matthew Alexander Fraser):

It was a good week for the PS with an average availability of well over 90%. Downtime was caused by minor faults spread across a range of equipment that could be reset after piquet interventions. On Thursday morning, and with very short notice, it was agreed between with the LHC co-ordination team that an LHC 50 ns beam would be provided to help diagnose the 16L2 issue. The beam was available for SPS on Thursday afternoon. Also on Thursday the LHC ion beam (EARLY) was sent to the SPS the setting up. An issue with the ion beam transmission between the machines was solved and attributed to the PS extraction equipment having wrongly scaled settings. The LHC VdM beam was tested during the week and is ready at 2.6 mm mrad at extraction from the PS. Over the weekend, the East Area was able to profit from the extra space in the super-cycle due to the SPS mains problem and could take extra spills. Work is on-going to improve the TPS15 shadowing of the SMH16 for MTE extraction and a further iteration was made over the weekend, needing adjustment and optimisation of all other beams extracted through SS16. The MD programme was busy and the BGI magnet was successfully powered at nominal current without perturbing the beam using an additional trim circuit, which was added during the last Technical Stop.

AD (Bruno Dupuy):

This week, there was no beam interruption caused by AD equipment fault. However, some equipment has degraded the quality of the beams for the experiments throughout the week.

- Ring power-supply oscillations for DR.BHZTR48-49 (Tuesday morning).
- Extraction KICKER (fine timing setting Wednesday morning, Thursday afternoon and Saturday mornings).
The timing must be adjusted, otherwise the experiments observe a vertical or horizontal sliding of the extracted bunch.
Although, modules have been changed during the last technical stop ==> Specialists will be contacted on Monday.
- Cavity DR.AC10-26 several RESET on over the weekend. (20% decrease in intensity in the AD, not necessarily visible by experiments).

Overall, the AD machine is not at 100% of their efficiency.

The next MD (on Monday) should make it possible to return to a more stable situation.

- Planned intervention in the BCCCA (Beam Cryogenic Current Comparator version A) cryogenic-valve flow adjustment.
- C10 cavity specialist intervention.
- S-Cooling fine adjustment.
- And more if possible...

SPS (Verena Kain):

Week 29 in the SPS was busy and eventful. 2 HiRadMat experiments were carried out and almost finished, one for ATLAS pixel detectors and another one to find the damage limit of the LARP rotating collimator. The RotColl experiment continued

until Saturday morning where a shot of 288 bunches could be taken. The beam size measurement in front of the targets with the dedicated BTV could be much improved by shielding the forward OTR. The measured beam sizes are now consistent with the programmed optics. More systematic measurements will come.

As part of the MD on Wednesday the issues with the coastable cycle on timing user LHCMD2 was investigated. The “SPS to tail clipper” inhibit is however still not working on this user and the RF reference phase can also not be trimmed. The second part of the dedicated MD was devoted to high intensity LHC beam ($\sim 1.75e+11$ ppb) on a long flat bottom cycle for the high bandwidth feedback study. To be noted for the LHC filling in the evening, MKE4 had another flashover that needed conditioning to recover from.

The ZS is running again with -220kV, the anode-cathode gaps have been adjusted. The first two ZS have larger gaps where as the last three gaps have been reduced. ZS4 and ZS5 are back at 20 mm gap. The losses do not seem to be affected and are independent of the duty cycle. The transmission of the MTE has improved. Towards the end of the week the transmission was 97 %. The BGI was used to measure beam profiles during the slow extraction. It did not disturb the spill. Unfortunately Tuesday afternoon QF glitches during the slow extraction flattop were noticed again (only on QF). Friday morning both the main bend and the QF circuit started to be affected more and more frequently also affecting other cycles, as they would also occur during the flat bottom. Despite long investigations Friday afternoon the problem could not be solved. Saturday early afternoon the problem had become so frequent that physics production became impossible. An EPC team worked Saturday early afternoon until midnight to solve the problem. Apparently a communication problem between master and BE PLC resulted in switching off momentarily the active filters. Several fixes were tried without success. The investigation was resumed Sunday morning 8:00am. After the repair of several issues, the mains could be switched back on at about 18:00. No more glitches occurred. Beam was back shortly afterwards.

The radiation issue on H6 has returned after the wobbling change. The RP monitor threshold was increased.

The LHC 50 ns was prepared in the injectors and was used to fill the LHC Saturday morning. The bunch intensity was about $1.1e+11$ ppb. Sunday after the mains problem the LHC BCMS beam was set up with $1.2e+11$ ppb and emittances of 1.5-1.6 μm .

The Xe beam was injected with 100 % transmission from the PS and accelerated all the way to flattop of the MD setting up cycle passing transition. The low transmission earlier was due to incorrectly scaled PS settings for the extraction elements.

LHC (J. Wenninger):

The week started with a cryogenic problem in point 2. The number of bunches was back at 2556 by Wednesday, but the fills were dumped by the combination 16L2 followed by a fast instability. To understand the problem, the orbit correctors in cell 16:2 were switched off during one night (small kicks). The following fills were all

dumped by losses in 16L2 + instability very shortly after start of stable beams (and in one case even just before). The steady state losses were also observed to be higher. Scans of the corrector currents in 16L2 with closed bumps revealed that the losses in 16L2 increase significantly when the corrector current is smaller than ~ 10 mA, with a sharp threshold. To avoid that regime a local bump of 0.5 mm was introduced in cell 18L2 in order to maintain at least 3 A in the 16L2 CODs. The following fills were smooth and were not lost due to 16L2 losses + instability. During a test on Saturday with 50 ns beams the steady state losses in cell 16L2 were even lower (normalized by intensity).

A problem of the SPS mains prevented taking any beam between Saturday and Sunday evening.