

End Week 31 (August 6th 2012) – Status of Accelerators

Statistics

nTOF: <https://espace.cern.ch/be-dep/OP/PS/default.aspx>

CNGS: https://accstat.web.cern.ch/accstat/statistics/charts/2012/SPS/CNGS_Target_Cumul2012.jpeg

LHC: <http://lhc-statistics.web.cern.ch/LHC-Statistics/index.php>

TI (Chris Wetton)

Several electrical perturbations during weekend due to thunderstorms.

<http://wikis/display/TIOP/2012/07/31/TI+summary%2C+week+31+2012>

Linacs (R. Wegner)

Linac 2:

Excellent week.

PS Booster (B. Mikulec)

The PSB had a good week with only few interruptions and issues:

- 1h30 beam stop Tuesday morning to change a water flow switch on BTY.BVT116.
- On Saturday, J-L. Sanchez managed to improve the transverse emittances of the LHC50 beam by improving the matching at injection. This emittance reduction could be confirmed by the LHC. We don't have a good optics model available for operation to cross-check the matching of the injection line with the 4 PSB rings and for the first PSB turns, as MADX is not very useful due to space charge forces. It would be very useful if ABP could provide us with a good model that also takes into account the last survey data of the injection lines.
- A lot of time was spent on systematic measurement analysis of the transverse emittance measurement instruments. J-F. Comblin implemented many new requests to improve the wire scanner and SEM grid measurements and logging.
- The CNGS beam for MTE has been prepared for the PS.

ISOLDE (D. Voulot)

This week we have a ²¹Na run on HRS/REX for a new scattering experiment on the REX second line. The set-up of the charge breeder was a bit painful but the high yields from the target compensate the poor efficiency. The run started as planned on Friday night and will be running until Thursday morning.

Meanwhile we had a number of collection of Tb isotopes on GLM and GHM for medical applications. This stopped today lunchtime and the target will be changed on Monday.

We had a large water leak on Friday morning, a pipe on the main ISOLDE pumps broke due to vibrations, forcing us to shut down the machines (REX+ separators). Thanks to the very fast intervention of CV (N. Roget and his team) we were back in operation in the middle of the afternoon.

PS (S. Gilardoni)

The PS had a good week with only a minor number of non-major faults, and we could produce regularly operational and MD beams. Summary excluding the LHC emittance studies:

We needed an access to change a relay gap of a 10 MHz cavity on Monday. At the same time we tried to solve the problem of the pick-ups of the transverse damper, but this finally was not possible. Tests done during the last weeks showed that the damper seems to work in the vertical plane and at fixed tune and energy. To continue the commissioning it is necessary to repair the pick-ups to have also at least also the horizontal measurement.

During the entire week we suffered from frequent faults of the DSC (DPSRG1) controlling the PFW/F8L, low energy quadrupoles, and few other elements, causing beam losses and radiation alarms. This problem is already followed by CO.

We had few trips of POPS during the week, related mainly to the bad weather. Only one was due to a false IGBT interlock.

On Thursday morning, we could not produce any fix-target beam for the SPS due to a problem with one of the CT extraction elements. A tube had to be changed.

On Thursday it was agreed with the LEIR supervisor to take the beam to improve transverse setting up during the weekend, before the source refilling scheduled for Monday.

We used the ion beam on Friday and on Saturday, but unfortunately we could not work on this during the entire weekend due a too large drop of the intensity on Saturday.

Still, taking the ion beam was useful to detect a possible issue with the LHC proton beam. Considering the very high intensity extracted from the PS, we are at the limit for the longitudinal-coupled bunch instability. The fact of using the third 80 MHz cavity for ions actually enhances the instability. It seems then that it will not be possible to assure the current LHC beam quality if we want to fill the LHC with protons and at the same time produce ions for other users. The operators have the consigne to close the gap of the 80 MHz cavity used for ions when filling the LHC.

There is in general some concern on the longitudinal beam parameters for the high LHC intensity, due basically to the well known instability and transient beam loading: the RF expert had to intervene few times to keep the bunch length at extraction below 4.1 ns.

Concerning MTE, work was done together with BI to verify the measurements with the beam kicked in the islands. Tests will continue this week. In the meanwhile, the capture was resumed and realised with a two-bunch beam with $600E10$. The idea is to monitor the capture stability.

Summary LHC emittance studies:

During the entire week, a series of measurements were done in collaboration with the PSB and SPS to understand the luminosity loss in the LHC, on top of the usual monitoring of the transverse emittances and longitudinal parameters at every fill and every shift. We did not observe an unusual blow-up between injection and extraction.

On Tuesday, together with the SPS, we measured the dispersion of TT2, H and V. The results are in very good agreement with the model, in particular for the H plane.

On Thursday we measured the dispersion at extraction on the LHCINDIV cycle, since the orbit cannot be measured for multibunch beams on harmonics greater than 21. The dispersion is in good agreement with the model.

On Friday, first, a series of measurements done with the BWS in the ring before extraction showed that the transverse emittances:

- are identical for the 4 consecutive LHC batches
- are not depending on the preceding user (24 GeV/c or 26 GeV/c).

Then, together with the SPS, we monitored the transverse profiles in TT2 and the trajectories. No difference between the different shots could be noticed, and tails were not observed in the V plane in TT2. For the H plans, we monitored one of the OTRs on Saturday and no tails were observed.

Based on all of this, it seems that the observation of the emittance differences between the batches is not produced in the PS, at least in the ring. TT2 also seems to be correct.

Still, since the last fill on Friday evening we added an extra LHC beam cycle in front of the 4 batches, with the beam sent to D3. It seems from Gianluigi

that this reduced a bit the difference between the batches. I am not sure of what we can learn from this. It seems that everything is equivalent up to the LHC, independently of the supercycle composition.

TT10 seems to be correct and stable and the measurement of the dispersion at the first SPS turn is very similar, if not better in term of reduced mis-match, to the measurements of 2008 done by E. Benedetto. I think that you should find something in SPS report.

For the next step, we are going to reconstruct the extraction conditions, in terms of optics, but we do not expect to find anything special since the dispersion measured in TT2 is practically the one of the model, in particular for the horizontal plane. Eventually, as discussed together with Gianluigi, Hannes and Yannis, we could think of a new iteration of the TT2-TT10 optics, but we more or less agreed that not much gain should be expected.

On Saturday, after the improvement of the transverse emittances in the PSB, a vertical instability was observed at the arrival on the flat top. This could be corrected by adjusting the tune and chromaticity in the vertical plane. Still, it is unclear why the tune went so close to the 1/3rd resonance. Unfortunately, it was not possible to cross check an eventual issue with the quadrupolar component of the main magnets because the probe installed for that purpose for MTE is not

operational yet. There is a frequency noise in the acquisition system of the magnetic probe making the signal difficult to exploit. The expert is working to find a solution.

Most of the monitoring of the different issues, like the beam instability, was done thanks to the fast signals acquired by OASIS. Until last year we could exploit even better those signals thanks to the analysis programs developed by OP under Labview. Unfortunately this year there is an issue with the Linux Labview libraries and the export of the OASIS signals, and this is not any longer possible. CO is working on the issue. It would really important to recover this possibility, since we could even improve our diagnostics and eventually logging capability, by better exploiting fast signals in the ring and in TT2.

LEIR (C. Carli)

The situation concerning controls problems has significantly improved since a week ago (thanks to the work of the supervisors in charge before this week and of Controls and Power converter specialists...). There is still a problem with a MIL1553 controls bus, which seems to have problems every day at 17:15!?

At the end of the week, beam has been sent to the PS for first ion setting up. The intensity was somewhat lower than it should have been. I spent quite some trying to optimize with little effect and, in particular, the second injection on EARLY did not increase significantly the available intensity. Evolution of the beam under electron cooling should be further investigated.

Now, the Linac3 source has been stopped to prepare re-filling; beam is expected to become available again this afternoon.

AD (B. Dupuy)

Monday 30.7: Machine-Development was shortened by a failure on DR.QUAD, after the first OP7.

The beam was used for physic around 19H00 after a hard reboot of the new power-supplies Mega-DISCAP (DI.BHZ6034, 6035, 6044 & 6045).

The next day: Adjustment and optimization of beams without major breakdowns. The bunch length is stable at 170ns, and the AD beam intensity was greater than $3.10E7$ anti-protons extracted.

SPS (D. Manglunki)

Not a fantastic week for the SPS

On Monday afternoon, 2h30 of North Area beam were lost because of a trip of chain 9.

On Tuesday CNGS was stopped for 3h20 because of a problem on the 48V distribution.

From Wednesday 8:00 until Thursday 8:00 was a dedicated "floating" machine development for UA9 with up to 288 bunches of the 25ns beam in coast at 270GeV. Apart from the expected time lost due to LHC fillings, two hours were lost due to an MKP problem, solved by the ABT piquet.

During the night a second scanning wire (519H) was broken. This brings us down to only two operational ones, fortunately one in each plane (416H & 519V).

On Thursday afternoon, for 3 hours, a beam position interlock in LSS4 prevented from extracting towards LHC beam 2. Although BI could not see any fault in the measurement, since it only concerned one single monitor, the tolerance has been increased on that monitor in order to fill the LHC. The next morning the reference has been changed too. Why the reference seemed to correspond to a wrong position is still unclear.

Friday night the mains tripped by an earth fault on a 18kV cell; the TE/EPC piquet had to change the configuration, replacing SMD10 by SMD14.

The week-end saw lots of mains and RF trips due to thunderstorm-induced perturbations on the electric network.

Finally, on Monday morning at 4:30, a problem developed on MKE4, the extraction kicker towards CNGS & LHC beam 2. The expert is still working on it.

During the week, ion cycles have been prepared without beam. The ion beam is expected later this week

LHC (G. Arduini, B. Holzer)

- 41% of time in stable beams
- 946 fb-1 total during the week

More details under:

<http://lhc-commissioning.web.cern.ch/lhc-commissioning/news-2012/LHC-latest-news.html>