

## End Week 14 (April 10th 2011) – Status of Accelerators

### LINAC 2

No major problems reported.

### Booster (Alan Findlay)

If we consider the LHC beams in the PSB this week, we had a good week, with only minor problems perturbing the beams, and none taking much more than an hour to fix.

We also had our first MD with the INCA's from controls, which seemed to go OK, but Stephane will forward us the results after their debriefing on Tuesday.

Our main headache this week has been R1 and the unexplained losses we're having during acceleration, principally with higher intensity ( $>4E12$ ), but even lower intensities are experiencing problems. The LHC beams taken at present are all single ring or single batch beams, so don't use R1, hence are untouched.

On Tuesday morning we started to notice the losses on the CNGS user, and even after we did a couple of interventions on the RF settings and HW to fix a couple of things, the losses persisted. The hunt was on for the culprit, and the loss pattern suggested that we had a transverse problem, so after confirming the RF systems behaved as expected, we started to look at our old multipoles (known to have caused a number of problems in the past) and the damper. The multipoles had the correct values and seemed to be responding correctly and could all have their currents increased and decreased as expected, so nothing there. The damper was also a suspect, as if one were to switch off the damper or seriously reduce its power, one would expect to see losses at the points we were losing. A basic system check found nothing, so the equipment specialist, A. Blas, was called in to look in detail, but no sign of any malfunction could be found.

The week continued with us looking into more and more detail of the operation of our equipment, but still with the idea that we had a transverse problem that neither the multipoles or damper could cope with. We managed to get into a slightly more stable situation by Wednesday afternoon, where the losses were about one shot in 3 and much reduced, but still very much present. Leaving the CNGS beam for the users, on Thursday we worked on the presently unused GPS beam, and we could get  $8E12$  accelerated, with a similar reduced loss pattern to the previous day, but still no break through.

By Friday lunchtime the machine could sense the weekend looming, so R1 had a tantrum and would not even let  $2E12$  be accelerated without spraying its particles all over the place. We did some fixes to get as much beam through for the users as possible, and with this compromise, could squeeze out  $4.5E12$  in place of  $6.5E12$  from R1, which is how we'd continue for the weekend.

Where are we now and what are our plans? We're linking the problem to a change during the technical stop, as we have not seen R1 with high intensity since, and have started to contact all parties who intervened for exact details of the work they carried out.

1) **Horizontal wire scanner** replaced in R1. Discussions with the equipment specialist, D. Gerard, confirmed that we replaced the wire scanner with one that had previously been installed in the

machine, and no changes had been made. The vacuum specialist, J. Hansen, also confirmed that nothing untoward happened with this intervention.

2) **Grounding of the R2 vacuum chamber** in section 10L1. I spoke to J. Hansen and M. Haase about this, as it involved connecting a ground connection from the R2 vac chamber to the support of the R1 CO2 cavity. This seems to be the sort of thing that needs to be checked in detail, but Jan and Matthias were both happy to undo this modification and would require only 10's of minutes to do this. This is a strong contender for a reason to have a machine access on Monday.

3) **Verification of the cables and turns of the beam transformer BR1.TSW** in section 8L1. P. Odier the equipment specialist was not available on Friday afternoon, so he'll be contacted first thing on Monday to find out exactly what was done. It was understood that this intervention was only in the surface building, but since the intervention list states the section and a 2 hour intervention being required, I suspect they intervened in the tunnel.

So, after checking with Patrick, Jan and Matthias, I believe we'll have to plan a machine access to confirm the state of the above equipment, as well as to perform a general machine patrol. I would hope to be able to do all interventions in less than 1 hour, but the equipment specialists will have to confirm this. We'll get ourselves organized on Monday and find the best moment to access the PSB.

## PS (Simone Gilardoni)

The PS had a good week, without any major problem.

The LHC50 beam was delivered regularly to the LHC whenever requested. We had a closer look to the ghost bunches between the bunches and after the batch. It is clear that, when ghosts are observed in the LHC and they are below ~1% of the main bunches, we cannot do too much in the PS because basically we do not see them. Our instrumentation clearly cannot see anything of this intensity. Anyhow, the operators and the RF specialists did their best to optimize the bunch splittings, in particular whenever the LHC asked to switch from 12 to 36 bunches. There is a clear procedure for the optimisation, but this takes time to the operators that cannot be further reduced.

We had a problem with the 20 MHz cavities, tripping pretty often and in particular when the AD beam was in the Supercycle with beam. The reason of the trips was investigated but it is not yet clear for one of the two cavities. We decided in any case to switch both the 20 MHz cavities to the frequency used for the 50 ns, to have a hot spare in case of troubles. We will switch back one to the frequency of the 75 ns whenever you will need it for the LHC.

Concerning other operations:

- the CNGS was delivered on requests, with few trips of one of the kickers that required the replacements of a part of the thyristors.
- the AD beam was prepared with an intensity up to  $1.3 \times 10^{13}$ . The nominal  $1.5 \times 10^{13}$  was seen, but the final setting-up to this intensity was delayed to avoid interfering with the 20 MHz cavity operation for the LHC.
- TOF: the experiment re-started the data taking after the stop due to the intervention on the de-gassing system. As agreed with RP, the nominal beam was delivered during the weekend to the experiment, with RP taking measurements of the air activation. We expect to have more news on Monday.

- MTE: the study of the trajectory oscillation continued. Now, we can clearly see that the fixed points are oscillating from shot-to-shot on the extraction flat-top. We are checking that this is not an artefact of the orbit measurement, as suggested by the BI expert. We asked also to have back the measurement of the B-field with the FMR to correlate the trajectory oscillations with the B-field. The measurement should be available by Monday. We also continued with the extraction tests with the electrostatic septum. The tests are not yet conclusive: we have to synchronise the kickers with the presence of the beam in only one island, which has to jump the septum, and the procedure is more complicated than expected.

- the LHC25 was delivered to the SPS whenever requested

Other activities:

BI tested the new wire scanner installed during the technical stop. There are problems with the control of the filters.

## SPS (Django Manglunki)

The SPS has been delivering beam to CNGS ( $\sim 3.8E13$ ), and to the LHC first the 75ns in up to 4x24 bunches, then the 50ns in up to 2x36 bunches. The 25ns LHC beam has also been prepared.

HiRadMat was also given some beamless cycles, and allowed access during the day, whenever LHC did not need beam.

On Monday evening between 17:00 and 20:00 the TRX4 which had a burnt transformer was repaired, allowing to retrieve the CNGS intensity.

On Saturday evening, a bad programming of the timing made the RBI.816 pulse at 450 GeV on CNGS cycles, causing it to overheat and trip due to the temperature interlock. This was due to the fact the sequencer had not been used to recover from access.

There currently is an SIS problem preventing the extraction of the probe beam towards the LHC, under investigation.

## LHC

Week 14: scrubbing

- No up to 1020 bunches per beam
- Electron cloud activity in arcs quickly suppressed
- Vacuum activity cleaning as expected
- One major time-out last week for HTS near miss.

<http://lhc-commissioning.web.cern.ch/lhc-commissioning/>

## TI (Eric Lienard))

Summary of events:

Date	Location	Subject
10-Apr	HS	<b>Perturbation électrique sur le CERN</b>
		Une perturbation électrique extérieure CERN, provoque un trip de la RF du SPS.
08-Apr	HS	<b>Perturbation électrique sur tout le CERN</b>
		Un déclenchement mono sur une ligne 225kV entre Genissiat et Verbois provoque une perturbation touchés.
04-Apr	359	<b>Arrêt FDED-00050 au 359</b>
		arrêt de la station FDED-00050 lors du retablissement de la communication avec plc
04-Apr	SE2	<b>Manque tension sur une centrale évacuation</b>
		manque tension sur une centrale évacuation qui a empêché de remettre le faisceau LHC