

Status of the machine studies

MSWG meeting, 07/05/10

1) Setting-up of the feed-forwards in the SPS and of the TWC 800 MHz in view of the Long Injector MD of next week 17 (T. Bohl)

- Wednesday 21/04 (08:00 - 18:00) to Friday 23/04 (08:00 - 18:00).
- A large part of the MD time was given away for setting-up of the transverse dampers. On Wednesday there were only a few hours available in the late afternoon for the original programme. On Thursday we had only a few hours in the morning (unstable beam availability from PS) and the rest of the day was again donated for the transverse damper setting-up. On Friday morning we could use the beam until about 1030H when we had to stop because of a vacuum problem in the SPS.
- Only a small fraction of the requested time was available. The feedforwards were adjusted for flat bottom conditions. The longitudinal dampers could only be adjusted without beam. The TWC 800 MHz was used on Friday morning and looked ok.
- Next steps: Commissioning of feedforwards for the ramp with 72 bunches. Commissioning of the longitudinal dampers with beam (flat bottom and ramp), 72 bunches and two injections.

2) Scrubbing Run => Setting-up of the longitudinal beam control (T. Bohl)

- Monday 26/04 08:00 to Thursday 29/04 08:00.
- Problems encountered: The full Monday was lost (SPS magnet exchange). Tue 2010-04-27 am: problems related to (i) copying of cycle settings failed, (ii) no access to LARGER data. Tue 2010-04-27 pm: problems: (i) CPS not being synchronised, (ii) no beam due to QF intervention, (iii) problem of wrong rad. steering function, (iv) no beam due to linac problem. Wed 2010-04-28: initially no beam due to power cut and PSB problems, in the afternoon compensator trip and no beam. Thu 2010-04-29 am: frev problems, then no beam due to access and then due to MPS problems (practically whole morning lost).
- Current results: Tue 2010-04-27: some setting-up of long. beam control but not much progress due to problems mentioned before and beam requirements for setting-up of transverse damper. Wed 2010-04-28: setting-up of feed-forward till about 14:00H, then setting-up of longitudinal damper. By 20:30H first long. damper operational and good transmission of 95% with 60 bunches of nominal intensity. By 22:00H also 2nd long. damper operational and by 22:03H acceleration of two batches of 72 bunches and transmission of 93% with 1.1e11p/bunch at flat top. Later injection of 4 batches and transmission of 95% at 80GeV/c (beam had to be dumped before flat top because of MKD problems) and around 00:30H acceleration of 4 batches of 72 bunches of 1.1e11p/bunch to flat top with 95% transmission. Thu 2010-04-29: setting-up of TWC 800 MHz. It consisted mainly of determining a new static phase offset with respect to TWC 200 MHz using the beam. This adjustment was anticipated and due to hardware modifications during the last shutdown. Then controlled longitudinal emittance blow-up was applied successfully with settings from last year. The setting-up finished Thu 2010-04-29 17:00.

3) Scrubbing Run => Some preliminary MD results (E. Metral)

- The first Long Injector MD block of 72 h should have started on Monday 08:00, but due to the vacuum leak observed on the dipole MBB.30090 the Friday before, the whole Monday was devoted to the magnet exchange. Due to a vacuum sector valve next to the magnet, which needed to be removed, the vacuum of the sectors 2+ and 3- had to be broken and it came back only at the end of the day. Furthermore, due to an intervention in the TI12 and TI18 lines, which had to be finalized to protect the SPS in case of LHC helium leak, the MD could not be started before Tuesday early afternoon. The good thing is that the necessary DSO tests for the NA could be performed in the shadow of these interventions.
- Despite this catastrophic start, the nominal LHC beam was accelerated in the SPS up to top energy with only ~5% of losses on Wednesday evening, which is one of the best results obtained so far, and it was obtained already during the first MD of the year! The vertical emittance was as usual slightly above nominal (~ 3.6 microm), but ~ 3.5 microm were already measured in the PS just before extraction. This very good result could be achieved in particular due to the presence of the ZS experts (as the ZS outgassing was the first limitation in the past few years to reach nominal intensity) and due to the fine adjustment of the longitudinal dampers. Concerning the ZS, the most effective settings seem to be: (1) ZS retracted (as usually done), HV ON to -7kV (usually we put 0kV), Ion traps ON -3kV/-6kV (as usual). All the results should be carefully analyzed, but it seems that we are now in good shape to study higher intensities than nominal in the SPS, which was never done in the past and which is planned for the next Long Injector MD of week 22.
- The MD, which was planned to stop on Thursday 08:00, was extended in parallel to LHC operation until the end of Thursday afternoon (due to some delay with CNGS). Here again a very good result was obtained as we

succeeded to inject Beam1 (and then Beam 2) in the LHC (from the LHCFast2 cycle) in the presence of nominal intensity in the SPS supercycle (on the LHC1 cycle). It was the first time such an operation took place in the SPS! It proved to be quite efficient and should be used during all the next Injector MD blocks (on Thursdays, as already planned on the Injector Accelerator Schedule).

- Reminder: the BQM (Beam Quality Monitor) has to be ON on the LHCFast cycle (which is normal to extract to the LHC) but also on LHC1 (even if we do not extract to the LHC). This is because the BQM is checked in SIS (enabled or not), and SIS cannot make the distinction between a cycle used for LHC and another SPS MD cycle.

4) MD planning for the next weeks, until the next Long Injector MD block of week 22 (E. Metral)

=> <https://ab-mgt-md-users.web.cern.ch/ab-mgt-md-users/2010/pmd18to21.htm>

1) Finalize in the PSB the preparation (in //) of an ~ ultimate intensity cycle (with larger transverse emittances than nominal).

2) Once this is done, this beam should be sent to the PS to study it in detail (in //). Hence, the high-intensity bottlenecks of the PS could then be studied. The maximum intensity / bunch should be sent to the SPS in week 22.

3) In week 22, the SPS will study its own high-intensity bottlenecks.

4) The SPS coast(s) will be prepared in week 24, to be ready for the following Long Injector MDs.