

Status of the machine studies

APC meeting, 18/07/08

1) Test of a new scheme for the 4-ppm steerers in the Booster injection line (K. Hanke)

- With the new scheme the correction of the PS fringe field, which influences the beam injected into the PSB, can be compensated better than before. We are analyzing the results in detail. The new scheme was left in service, with the possibility to switch back to the old one in case of problems. We will use this now in operation.

2) Rephasing SPS p for LHC (P. Baudrenghien)

- On 26/06/2008, the radial steering was not working. This was traced to a synchronization problem in the new Freq Program module.
- On 27/06/2008, the radial steering was working OK now. Playback (= mode where the freq prgm is not following the reference magnet but an "average" over previous cycles) did not work. Cause traced to the software in new freq prgm.
- On 04/07/2008, the MD was quite successful actually. Freq prgm now working OK, including radial steering and "playback" mode. Rephasing parameters were fine tuned for no observable blow-up/loss of beam. Nominal beam rephased OK in less than 500 ms on flat top.
- Next steps: Statistics on the reproducibility of the phase on flat top. We have observed spurious on the phase signal on occasions. On-line acquisition/display of phase error must be implemented. Make electronics more "robust".
- New requirements: FastLHC type cycle, 12 bunches, low (any?) intensity. A few 4-hours slots during the coming 4 weeks for validating the upgrades in the Frequency Program. CAUTION: these MD are NOT compatible with beam on LHC MD cycle (same hdw used).

3) Achieving nominal longitudinal parameters at 450 GeV/c in the SPS (T. Bohl)

- Several problems:
 - It was not possible to get permanently 4 batches of nominal intensity injected into the SPS due to vacuum problems in the SPS.
 - Setting up of SPS continued up to about 23H.
 - SPS injection problems (30 mm interlock).
 - SPS beam dump kicker problem.
- We did not get nominal conditions within the allocated time partially due to the problems mentioned. The goal to get nominal conditions was too ambitious as it needed everything optimal (RF: feedbacks, feedforwards, long. damper, TWC800, long. emittance blow-up and diagnostics) and also the transverse machine settings. However, the MD time was spent in a useful way to prepare the following MD sessions.

4) LHC beam at different intensities with constant longitudinal parameters in the SPS (T. Bohl)

- MD started one hour late due to previous MD and frequent MPS problems in PS and no beam.
- Optimisation of TWC 800 MHz phase with respect to 200 MHz RF system in view of beam loading and controlled longitudinal emittance blow-up. Tried also 200 MHz amplitude noise instead of phase noise (was not effective). Good step forwards to find optimal controlled longitudinal emittance blow-up settings.

5) Calibration of the signal of the BLM detectors (IC & SEM) in a setup similar to the LHC collimation setup (at prototype collimator mounted in LSS05) (T. Bohl)

- Initially, there was some delay when reducing to lower intensities (12 bunches, $1.2 \cdot 10^{11}$), I think due to beam instabilities in the PSB. This caused about half an hour delay. But beam time was sufficiently large to do all measurements.
- First comparisons between MD data and simulation for the LSS05 match reasonably. There are still some inconsistencies in the data when varying the intensities on the collimator and monitoring "the signal per particle on collimator".

6) Behavior study of the radial loop by permuting the Pickups from the control system at the transition crossing in the PS (S. Aumon)

- The first results show the current pickup configuration of the radial loop control system makes the beam not centered. The MRP jump can't be avoid whatever the pickup combination we take. However, by excluding the PU51 from the radial loop, the MRP improves (-6mm-> -2mm). The MRP jump at the transition is reduced by 1 mm without the PU51 but other combinations of PUs make the MRP about 3 mm, compared to 7 mm from the nominal configuration.

- Next steps: First, look at the dispersion at the pickups from the radial loop (PU22-51-96-36). Try to find a better configuration of PUs than the current one and test it.

7) Longitudinal emittance blow-up by artificial RF noise, test optimum parameters for noise and 800 MHz phase for high intensity beam (J. Tuckmantel)

- 4-batch-time was limited due to kicker outgassing (but it was not a serious problem for this MD).
- In contrast to last MD (2007) successful blow-up and about equal bunches along all batches; parameter space exploited and good settings identified. Gives good expectations to do similar in LHC.
- Next steps: Tests with 'low' and 'high' intensity and find - if exists - universal settings for 'all' intensities and batch configuration; optimise RF feedback and feedforward for equal (stable) bunches on flat-top.
- New requirements: as last MD (high and low intensity) => Week 33.

8) Ecloud and related instabilities measurements during the Long Injector MD of week 28 (G. Rumolo)

- Measurements were taken. Data to be analyzed.

9) Long LHC cycle in the PS (R. Steerenberg)

- Set-up an LHC beam of almost nominal intensity of 8E12p in the 5BP cycle with double injection and triple splitting, accelerated with H21 without losses to the flat top and extracted regularly to D3. The transverse emittances at extraction were almost nominal (3mm.mrad in both planes). We did not manage to get the high energy gymnastics (double splittings and bunch rotation) because of an upper limit of 3600ms in a very generic class of timings (PTIM-V), which was thought to be a relative timing window maximum value but it is an absolute one. The extraction timing is also limited by it.

10) RF studies on the compatibility between high-intensity and low-intensity LHC beams in the PS (M. Morvillo)

- MD foreseen on 10-11/07/08 but was cancelled (no beam due to problem in the PS with the 8loop).

11) SPS BWS (E. Metral)

- Jan and Ana informed us on 14/07 that the BWS517 wire-scanner is now working again.
- Check calibration etc. and comparison old/new application continues. The old application was used during the Long Injector MD of week 28 and seemed to give reasonably good results (similar to last year. In fact this could be strange as the beam in TT10 seems too big...). Bernd came on 07/07 to try and measure the transverse profiles and saw nothing (white board...).

12) Fast Analog Signals in the SPS (E. Metral)

- We (Joseph Kuczerowski) asked (on 01/07/08 and on 15/07/08) to increase the sampling rate for the fast analog signals from 2 to 8 GHz and the number of points to 128 Mpoints in OASIS (as the ACQUIRIS card can do that) but we did not gate any feedback from CO.
- These signals would be also very useful for the TMCI (or other) studies.

13) LHC BPM in the SPS (E. Metral)

- I checked with Verena that it was working again during the Long Injector MD of week 28.