

Status of the machine studies

MSWG meeting, 06/11/09

1) Transverse emittances on LHC PROBE during the LHC Injection Tests in week 43

- Massimiliano Ferro-Luzzi informed me about transverse emittances which were too big (~ 5-6 microm). It was found later that after some adjustments in the CPS, the emittances came back to ~ 1.5-1.8 microns in both planes (according to Jorg).
- Massimiliano said that Roger Bailey will try to collect a summary of emittances or emittance ranges for all LHC beams in the injector complex. Some information was already provided by Klaus and Bettina.

2) Coupled-bunch instability in the SPS with LHC beams (N. Mounet and E. Metral)

- During dedicated MDs of weeks 38 and 45.
- Useful data taken which are being analysed and a MD note* is in preparation.
- Problems: LHC BPM, which was difficult to use during the last MD and which could not be used during the 2nd one. It's a pity as this is the instrument, which was really needed as we want to analyse the motion of each bunch turn after turn. Lars Jensen was informed and he has some ideas on the origin of the problem (as he made some modifications recently).
- Summary of the 1st MD: Instabilities in vertical were observed for 1 batch, and in horizontal for 1 and 3 batches. Various values of the chromaticity were tested each time, but it has to be checked that instabilities were actually measured with at least several of these values.

3) Generation of LHC beams in the PS without switching the beam control (H. Damerou)

- Thursday 29/10 (08:00 - 18:00).
- As a proof-of-principle experiment, LHC 25 ns and LHC 75 ns beams have been produced successfully with a simplified beam control configuration that does not require to switch the beam control at the beginning of the flat-top. Oscillations of the fine synchronization loop have been observed and attenuated with a modified loop filter. Fine adjustments are yet to be done, but the feasibility of the scheme could be demonstrated.
- Next steps: Some additional measurements might be performed in parallel during this week's (week 45) long MD, as already scheduled.

4) Rebucketing instead of LHC fine synchro in the PS (H. Damerou)

- Friday 30/10 (08:00 - 18:00).
- The new scheme, slow switch to a rigid h84 bucket derived from the SPS RF (virtually re-bucketing), has been tested as planned with the LHC25 beam and works. However, the phase jitter of the bunches at extraction was not observed to be significantly better than with the conventional scheme (using coarse and fine synchronization).
- Next steps: If time permits, maybe a further quick test during this week's (week 45) long MD (Wednesday daytime), but not mandatory.

5) Dedicated MDs of week 45 (E. Metral)

- 1st beam at 10:18, as we had to wait for the vacuum piquet to block the fast valves! It's a pity as several things have been put in place (as similar problems arrived in the past). Discussions ongoing with Giovanna Vandoni to try and improve this situation.
- LHC beams:
 - The LHC 25 ns was taken as usual for ecloud studies. With 4 batches we had an interlock due to vacuum of the MKDH3. The MKDV1 (which got transition pieces) is also more critical than the MKDV2. Then we had a temperature interlock on MKE3 (> 70 deg C).
 - The LHC 50 ns and 75 ns (both produce in 1 batch from the PSB) were taken for the first time in the SPS and very good results were obtained, in particular with the LHC 50 ns as 4 batches were injected (still every 3.6 s even if 2.4 s could have been used) and accelerated in the SPS up to top energy with an intensity per bunch slightly larger than nominal (~ 1.2E11 p/b. This value is deduced from the BCT, while the FBCT gives a value which is ~ 2 times smaller! Lars Jensen was informed) within transverse emittances of ~ 2.5 microm in both planes (which is already the case in the PSB according to Giovanni). Furthermore, no major problems of outgassing or heating or ecloud were observed with the 50 ns compared to last year. Note that one of the major differences compared to last year is the larger transverse emittance (~ 2.5 this year compared to ~ 1 last year). As proposed by Karel, we could next year take the old LHC 50 ns beam and scan the transverse emittance (with blow-up in the SPS or even better in the PSB) and see when we have the pbs in the SPS for each system.

Furthermore, it is true that when the RF people make the longitudinal blow-up we have almost no activity, but when they remove it there is some activity.

- With the LHC 50 ns beam, MKDV2 seems to be worst than MKDV1 (it seems this behaviour was already observed in the past by Karel => To be checked).

- We even injected and accelerated 5 batches spaced by 2.4 s instead of 3.6 before.

- For the LHC 75 ns beam, it seemed also that everything was fine (no heating, outgassing etc.) EXCEPT on the ecloud monitors where it seemed that carbon coating was worst than SS (it seems it was the first time such as thing was observed!). To check that we came back to 50 ns where we observed the usual behaviour. Therefore, it really seems that something is happening with the 75 ns beam => To be analysed in detail.

- UA9:

- Some spikes were observed on the LHC BLM (as it was already observed sometime during the last MD). It seems to be **CORRELATED WITH WORKING HOURS** => During this kind of MDs one should try and warn everybody not to touch anything!

- Concerning the measurements, a scan with a bump at the TIDP was done to have the TIDP primary or not and observe whether there is some leakage in the collimation system.

* Email from Tjitske (26/10/09): “Dear All, For your advanced information. New categories will soon be introduced in the sector publications, i.e. Accelerator & Technical Notes but also Accelerator & Technical Performance & MD notes. These series are under preparation so kindly use the existing templates and submission procedure until further notice”.