**Meeting of LIU SPSU-BD WG on 21/06/2012**

**Present:** Gianluigi Arduini, Theodoros Argyropoulos, Hannes Bartosik, Chandra Bhat, Thomas Bohl, Heiko Damerau, Juan Esteban Muller, Silke Federmann, Gianni Iadarola, Yannis Papaphilippou, Giovanni Rumolo, Elena Shaposhnikova, Helga Timkó;

**Presentations:**

**Silke F.: Evaluation of Microwave transmission measurements**

The microwave transmission measurements performed between the two uncoated SPS dipoles during the 2012 SPS scrubbing run indicate the presence of an electron cloud after the injection of the second batch of the 25ns beam with a total intensity of around 2.5e13 p (~1.7e11 p/b). For the 25ns beam with nominal intensity (~1.2e11 p/b) no phase modulation and thus no electron cloud signature was observed.

*No electron cloud signal observed for nominal intensity could be due to the fact that there is no electron cloud in the machine, or due to the fact that the measurement setup cannot resolve it.*

*The big peak in the signal before the injection is a spurious signal (jitter in electronics) observed during the ramp (of the previous cycle).*

*Further measurements in upcoming MDs should be performed, as this tool could provide a direct measurement of the electron cloud in the machine. This could be very interesting for example when increasing the batch spacing, in which case the electron cloud signal should disappear.*

**Thomas B.: Issues with LHC beam quality in the SPS**

The longitudinal setup of the operational 50 ns beam becomes difficult for the intensities recently requested by the LHC. In particular, the optimal settings of the controlled longitudinal blow-up are very sensitive to variations of the beam parameters along the injected batches.

*The measured peak amplitude of the longitudinal bunch profiles is increasing from batch to batch. This can be explained by losses of the first three batches on the flat bottom.*

*The measured peak amplitude of the last bunches is always lower. This might not be related to bunch intensity but rather to the larger bunch length observed for these bunches.*

*A similar pattern of the average bunch position along the train is observed for all four batches (apart from the first bunches of the first batch, which are controlled by the phase loop at injection). This is due to beam loading, where in particular the asymmetry of the pattern is due the 800 MHz component. As a consequence the 800 MHz component seen by the beam is not at the same phase for all bunches, which in turn leads to problems for the controlled blow-up and beam stability.*

*The distribution of the shortest and longest bunches is observed to have changed since end of May, when the intensity of the LHC beam was increased and the settings of the longitudinal blow-up were adapted. A small spread of bunch lengths at the flat top and stable beam conditions are achieved only when the spread of the beam parameters at injection is very small (around 5%). It seems that in particular the first and the last batch are the most critical, as they exhibit smaller longitudinal emittance (the first batch is controlled by the phase loop at injection, the last batch is accelerated immediately).*

*It might be worth to consider adapting the BQM restrictions, since it may not be necessary to reject a full bunch train if a single bunch has slightly larger/lower bunch length. A more suitable criterion could be to check if (for example) 10% of the bunches are out of the BQM limits. The impact of injecting such a bunch train into the LHC should be studied.*

*Using the Q20 optics for LHC filling already now could be a possibility for improving the longitudinal beam quality at SPS extraction, since the beam is more stable (both at injection and during the ramp) and less sensitive to beam loading. In this respect it might be very interesting to study losses in the LHC when injecting long bunches from the SPS (even with the nominal optics).*

**Giovanni: MD planning**

*It was mentioned that the ion pumps close to the SPS internal beam dump suffer from the high radiation level produced from continuous dumping 4 LHC batches at high energy. In order to minimize the radiation level in LSS1, it is considered to dump the beam on the TED in one of the LHC transfer lines during the MD.*

**Helga: Update on PS-to-SPS transfer MDs**

Recent transmission studies were performed with a new special cycle in the SPS with a short flat bottom and a beam dump at 30 GeV.

*The two-dimensional PS bunch-rotation timing parameter space has been measured with different 40 MHz and 80 MHz voltages. The studies demonstrate that, with optimised timings and with a 600 kV voltage for both the 40 MHz and the 80 MHz RF systems, a loss reduction of more than 50 % (for 1 batch) can reproducibly be achieved. With such settings, also the bunch length becomes smaller (~3.7 ns) than the currently operational value, which leaves more margin for* *additional emittance blow-up in the PS (which could be needed for increasing the beam intensity delivered by the PS).*

*In order to use the optimal settings with two 40 MHz and two 80 MHz cavities (which yields the optimal transmission) operationally, small hardware modifications would be required (ions need only one 80 MHz cavity, but in this case there would be no spare power supply).*

**Juan: Update on single bunch instability on the SPS flat top**

During the single bunch MD in the first 2012 LHC MD block, it was observed that the bunch length at the SPS flat top was increasing with intensity even though the injected longitudinal emittance was kept constant and the bunch intensity was adjusted by vertical scraping at the end of the ramp in the SPS.

*A possible explanation for the observed bunch length increase could be loss of Landau damping on the SPS flat top, which leads to a longitudinal instability and consequently emittance blow-up.*

Minutes written by Hannes Bartosik