

Minutes of the meeting of the SPS Upgrade Study Group on 23 September 2010

Present: G. Arduini, J. Bauche, C. Bhat, F. Caspers, P. Costa Pinto, H. Maury Cuna, S. Federmann, R. Garoby, B. Goddard, E. Metral, M. Taborelli, G. Rumolo, B. Salvant, E. Shaposhnikova, C. Yin Vallgren

Excused: M. Taborelli

• LIU project - R. Garoby

Roland has presented a new organisation of the projects at CERN and in particular the structure and mandate of the LIU - LHC Injectors Upgrade Project which covers the upgrade of the three existing accelerators (PSB, PS and SPS) and construction of the Linac4. Brennan Goddard will be coordinating the SPS Upgrade Project, the detailed organisation will be presented in an upcoming meeting. The continuity with the existing SPS Upgrade Study Group will be ensured, but the work should be accelerated.

• News on high intensity bunches in the SPS - B. Salvant

Studies of single high intensity bunches in the SPS were done using two different MD cycles - MD1 cycle with 4 s flat bottom, no acceleration and LHCFast cycle with short flat bottom (60 ms) and acceleration to 450 GeV/c. Integration of longitudinal bunch profiles was used to recover the bunch intensity (losses) immediately after injection, not seen by BCT (first measurement at 10 ms). This allowed the detailed investigation of loss as a function of injected bunch intensity and chromaticity to be carried out. This tool is even available now operationally from the MR application. For very high intensity ($\sim 3.5 \times 10^{11}$) fast losses at injection measured in this way were around 6%.

The minimum chromaticity required to avoid Headtail instability (at any intensity) is 0.03. Then TMCI is observed at intensities higher than $\sim 1.6 \times 10^{11}$. Increasing the vertical chromaticity pushes this threshold up. Longitudinal emittance was around 0.31 eVs (10% lower than nominal).

To cure the vertical instability during acceleration the vertical chromaticity was increased by 0.2. A large variation in bunch intensity and transverse emittance from the PS was observed. Transverse emittance blow-up in the SPS was measured for two different sets of injected emittances. It is smaller for larger injected emittances.

• Highlights from workshop E-CLOUD10 - C. Yin Vallgren

Christina was the only CERN participant at this workshop. In Fermilab the e-cloud build-up can become a problem after the planned, significant (factor 3), intensity increase. Experimental set-up for e-cloud studies includes coated and uncoated vacuum chambers, 4 RFAs and 3 antennas for microwave transmission measurements. The goal of studies is to validate coatings as possible solution for Project. They also received the a-C coated chamber from CERN. The behaviour of e-cloud signal from RFA as well as the signal amplitude (too high according to Fritz) in RF measurements has not been yet completely understood. Conditioning was observed for both a-C and TiN coatings and they had comparable performance. They are prepared to produce TiN

coating for us.

→ We should use this offer to compare the a-C and TiN coating performance in the SPS.

The performance of different coatings including a-C together with many other mitigation techniques (grooves, clearing electrodes, solenoids) are also under study in Cornell (test for ILC damping ring). They see similar performance of TiN and a-C coatings in both regimes, either with significant contribution of SEY or PEY. They built 6 set-ups for measurements of SEY in-situ and one can be used at CERN.

→ This opportunity should be used to perform the SEY measurements of samples without air exposure in the SPS ring.

Vacuum performance studies at KEKB, where a large part of the ring has TiN coating (in addition to antechamber and solenoids or grooves), show large content of nitrogen indicating possible decomposition of TiN. Similar effect was observed at Cornell.

- **Ageing - P. Costa Pinto**

Only very small increase in the SEY (0.95 to 0.97) was observed for different liners extracted from the SPS. These liners were in the SPS ring for a different period of time - from a few months to 1.5 years.

- The next meeting will be on **18 November 2010** at 15:30.

Preliminary agenda:

(1) MD results of week 42:

- Beam observations - E. Shaposhnikova

- Pressure and e-cloud signals - H. Neupert/M. Taborelli

- RF transmission measurements of e-cloud - S. Federmann/F. Caspers

(2) Single bunch longitudinal instability - T. Argyropoulos (tbc)

(3) MD results for low transition energy in the SPS - H. Bartosik

Elena Shaposhnikova, 27.10.2010