

**Minutes of the 25th meeting of the SPS Upgrade Study Team
on 21 April 2009**

Present: G. Arduini, M. Benedikt, S. Calatroni, F. Caspers, P. Chiggiato, R. Garoby, G. Rumolo, E. Shaposhnikova, M. Taborelli

• **Proposal for FT beam emittances from PS2 - M. Benedikt**

The design of the PS2 will be optimised for the LHC beam with maximum intensity 6.7×10^{13} . Maximum total intensity in the PS2 possible with the present design of LPSPL is 10^{14} . In the PS2 this beam will have the same structure as the LHC beam (25 ns spacing) with 50% higher bunch intensity. Assuming the same longitudinal parameters and brightness this leads to 50% larger transverse emittances of $4.5 \pi \mu\text{m}$, which is much smaller than the present emittances extracted from the PS ($15/8 \mu\text{m}$ in h/v plane). In the present PSB-PS transfer for High Intensity (HI) beams the space charge shift is a factor two lower than for LHC beam due to the different production scheme used (splitting of HI bunch in the PSB). Keeping a similar margin for the HI beam in the PS2, the proposed values of transverse emittances are $9/6 \mu\text{m}$ correspondingly in h/v plane.

The questions to the SPSU WG are:

- Are smaller emittances for higher intensity beam acceptable for the SPS?
- Is an rms emittance of $6 \mu\text{m}$ compatible with the SPS vertical aperture?
- Should an emittance exchange still be foreseen in the PS2 design?

The effect of MTE on extracted emittances is still to be investigated. Some experience will be gained in 2009.

The quick answer requested by Michael will be given only by rule of thumb scaling from the existing situation and ignoring possible limitations from the collimation system in the SPS (if it will be needed - this issue was not studied yet). Not to exceed the present radiation level due to injection losses one should take into account both the injection energy, twice higher than the present 14 GeV, and the beam intensity (the SPS record for FT beam is 5.3×10^{13}). Indeed to maximise the total number of protons on target in a given operation period in the SPS, the optimum PS2 extraction energy for a high intensity beam should be around 25 GeV.

For the proposed parameters the space charge tune shift at injection in the SPS is still higher for the LHC beam even taking into account the 50 GeV injection energy.

• **Progress report on coatings - M. Taborelli**

The correlation between storage conditions and ageing were studied. The polymer boxes normally used for storage are suspected to speed up the ageing. No ageing was measured (from SEY) on two samples after one month of storage in N_2 . More statistics are needed to draw a conclusion. The results can have an important application for temporary storage of the coated magnets or for minimising the effect of an intervention in the ring. It is also planned to study the effect of water content and the use of the Al foil.

The effect of creating a more graphitic type of carbon coating using C-Cu co-deposition was studied as an alternative to a-C coating. Storage of samples in N_2 was again beneficial for ageing, which could also be seen as oxidation of Cu (not necessary related to SEY).

The impressive list of other issues under study related to the SPS includes production of surface roughness with different under-layers, cathode geometry and substrate temperatures, production of more compact coatings as well as of liners with similar coating to the MBB (plus more uniform and wider). Thanks to Jeremie one more non-radioactive magnet could be available soon in bld.181 to continue coating tests on liners.

According to Fritz it should be possible with coating to reduce simultaneously the resistive wall impedance by using copper as underlayer ($< 5 \mu\text{m}$).

⇒ The first μwave measurements with beam will be done by Fritz after PAC09.

⇒ Pressure acquisition in the SPS e-cloud test area should be controlled after beam arrival and results will be reported at the next SPSU meeting.

- The next meeting will be on **19 May 2009** at 15:30 in the JBA room (bld. 864).

Preliminary agenda:

Follow-up of the transverse impedance issues - B. Salvant, M. Barnes

Preliminary estimation of resources required for the SPS coating - J. Bauche

Progress report on coatings - M. Taborelli

Elena Shaposhnikova, 23.04.2009