

**Minutes of the 33th meeting of the SPS Upgrade Study Team  
on 15 December 2009**

**Present:** S. Calatroni, F. Caspers, P. Chiggiato, S. Federmann, R. Garoby, J. J. Gras, W. Hofle, G. Rumolo, E. Shaposhnikova, M. Taborelli, C. Yin Vallgren, F. Zimmermann

**Excused:** G. Arduini, J. Bauche, E. Metral

**• Beam diagnostics for future SPS beams. - J.J. Gras**

Two different phases were considered for each instrument in the SPS: phase I - the ultimate LHC intensity and phase II - high intensity with the PS2 as an injector. Minimum bunch intensity of  $2 \times 10^9$  was assumed for both phases. Only beam patterns with a maximum frequency of 40 MHz are assumed for the phase II. Measurements of beam position (BPM), beam intensity (BCT), transverse bunch dimensions (wire scanners) and beam losses were analysed from this point of view.

All systems are ready for phase I except for the MOPOS which has some problems (offsets). So far they have not been fully understood. It was demonstrated that most of the systems after the planned renovation can satisfy the phase II requirements if necessary. The MOPOS, the DC and fast BCT systems will be renovated in 2012 and the BWS in 2014 assuming that all resources needed are available.

The large discrepancy between the DC and the fast BCT measurements (in the absence of losses) sometimes observed in the SPS during MDs with LHC beam can be studied on our request in 2010.

**• Summary of measurement data from e-cloud monitors in MD run week 45. Comparison with the previous MD runs. - C. Yin Vallgren**

During MD week 45 the LHC beam having different numbers of batches (1, 2, 3, 4) and bunch spacings (25, 50, 75 ns) was accelerated in the SPS.

For nominal beam with a 25 ns bunch spacing the e-signal in the ECM with the StSt liner was reduced when the ring was cleaned of the debunched beam by bad injection of the second batch. This also agrees with the pressure curve in uncoated magnets. Coated magnets did not show the same behaviour which indicates again that the reason for the pressure rise in coated and uncoated magnets is not the same. For 50 ns and 75 ns bunch spacing the normalised (to intensity) e-cloud signal in the StSt is approximately 1000 smaller than for 25 ns spaced bunches and becomes comparable to the signal in a carbon coated liner. In the carbon liner the e-cloud signal is very small for all bunch spacings. After one year, conditioning is observed with different bunch spacings both in the StSt (by 30%) and carbon liners.

Accurate data analysis has not confirmed fast conditioning at low B-field in the ECM in the MD week 33.

**• Results of e-cloud measurements with the microwave transmission method in the CERN SPS and PS. MD week 45. - S. Federmann et al.**

The experimental set-up in the SPS was the same as in the MD during week 38. The results obtained in week 38 were well reproduced in week 45. Due to different receiver paths in uncoated

and coated magnets only a comparison of relative changes in signals is possible. In W45 in addition to previous measurements the PM calibration signal at 42 kHz (20 dB stronger than the expected e-cloud signal) was used to see the effect of electronics on AM modulation and determine a time interval suitable for undistorted measurements.

In the uncoated magnet the signal is much smaller for 50 ns bunch spacing and absent for 75 ns. In the coated magnet practically no signal is observed in all situations except maybe near the flat top. Data obtained by microwave transmission method agree very well with the e-cloud monitor data.

In 2010 it is planned to use the AM modulated calibration signal to determine AM/PM conversion. Two instruments will be available simultaneously with a record length of more than 15 s possible with the new one. Measurements will be done on a section with two coated (or uncoated) magnets (see below).

No e-cloud signal was observed so far in the PS set-up which is however different from that in the SPS. This could be due to insufficient signal-to-noise ratio (no electronics in the tunnel) or use of "wrong" trapped mode. More efforts will go in this direction in 2010.

- **Plans for 2010. - M. Taborelli**

It was proposed to remove one of the coated magnets from the ring for careful inspection in the lab after cooling down (from radiation).

After discussion it was decided that this will be magnet MBB51490 (used in 2009 for mw measurements). We will perform microwave measurements of the e-cloud on the same two coated magnets which are used for pressure measurements. The latter can be done with higher resolution (16 ms). Pressure measurements will also be performed in the ECM region (two possible options are under study). Installation of the residual gas analyser requires studies of the KEK and Cern-TA experience with shielding.

→ Understanding of degassing together with optimisation of the coating process have the highest priority for the project in 2010.

- **AOB**

(1) J. Bauche has found that the magnetic field on the axis outside the MBB has been measured in the past (J. Dutour, 1999). The magnetic field of 2680 (100) Gauss was detected at 100 (400) mm for maximum current of 5.8 A with approximately twice smaller field values at twice less current.

(2) The SPSU website was discussed. According to the recommendation of the BE management, from 2010 it will only have access from CERN.

(3) From 2010 meetings will take place on Thursdays at 15:30 in the JBA room. The next meeting will be on January 21st.

- The next meeting will be on **21 January 2010** at 15:30.

Preliminary agenda:

Shutdown work progress - M. Taborelli

The SPS RF system upgrade - E. Shaposhnikova

Elena Shaposhnikova, 04.01.2010