Minutes of the 20th meeting of the SPS Upgrade Study Team on 18 November 2008

Present: G. Arduini, M. Barnes, J. Bauche, D. Tommasini, S. Calatroni, F. Caspers, P. Chiggiato, K. Cornelis, E. Mahner, E. Metral, G. Papotti, G. Rumolo, E. Shaposhnikova, M. Taborelli, C. Yin Vallgren

Excused: R. Garoby, F. Zimmermann

• Coating of the SPS main dipole vacuum chambers: alternative scenarios, logistics - J. Bauche (AT/MCS)

The previous experience in the SPS with a similar scale project includes the installation of synchrotron light shielding in the 80's and RF shielding of the vacuum ports during 1999-2001. Three possible scenarios for the future coating of the SPS dipole magnets were presented. They differ by the place where coating would be performed: in the SPS tunnel, in the underground workshop or on the surface. Assuming in-situ coating (the time needed to take out a vacuum chamber from the SPS magnet is around 3 weeks) with 48 h per magnet, 2 Dumont machines for magnet handling and transportation (together with trailers) and a coating rate of 6 magnets per day (12 coating benches?), the minimum time to coat 744 SPS dipoles is around 120 days in all three scenarios. Probably a realistic goal is to complete this work during three shutdowns (14 weeks each). It was shown that the second scenario (coating in underground workshop in ECX5) has many advantages (time needed, radiation exposure, available space) in comparison with the other two and this is at the moment the preferred option. The next step will be the test on a few magnets in 2009. This project can go in parallel with the planned refurbishing of the water cooling system of the SPS magnets.

Question: What will be the air exposure of coated magnets during this process?

• Progress report on coatings - M. Taborelli

Studies of the ageing of a-Carbon coating on rough surface (Zr) show an increase of the SEY after 4 months of air exposure from 0.85 to 0.95. The possible problem is related to degassing of this surface. Measurements done for the smooth a-C coatings show an improved degassing rate (but still higher than for the StSt reference) for the lower pressure used for sputtering. The measured degassing rate is not correlated to the SEY value.

→ Increase of coating time for two layers (a-C on rough surface) is compensated by the gain expected for slowing down the ageing.

Progress on the coating system for the SPS magnets was reported. Studies of different sputtering configurations continue.

The idea of a gutter-like coated insertion inside the SPS vacuum chamber was discussed again. It has a lot of advantages from the implementation point of view but nevertheless for machine operation can be considered at the moment only as the worst case scenario. Simulations performed by G. Rumolo for a half beam pipe coated (variable SEY) and half uncoated (SEY of 1.8) show a suppression of the e-cloud build-up for a SEY less than 0.9.

• **MKDV vacuum behaviour with LHC beams - K. Cornelis**

Pressure rise in the MKDV kickers during the SPS MD on 12-13.08.2008 with a 50 ns spaced beam of nominal bunch intensity (1.1×10^{11}) was triggering interlocks and it was even higher than with the nominal 25 ns spaced beam. Pressure in MKDV kickers measured with 1 s time resolution for 50 ns and 75 ns spaced bunches and different beam and machine parameters during the MD on 6-8 October 2008 was presented. The results obtained for a 50 ns beam show the threshold behaviour both for bunch intensity (7×10^{10}) and number of batches in the ring. The effect of relatively fast conditioning (a few hours) was observed together with its loss on the same time scale when operating with different beam. The behaviour of MKDV1 and MKDV2 vacuum is different both in time and amplitude (initially the MKDV! peak is twice higher). The peak value is reached at the end of the acceleration. Pressure rise was less for longer bunches (lower voltage) and larger beam gaps. Simulations done by G. Rumolo confirm a possible presence of e-cloud but can't explain the fact that the beam with 50 ns spacing has a higher effect than a 25 ns spaced beam even when also taking into account possible residual magnetic field.

→ The surface coating of the ferrite should be improved together with installation of transition pieces for impedance reduction.

• **Experimental set-up in 2009**

514-515

- 3 spare MBB magnets will be coated and installed in positions 51490, 51530 and 51590.
- Two antennas will be installed: one between QM51410 and uncoated MBB51470 and one between coated MBB51490 and MDV51507 magnets at the same distance from emitter (installed between MBB51470 and MBB51490) for comparative microwave transmission measurements of e-cloud density. Additional calibration of μw measurements could be obtained in the PS set-up (SS98) with StSt cleaning electrode (E. Mahner). Enamel electrodes will be taken out from the SPS.
- A vacuum gauge (and residual gas analyser?) will be installed between two other coated MBB magnets.

517

- C-magnet: a-C sample

518

- XSD1: new StSt reference liner
- XSD2: a-C (CNe13) - the same as in 2008 after venting during shutdown
- SDneg: new a-C or rough a-C/Zr
- EcEx (repeller or "Macek") detector: modified version (if ready) or a-C

• The next meeting will be on **9 December 2008** at 15:30 in the JBA room (bld. 864).

Agenda:

Electromagnetic roughness - F. Caspers

Progress report on coating system and coatings - S. Calatroni/M. Taborelli

Open actions from 2008 - E. Shaposhnikova

Elena Shaposhnikova, 27.11.2008