Minutes of the 14th meeting of the SPS Upgrade Study Team on 15 April 2008

Present: S. Calatroni, F. Caspers, K. Cornelis, R. Garoby, E. Mahner, G. Rumolo, E. Shaposhnikova, M. Taborelli, F. Zimmermann

Excused: P. Chiggiato

• The 2008 SPS and PS e-cloud program (preliminary) - E. Mahner et al.

Edgar described the announced program of e-cloud studies for the SPS as well as the PS (two types of electrodes) and RHIC (different beam filling patterns). For the SPS the list of priorities of the AT-VAC Group starts with e-cloud density measurement by microwave transmission since this technique could also be used in the LHC, especially in the absence at the moment of any other e-cloud diagnostics. Other high priority studies of the AT-VAC Group are those which could help to validate of the e-cloud simulation code (pickups, "repeller" and cleaning electrodes). The acquisition time should be significantly decreased to be at the correct time scale for measurements with the "repeller". Note that the list of priorities of the SPSU Study team is different and for e-cloud studies starts with a search of in-situ solutions which would allow a significant SEY reduction of the SPS vacuum chamber.

The 2008 accelerator schedule for the SPS has six large MD blocks (including the scrubbing run). Only three technical stops are foreseen at the moment. The first one in W.24 will be used to complete installations in the ring. More possibilities for the SPS access exist on request. Minimum intervention time for changes in the vacuum system is 2-4 hours. The LHC beam with 50 ns bunch spacing should be available in the SPS in W.33 (August).

According to Fritz, the RF antennas have improved instrumentation in comparison with 2003; the studies will be done parasitically. The resonance of transmission frequency with cyclotron frequency gives significant signal amplification, the crossing is expected during acceleration.

It was stressed that it is very important to have complete logging of beam parameters (intensity) and vacuum conditions during all e-cloud measurements.

For certain coatings (including NEG) no e-cloud build-up is expected (from simulations - for SEY below 1.3). One should be able to distinguish between cases with low SEY and a low signal due to some problem in the experimental set-up (e.g. cables). To avoid some systematic offsets, the swapping of cables between detectors (reference and sample) could be foreseen. It is planned by AT-VAC to keep the NEG chamber in the ring a whole year as a reference even if no e-cloud signal could be measured.

• Progress on coatings and grooves - M. Taborelli

Very recent measurements of different Carbon-based coatings at CERN were presented. Apparently the measured relative yield strongly depends on the sputtering gas used for film deposition. The lowest yield obtained so far is with Ne. These results are confirmed by full energy range measurements at CSIC-Madrid with maximum SEY of 1.2 after 2 weeks of air exposure. This value could be compared with a maximum yield of 1.6 for C-coating deposited with Kr. This liner is

installed now in the SPS. The reason for this very low SEY is now under study and has not been yet understood. This would be a good next candidate for a test in the SPS if results could be reproduced. The effect of a rough surface is also on the list together with BC composition containing lower amount of B.

The first measurements using new SEY instrumentation give similar results to the previously obtained data for unbaked copper. Still a lot of parameter optimisation needs to be done. The SPS transfer chamber is under construction.

The photos of stainless-steel and copper grooves produced by the cutting tool in the CERN workshop were shown. In both cases the size of grooves is less than 2 mm, but the first one has burrs along the grooves and the second one a large curvature radius at the bottom. According to the SLAC simulations, the effect of the grooves becomes negligible for radii more than 50 μm. The question of groove impedance was discussed again. Fritz doesn't believe in only a 30% increase of impedance related to grooves. The situation can be only worse for very sharp edges. It looks like the local field was not taken into account in simulations. It was decided to continue to follow this path for proof of principle for the proton machine. A good sample (800 mm x 140 mm or 2x400 mm x 140 mm) is expected to be produced in June. To continue this work a budget of 10 kCHF should be allocated.

• **The SPSU subjects and budget for 2008 - E. Shaposhnikova**

The main subjects to be treated in the SPSU Study team in 2008 were presented. The largest part is devoted to the e-cloud activities. The SPS impedance is another important issue for future intensity increase. The search for unknown impedances (mainly in transverse plane) is now also taking place in the dedicated study team (E. Metral et al.). The discussion of the way of reducing the impedance of known elements such as the MKE will take place at the next SPSU meeting in May. The design of new hardware (MKP) related to the PS2 will be treated first in the PS2 WG with periodic reports to the SPSU team. The non-exhaustive list of hardware which needs upgrade and should be also discussed in the SPSU includes beam dump and dump kickers, RF (power, couplers, feeder lines, beam control) and transverse damper. Beam collimation and instrumentation should be also considered. A budget of 1.1 MCHF for the SPS Upgrade activities in 2008-2011 is allocated in the White Paper in Theme 1 under "RF beam control". The present money request for 2008 sums up to 260 kCHF and is dominated by TS-MME spending. No budget code is available at the moment.

• The next meeting will be on **13 May 2008** at 15:30 in the JBA room (bld. 864).

Tentative agenda:

1. The status of the MKE kickers in the SPS - M. Barnes and J. Uythoven
2. Transverse feedback to cure electron-cloud induced single bunch vertical instability. Proposed studies and outlook - W. Hofle
3. Progress report - M. Taborelli

Elena Shaposhnikova, 16.04.2008