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

Present: J. Bauche, S. Calatroni, F. Caspers, P. Costa Pinto, E. Mahner, E. Metral, M. Taborelli, G. Rumolo, E. Shaposhnikova, U. Wienands, C. Yin Vallgren

Excused: G. Arduini, C. Bhat, S. Federmann, R. Garoby

• Heavy-ion desorption yields of amorphous carbon films bombarded with 4.2 MeV/u lead ions at LINAC3 - E. Mahner

No desorption yield data is available for interaction of heavy ions with a-C films. These films have very low SEY, but 40 times higher outgassing (water vapour) rate in comparison with StSt (after 10 hours of pumping). Compact a-C film with a thickness of 510 nm was produced using the magnetron sputtering for studies in the Linac3. The StSt base gives a roughness seen on the a-C surface, probably not important for the SEY reduction.

Since 2001 measurements of dynamic pressure (desorption yield) have been done for 27 different surfaces in isolated (for baking) set-up at 4.2 MeV/u with Pb^{54+} ions with grazing angle impact.

Desorption yields 3 orders of magnitude higher than those for the unbaked StSt were obtained for unbaked a-C with 3-4 times smaller ion flux. Desorption is dominated by CO_2, CO and H_2. The exact scaling to the SPS energy is not known, but desorption yield should be significantly less for higher ion energy. Existing data have a large scatter. More studies are required. The MD proposal of Edgar is to lose a few ion bunches on a-C coated magnets in the SPS. If a high desorption yield is confirmed then a localization of the ion loss (collimation) is mandatory for the coated SPS chamber. In the past ion losses in the SPS were very high (up to 30%).

→ Possibility of the experimental verification in the SPS should be studied (Edgar); could be done on a coated vacuum chamber and not a dipole. Next time we will have ions in the SPS is in one year - could be too late.

• Summary of ageing (increase of SEY) observations - C. Yin Vallgren

So far coatings have been produced in three different configurations (tube, liner and inside MBB). Ageing was studied in the lab under different controlled conditions (atmosphere). There is some difference in ageing for coatings done in the liner and tube configuration. In the SPS we have data for the liner and for mobile samples and samples from MBB, however the statistics is always quite small. No degradation of ECM signal has been observed in a-C liner but direct measurements of SEY are still necessary to confirm these promising results. A small increase of SEY (from 0.92 to 0.96) was measured on the C-strip liner after one year in the SPS and transportation in air to the lab.

Increase of SEY (to 1.3) measured on 3 samples from MBB magnets is attributed to different (worse) conditions of coating (temperature and B-field orientation).

Increase of SEY in the middle of one mobile sample can most probably be explained by air exposure. For two samples under study the SEY increased at the edges - in the region without electron bombardment.

The detailed proposal of ageing studies developed by Pedro and Mauro was presented, these studies should significantly increase the statistics for both ageing and production reproducibility.

• **Summary of SPS MD run week 35 - C. Yin Vallgren**

Main observations:

- fast conditioning of DLC, e-cloud signal in good agreement with SEY

- factor 10 difference in e-cloud signal for 50 ns and 25 ns spaced beam (same bunch intensity, twice smaller total)

- no e-cloud signal decrease (nor strong increase either) for bunch intensity increase above nominal

- E-cloud signal in half-coated liner has a sharp boarder

• **Pressure data from SPS MD w35 - M. Taborelli, H. Neupert**

The pressure behaviour for three pairs of reference magnets were compared for different beam spacings and intensities. Comparison of 50 ns and 25 ns spaced beams with the same bunch intensity (and different number of bunches) shows that the largest increase in peak pressure is for uncoated-uncoated magnets (neglecting the static value) with coated-uncoated being slightly better. The situation is opposite for increase of bunch intensity for 50 ns spaced beam, when much less e-cloud build-up is expected. Practically no increase for uncoated-uncoated magnets.

→ Proposal for the next MD: study correlation between pressure rise and ECM signal in well defined conditions for the same total beam intensity with different number of bunches and bunch intensity.

→ Comparison of static pressure for the old and new (almost fully coated internal surface) coated magnets.

After this meeting Mauro looked at the static vacuum at the gauge between the 2 coated magnets, for the old values - around April 2009 and for the new values - now. In both cases it is about one month after insertion and the pressure is around 2×10^{-8} mbar in both cases (but with scatter from 1.5 to 3×10^{-8} mbar depending on data). There is no evidence that the static outgassing of the old magnets is lower than the new ones (due to the smaller coated surface). For dynamic pressure the rise was about 2×10^{-7} mbar (MDw25) and now it is 4×10^{-7} mbar, both with 4x72 bunches accelerated.

• The next meeting will be on **21 October 2010** at 15:30.

Preliminary agenda:

MD results for ultimate intensity single bunch - B. Salvant

Preliminary planning of MD week 44 - G. Rumolo

RF transmission measurements of e-cloud in MD w35 - S. Federmann/F. Caspers

News on coatings and coating systems - M. Taborelli/ P. Costa Pinto

Elena Shaposhnikova, 7.10.2010