Minutes of the 12th meeting of the SPS Upgrade Study Team on 5 February 2008

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

Excused: K. Cornelis, B. Henrist, E. Metral, T. Kroyer, F. Zimmermann

• **G. Arduini** described the progress with installations in point 5 for e-cloud tests with C-magnets. Everything is ready for installation of two C-magnets (holes drilled), the compatibility of the vacuum chambers produced is under discussion with Vacuum Group (Giovanna Vandoni). Their aperture has been verified and is acceptable. In the worst case the MBB vacuum chamber can be installed. The deadline is mid-March.

Aperture will be also checked for the microwave diagnostics (10 mm inside vacuum chamber).

• **Grooves (from e-mail communication with M. Pivi, SLAC).**

On request from M. Pivi the Canadian company Almag has produced by extrusion grooves of 1.9 mm depth on 20 aluminum plates of size 1500 mm x 60 mm x 3.5 mm and sent them to CERN (to M. Taborelli). Their height is too big for the SPS aperture, but probably they still can be used (after TiN coating) for proof of principle and results can be compared with a smooth chamber with TiN coating. The TiN coating of these grooves is necessary due to high SEY of aluminum (more than 2.5). With grooves, according to the simulations done at SLAC, the SEY should be reduced to 0.9. Production of smaller grooves (1 mm) on stainless steel is under discussion with EMEGA in California and probably can be done at no cost. M. Pivi will be visiting CERN from 10 to 28 March 2008.

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

The comparison (by XPS) of the surface composition of different coatings (C, CN and TiN) after air exposure has shown that TiN has the largest concentration of O (30 %) and therefore is expected to be the most sensitive after air exposure with respect to SEY. The present status of the SEY measurement system was presented as well.

The measured dynamic vacuum properties (ESD) are roughly the same for C and CN baked at 80 deg C. The composition of desorbed gases is different for different coatings (e.g. mainly CO_2 for C and N_2 for CN).

Other potential coatings for studies could be BN, BC and a-SIC.

• **The SPS e-cloud measurements 2008. Status and near future planning - F. Caspers**

Two different experiments planned in the SPS were described. They will be based on stripline electrode with electron collectors (shielded button pickups, similar to PS set-up in 2007) and microwave diagnostics.

The full size (4 m long) prototype using an enamel technology should arrive from Germany at CERN in a few days and will be installed immediately. This electrode has inox part (2 mm) with enamel (0.1 mm) and resistive (0.01 mm) layers and a conductive paint (0.3 mm) on the top at the

two ends (10 mm long). Very promising results from another company (Heraeus) with 30 microns for the isolation and 20 microns for the resistive layer were also presented.

The deposition of different layers requires very high temperature (800 deg C) and can't be done in-situ. So at the moment the possible implementation of cleaning electrodes in the SPS is based on the production of insertions. Then the question was asked what should be the next step for this approach. The insertion of these electrodes into the SPS beam pipe will create a double vacuum chamber. Apart from worries expressed by K. Cornelis from the operational point of view are there any other showstoppers (as vacuum with increased surface)? After discussion it was decided to continue production of inserts and to perform different tests in the machine.

It was also proposed to measure the SEY and vacuum properties of the electrodes (for the situation when they are not active). ⇒ **M. Taborelli** will test them in the lab.

The second part of the measurements will be based on the microwave (3 GHz) transmission technique proposed a few years ago. There are 3 pairs of antenna which will be installed in arc 4-5 of the SPS (over a distance of 14.4 and 33.1 m). This measurement set-up is similar to the one used in the SPS in 2004. This time, cross-calibration with the other e-cloud diagnostic will be also possible.

• Summary of e-cloud test installations (my understanding)

514: 3 pairs of antennas
517: Two C-magnets: one for exchangeable samples with different coatings and one spare
518 (based on drawings of **B. Henrist**):

1. Detector XSD1 with stainless steel screen and collector as a reference
2. Cleaning enamel electrode
3. Detector XSD2 with TiN coated screen and collector
4. Detector EcEx with electrode and collector (R. Macek type)
5. Detector SDneg with NEG coated screen and collector, surrounded from both sides by two other NEG coated chambers with two baffles. These chambers could be baked (activated).

• The next meeting will be on **11 March 2008** at 15:30 in the JBA room (bld. 864).
Tentative agenda:
1. Progress reports on preparation for the 2008 tests in the SPS
- F. Caspers, B. Henrist, M. Taborelli
2. MD plans for e-cloud studies - G. Rumolo

Elena Shaposhnikova, 13.02.2007