Minutes of the 22th meeting of the SPS Upgrade Study Team on 9 December 2008

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

Excused: E. Metral

• **Coating of the SPS main dipole - N. Gilbert, J. Bauche**

The planning of the shutdown work in the sector 5 of the SPS was presented. Taking into account the prolongation of the shutdown by one week announced recently, week 10 (March 6th) is the latest possible time for the installation of three coated MBB magnets at positions 51490, 51530 and 51550. How many coated magnets will finally be installed in the ring depends on the results of tests with a new coating system, now under development (see next talk). In addition, after opening, 5 days are required for the baking of the BIPM (ionization profile monitor) in the same sector 520.

The planning for the SPS shutdown work will be presented for approval at the APC meeting in January 2009 (16th).

• **Progress report on coatings for SPSU - M. Taborelli**

The coating of MBA and MBB type magnets in the configuration with the magnetic field parallel to the electrical field was tested using a mini set-up in bld. 181. To provide a magnetron effect, an electric field component perpendicular to the magnetic field was created by using two rods out of four (first using the internal and then the external) as active cathodes. The beam pipe and the two other rods were grounded. This coating process gave good results (maximum SEY of 1.05 for CAr_7), but took 30 hours (to be compared with 8 hours for the usual configuration). The latest results using bars instead of rods give good hope for a significant reduction in time needed for coating. The design of the coating system for the MBB geometry is almost completed. The critical value of SEY is equal 1.3 for MBB and 1.5 for MBA, this is why using the MBB can give a better estimation (upper limit) of the SEY of the coating produced. The coating of the liner in MBB geometry and then of the MBB itself after cleaning will be done in bld. 867 and should be completed by the beginning of W10. Information about the number of magnets ready for installation in W10 will be available in W8. In case only one magnet is ready it will be installed at the position 51490 for microwave diagnostics. According to Fritz, the planning for the displacement of antennas and cabling is under way. Two other coated MBB magnets will be used for pressure measurements with reference measurements between two un-coated magnets somewhere else ⇒ to be identified by Mauro. If only one more coated MBB is ready in W10, the pressure measurements will be more tricky to use for the e-cloud diagnostics but probably it is still possible ⇒ for reliable results one needs symmetric pumping around this point. The vacuum gauge should be installed between MBB51530 and MBB51550 and this can be done in any situation with magnet coating to speed up the future work during the SPS technical stop.

• **A locally modulated static magnetic field for reduction of the SEY and also**

mitigation for multipactoring - a proposal - F. Caspers

The new idea proposed is based on the positive effect of a rough surface (e.g. grooves) and of static magnetic and electric fields (solenoids, clearing voltages). The proposal is to create magnetic roughness by magnetisation of a ferromagnetic layer (e.g. nickel) covered by a thin layer (5 skin depths) of conductive material (e.g. copper). This would be difficult to apply in-situ for the existing vacuum chamber but could be envisaged for a new vacuum chamber in the field-free regions. For application inside dipoles the solution should be modified (there could be local ferromagnetic patches of $\sim$ 10 μm size). Preliminary simulations by W. Brunes demonstrate the effect for a periodic magnetic field (10 mm period) of 0.01 T. For the modulation at the level of 20-60 μm which could be achieved a large effect is also expected for smaller fields (0.001 T).

The idea caused a lot of interest for possible application in satellites and is also pursued by this (space) community.

- **Activities in 2008 and open actions - E. Shaposhnikova**

Analysis of the main SPSU activities was presented. The largest fraction was devoted to e-cloud issues with Mauro Taborelli giving a talk at each SPSU meeting ("man of the year")! Coating with a-C on a rough surface is considered at the moment as the most promising solution for in-situ e-cloud mitigation. If this will be implemented in the SPS, the existing vacuum system will need to be modified as well. Other important subjects treated in 2008 are the SPS beam dump and various kickers (MKE and MKDV,H). The situation with shielding of MKE kickers, which helps in the longitudinal plane but doesn't reduce significantly the transverse impedance, will be reconsidered in 2009. The search for unknown SPS impedance sources (broad-band in the transverse plane and mainly narrow-band in the longitudinal) should continue together with measures to reduce main impedance sources already identified. The RF feedback and feedforward around the 800 MHz RF system (two TW cavities) planned for 2009-2010 should reduce its main impedance by a factor 10. The RF upgrade of the 200 MHz RF system (power, couplers and number of cavities and cavity sections) will be followed more closely next year as well. Beam loss is one of the main limiting factors for intensity increase and usually relative losses only grow with intensity. This is why beam collimation could be required in future as well as serious modifications to the beam instrumentation. We could revisit the choice of the future SPS injection energy at 50 GeV (with PS2) in view of the possible future demand for an energy upgrade of the LHC and SPS. An Interim Report and Review (external?) for the end of 2009 were also proposed.

- The next meeting will be on **27 January 2009** at 15:30 in the JBA room (bld. 864).

Preliminary agenda:

Progress report on coating system and coatings - M. Taborelli

Elena Shaposhnikova, 11.12.2008