Minutes of the 29th meeting of the SPS Upgrade Study Team on 8 September 2009

Present: G. Arduini, F. Caspers, S. Cettour Cave, P. Chiggiato, K. Cornelis, P. Costa Pinto, E. Metral, E. Shaposhnikova, M. Taborelli

Excused: S. Calatroni, R. Garoby, E. Mahner, G. Rumolo, C. Yin Vallgren

• Results from MD week 33 - M. Taborelli, C. Yin Vallgren

Pressure measurements showed faster conditioning for the uncoated magnets with 1 batch. With 2 batches pressure in the uncoated magnets went up in comparison with the coated but did not return to the lower level for subsequent operation with 1 batch. In accordance with expectations pressure in the uncoated magnets went down more than in the coated for increased spacing between batches.

Keeping in mind a large variation in shape and magnitude of the pressure curves between the uncoated magnets themselves, gauge calibration and pumping speed were questioned.

The influence of the uncoated region was studied in measurements performed with the e-cloud monitor in the StSt liner at low B-field. Maximum e-cloud signal was measured at low B-field (around 50 Gauss). The results should be compared with simulations done by Giovanni Rumolo (see the next presentation).

Plans:

- coating of regions between magnets and their edges for cleaner pressure measurements
- exchange or replace with calibrated vacuum gauges between the coated and uncoated magnets, install a residual gas analyser
- pressure measurements for liners
- analysis of the effect of fast conditioning at low B-field observed with ECM in MD W.33

• Effect of the holes in the e-cloud strip-line monitor - G. Rumolo, presented by G. Arduini

The ECLOUD code has been modified to simulate the effect of the hole in e-cloud detection system. Different hole sizes and locations were examined for 4 LHC batches in the ring and the magnetic field was varied from 0 to 1.2 kGauss (value in SPS dipoles at 26 GeV/c injection). It was obtained that two holes of the 1 mm radius (one under another) significantly (factor 25) reduce the e-cloud current measured for high B-field (for the Larmor radius small in comparison with the hole radius) due to the local suppression of the multipacting.

Nevertheless even taking into account the effect of the hole, the e-cloud current at 50 Gauss is already as large as at 1.2 kGauss and the effect of the dipole fringe fields in pumping ports can play a significant role for e-cloud build-up.

Next:

→ simulations for hole on one side only and with array of holes (as in the monitor).

• E-cloud in SPS dipoles - K. Cornelis

Over the years the e-cloud traces were observed on the bottom and top of the vacuum chamber

in many SPS magnets as well as in pumping ports. These stripes have different color in the pumping port (blue) and inside (after 0.5 m) the magnets (brown), however the surface is also different (shiny and mat). The difference in visibility of e-cloud traces in photos and video (sometimes they are more visible at the magnet edges over $\sim$ 50 cm) could be also due to the different lighting inside and outside the magnets as well as the surface properties (rough surface with dust inside magnet).

The pressure rise threshold in the field free region measured in the past is higher than between dipoles (correspondingly 8×10^{10} and 5×10^{10}) but above the threshold the pressure value in the field free region becomes very quickly comparable with that between dipoles.

$\rightarrow$ It is very important to have 3D measurements of the magnet fringe field to see the magnetic field configuration in pumping ports between magnets.

• **E-cloud test installation (BA5) - further findings and observations - F. Caspers, S. Federmann**

More tests of the microwave transmission method were performed. The effects of Inter Modulation Distortion (IMD) can be seen on the carrier CW signal (2.682 GHz) at each beam injection (about -0.5 dB) and at the end of acceleration ($\sim$ 0.5 dB) The first could be removed by replacing of the amplifiers (done). There is also a much larger reduction in the amplitude of the carrier (observed also without beam) which follows the magnetic cycle. Different hypotheses explaining this phenomena were explored and after additional tests on the SPS dipole in bld.867, the most probable explanation is related to the small (a few 10 μm) deformation of the vacuum chamber due to magnetostriction during the magnetic ramp.

Next step is to study the possible effect of the direct interaction of beam with CW signals.

It was also suggested to think about creating e-cloud (first, inside the e-cloud monitor and then inside the magnet) with a wire as a beam.

Due to the absence of Fritz the next μw measurements during the SPS MD probably will only be possible in November (week 45).

• **Next SPS MD in week 38**

The MD is scheduled for Tuesday 15 September. We will start with 25 ns spaced beam and then the injectors will provide 75 ns spaced bunches. The 50 ns spaced beam is not yet available from PS due to the new production scheme used this year (single batch).

A solenoid field can be used to try and affect the e-cloud in the field-free region (pumping port) to see the effect on pressure. One power supply is available in tunnel from the C-magnet. Access to the ring is possible on Monday morning.

- The next meeting will be on **29th September 2009** at 15:30.

Preliminary agenda:
Results from the SPS MD week 38 - M. Taborelli
E-cloud activities in Cornell - S. Calatroni
Planning of MD week 41 - E. Metral, E. Shaposhnikova
Preparation of anti e-cloud coating workshop - F. Zimmermann

Elena Shaposhnikova, 9.09.2009