Minutes of the 15th meeting of the SPS Upgrade Study Team on 1 July 2008

Present: G. Arduini, S. Calatroni, F. Caspers, P. Chiggiato, J.M. Jiminez, R. Garoby, S. Kurennoy, E. Mahner, E. Metral, G. Rumolo, E. Shaposhnikova, M. Taborelli, C. Yin Vallgren

Excused: B. Henrist

• Progress on coatings - M. Taborelli

An even lower SEY, $\delta_{max} = 0.95$), was obtained for carbon (CNe8) coating with the baked (before sputtering) chamber with $\delta_{max} = 1.25$ after 8 days of air exposure. If it is confirmed that this low SEY is achieved due to a clean surface, then different cleaning methods could be envisaged for the SPS itself. A variation in δ_{max} of 0.05 was measured due to the inhomogeneity of C coating. The liner with this coating is installed in the SPS.

→ It is important to measure the SEY time evolution on a much longer time scale, comparable or longer than the SPS shutdown (when at least 50% of the chamber can be exposed to air).

Copper black coating produced by sputtering technique was also tested (δ_{max} increased from 1.25 to 1.85 during 18 days). The results are not as good as for the black gold ($\delta_{max} = 1$ after one week air exposure). In fact the measured gold coating was really black while the copper is brown (visually). Note that coating with gold was done by evaporation. The measured difference in SEY for a planar and liner geometry is negligible.

An additional SEY reduction of 15% is expected for rough surfaces, so future plans include studies of C-coating on Cu black and rough Zr.

Taking into account the progress made towards obtaining a low SEY we are approaching the next important problems:

(1) Sputtering in a real SPS chamber inside the magnet

(2) The time evolution of SEY during air exposure followed by scrubbing with the beam. If during an air exposure (SPS shutdown or long intervention) the SEY increases to some value above the threshold δ^t_{max} (assumed to be in the SPS around 1.3), then the most probable scenario will be that beam scrubbing will allow this threshold value to be asymptotically approached (due to continuous dose reduction during conditioning). One possible solution to avoid the increase in SEY could be a passivation of surface before venting. Otherwise some method of surface reactivation after venting other than beam is need since the beam will not condition the surface below δ^t_{max}.

The next technical stop in the SPS is foreseen for August 11.

The SPS scrubbing run - C. Yin Villgren

The measurements done with SEMcloud monitors during the SPS scrubbing run for Stainless Steel (SS) and Carbon (C) surfaces show clearly the results of scrubbing with beam when maximum e-cloud signal is normalised to maximum beam intensity for a given cycle. Only a few nA current was measured for the activated NEG coating in comparison to $\sim 2.55 \times 10^4$ nA for SS and $\sim 0.5 \times 10^4$ nA for C at the end of the run. Reduction of the signal by a factor of 3 was observed for SS and almost by a factor of 5 for C. The initial SEY is believed to be 2.5 for SS, 1.4 for C and 1.1 for NEG.

The SPS scrubbing run - G. Arduini

The effect of the debunched beam (due to injection/capture losses) on e-cloud accumulation was seen again during the scrubbing run. At the moment when the debunched beam fills completely the gap between batches, the signal on e-cloud monitor grows. Cleaning the gap by the transverse damper helped in the past (MD in 2007). A small slope in B-field (beam acceleration) on the flat bottom (Karel) also helps. Scrubbing effect is very local. When beam was displaced radially by a 5 mm bump, the e-cloud signal increased again. This experiment is relevant to what can be expected during the LHC beam rephasing on the flat top.

The 2008 e-cloud transmission experiment: first results - F. Caspers

Progress was made in understanding the results obtained with this technique in the SPS in 2003. In a new set-up in BA5, among other improvements, the high pass filters are replaced by narrow filters centered at 2.5 GHz. The two sidebands of the CW carrier produced at the revolution frequency (43.4 KHz) by the expected phase modulation due to e-cloud should give information about the density of e-cloud in the transmission region (11 m and 30 m long) since their amplitude is correlated to the average e-cloud density. Different tests were done to demonstrate the presence of the signal at the expected time and frequencies and more are planned to confirm that this is phase and not amplitude modulation. The results are very promising for the e-cloud diagnostics both for the SPS and LHC.

According to Edgar, the measurements done with button pick-ups in the SPS are less clear than in the PS. First test with cleaning electrodes in the SPS was successful, data need to be analysed.

• The next meeting will be on **11 July 2008** at 14:15 in the JBA room (bld. 864).

Tentative agenda:

Status of the SPS beam dump - Y. Kadi

Status of the SPS beam dump kickers - M. Barnes

News from the SPS long MD week 28 - everybody

Elena Shaposhnikova, 2.07.2008