

Minutes of the combined meeting of the SPS Upgrade Study Group and Task Force on 20 May 2010

Present: G. Arduini, B. Balhan, M. Barnes, J. Bauche, J. Borburgh, S. Calatroni, F. Caspers, S. Federmann, R. Garoby, V. Mertens, E. Metral, G. Rumolo, E. Shaposhnikova, M. Taborelli, C. Yin Vallgren, U. Wienands

Excused: E. Mahner

• Observations and measurements on the ZS during the SPS MD - J. Borburgh

Since the 2002 accident with ZS5, with LHC beam in the ring the ZS was always kept "retracted", with high voltage "on" at 0 kV and ion traps "on" at -3 kV and -6 kV. During the operation the cathode is at -220 kV. Recently it has been seen that the ZS anode behaves as an RF pick-up. The origin of the anode current decrease is not completely clear. During the last MD it was found that powering the main gap voltage to -7 kV significantly reduced outgassing, which strongly depends on beam parameters (in particular bunch length). During main voltage variation de-conditioning could be observed together with relatively fast conditioning. More simulations and studies are required to find optimum configuration. There is a list of intensive studies planned for the next MD which also includes measurements on individual ZS. More ideas for the ZS test facility in LSS6 were presented. The project should be launched now to start work during the 2010/2011 shutdown.

The MSE tripped during these tests. From the equipment point of view the threshold for the vacuum interlock on MS could be increased to the 10^{-6} level.

• Heating and outgassing of SPS kickers: MD of week 17 - M. Barnes

SPS now has 19 kickers with total length of magnetic material of 32 m. The presented table summarises the situation with all these magnets. The impedance of many magnets has not yet been measured.

During MD W17 the MKE6 magnet with serigraphy showed initial outgassing followed by conditioning. For the magnet MKE4 without serigraphy the pressure rise was significantly (factor 10) less than for MKE6 (and no conditioning effect), but a temperature rise of 35 deg was observed. The present interlock level is at 70 deg and according to estimations it would take 3-4 hours with 4 nominal batches in the ring to reach this limit.

All MKP show similar pressure rise and the heating agrees well with expectations based on the impedance model. It is not clear if any improvement will be needed in future. However they suffer from the outgassing in TIDVG (situated nearby) during beam dumps.

MKDH are made from laminated steel and MKDH1 shows the highest pressure. There are some open question concerning particular behaviour (pressure spikes) during MD probably related to some RF manipulations (change of voltage) or trimming some other parameters.

A lot of analysis has still to be done comparing results from different MDs in 2009 and 2010 for 25 ns bunch spacing. More data are expected from the next MDs in 2010.

→ One of the important questions (for future modifications) is the effect of serigraphy on

outgassing.

- **News on microwave transmission measurements - S. Federmann**

For measurements over the length of two MBBs the coupling seems to be no longer sufficient to have a signal above the noise floor. The proposed modifications include removal of the RF shielding in the pumping ports with antennas. One more amplifier has been lost due to radiation and now, in the new set-up, all sensitive electronics will be moved out from the tunnel.

- **SPS MD run W17: e-cloud monitors and pressure rise. Coatings news - M. Taborelli**

Static pressure was the same as in the past MDs. The highest pressure rise was measured in the recently installed uncoated MBB. The lowest - for the reference uncoated dipoles (51340). The results are also similar to the 2009 data. A large pressure rise was again measured between the two ECM with the StSt liners. However during this MD practically no conditioning was observed in StSt liners (due to signal saturation?), contrary to the ECMs with a-CNe13 and a-CZr liners, where the e-cloud signal was reduced by a factor three (together with some pressure decrease). Fast (300 Hz) acquisition indicates clearly that the pressure starts to grow after injection of the second LHC batch (while it is still decaying with one batch in the ring). Similar behaviour is observed both for magnets and liners. Pump-down measurements done in the lab for the tube confirm 10 times higher outgassing of a-C coating (in comparison with unbaked StSt).

The StSt liners and chambers connecting them will be replaced by coated elements for the MD in W22 for pressure measurements. Two new coated liners have an SEY of 0.95 after one week of air exposure. After that the next liners (inserted in W26 or W30) will be the ones with a partial a-C coating.

→ ECM with one coated liner and one StSt liner could also allow the study of the ageing of a-C coating in the presence of e-cloud.

During the test of the vacuum chamber coating for MBB magnets, a more uniform coating was obtained with rectangular cathodes than with cylindrical. A prototype of 7 m has already been produced.

The insertion of the two magnets with a vacuum chamber coated in the lab is foreseen during MD W35. The present coated magnets (MBB51530 and MBB51550) should be installed in the SPS in a different position to continue the longterm stability test. A full test should include coating and installation of two MBBs, two MBAs and QD.

Clearing electrodes are reconsidered again for the coating option with magnet opening. The samples of plasma sprayed alumina were ordered from two firms to test degassing and dielectric strength.

- **Planning of the SPS MD W22**

The next MD in week 22 will be devoted to LHC beam with intensity above nominal. LHC beam with 25 ns bunch spacing with ultimate intensity but larger transverse emittances has been prepared in the PSB and in PS. We will start with 12 bunches of ultimate intensity. Then the number of bunches (Booster rings) will be progressively increased. The detailed parameters (number of PS batches, maximum energy and RF voltage) will depend on the limitations observed (also from the

ZS and other magnets). We will finish the MD with nominal LHC intensities to have reference measurements.

- The next meeting will be on **24 June 2010** at 15:30.

Preliminary agenda:

Highlights from IPAC'10 - participants

Recent results on coatings and coating systems - M. Taborelli

Planning of the MBB insertion - J. Bauche

Results of MD W22 with ultimate intensity - E. Shaposhnikova/M. Barnes

TMCI in the SPS - B. Salvant

Elena Shaposhnikova, 20.06.2010