Minutes of the 15th meeting of the SPS Upgrade Study Team on 13 May 2008

Present: G. Arduini, M. Barnes, F. Caspers, K. Cornelis, W. Hofle, R. Garoby, E. Mahner, E. Metral, G. Rumolo, E. Shaposhnikova, M. Taborelli, J. Uythoven, F. Zimmermann

Excused: P. Chiggiato

• Present status and future plans for the MKE kicker magnets - M. Barnes

Five MKE magnets are installed in LSS4 for extraction to LHC and CNGS and three in LSS6 for extraction to LHC only. According to their aperture size (large and small) there are L- and S-type magnets. They all consist of 7 ferrite cells and are 30 years old. They were equipped with transition pieces in 2002 during the first impedance reduction campaign. In 2004 beam induced heating was identified as a limiting factor for their operation with CNGS beam. Magnets were equipped with high thermal conductivity plates, water cooling and temperature sensors (LSS4 in 2003 and LSS6 in 2005/2006). Due to water cooling kickers are operational at twice higher beam power deposition. Calibration of measured temperature on the probes allowed the correlation with ferrite heating to be established (close to Curie T). Then this ratio is assumed to be linear and is used over all the range. Beam interlock was adjusted at 70 deg C during operation with beam extraction and 90 deg C without (e.g. scrubbing run).

Significant reduction of heating (at least a factor 4) was measured for the magnet equipped with interdigital comb structure (serigraphy). This agrees with the expectation based on measured longitudinal impedance which is reduced everywhere except at very low frequencies, where one can see a resonant peak at 48 MHz which is defined by the finger geometry. At the moment, in LSS6, one L-magnet is completely serigraphed and one S-magnet has 2 out of 7 cells with serigraphy.

All different magnets (L and S type, 8C11 and 4E2 ferrite) have similar longitudinal impedance. In the present estimations of power deposition the calculated longitudinal impedance was replaced by the measured one, which give results closer to measurements. The temperature rise depends on the type of the SPS supercycle and average bunch length during cycle.

It is planned to equip all MKE magnets with the same printed comb structure during 4 next shutdowns (2/year), provided that the shutdown is at least 3 months duration.

Open questions:

- What is the intensity limitation for the MKE with serigraphy for present and future (with PS2) LHC and CNGS beams? → M. Barnes et al.

- Should/could serigraphy be further optimised before application to other magnets? If yes, what are criteria and time scale? (Displacing the low-frequency resonance from magnet to magnet?...) → F. Caspers et al.

- Is transverse impedance of the modified kickers acceptable for future SPS intensities from the beam stability point of view? → E. Metral et al

- What could be the design for completely new kickers in future which satisfy all existing requirements? → M. Barnes

These issues will be discussed at the SPSU meeting in a few months (September)

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

The low SEY for Carbon coating deposited with Ne was reproduced for flat geometry, but not for the round pipe (problem of thickness). It is possible that this low SEY is obtained due to the high pressure used during sputtering with Ne. Tests to control quantaty of the dust particles on the C-Ne coating were performed in the clean room by pumping the chamber and having a particle counter. Apparently for coated chamber the initial dust level is 10 times higher and it takes about 10 min to come to the initial level of chamber without coating. Shaking and heating the chamber could imitate more closely the machine conditions. The measurement will be repeated to see time evolution. An additional SEY reduction of 15% was measured for a rough surface (Zr). Almost a factor 3 reduction in SEY was also obtained at 500 eV for black gold in comparison with smooth Au. Note that for black Au the maximum in SEY is shifted to high energies. At the moment the layer produced is not homogeneous, outgasing should be also controlled.

The candidate for the next liner should be found and one liner should be prepared for installation in the SPS after the scrubbing run if this possibility occurs.

The SPS transfer chamber was tested under vacuum, but two valves are still missing.

The simulation for grooves without magnetic field was done on our request in SLAC. This will allow the comparison of SEY to be done in the lab (factor two is predicted). The question of groove impedance needs to be clarified.

• The next meeting will be on **24 June 2008** at 15:30 in the JBA room (bld. 864).

Tentative agenda:

1. Transverse feedback to cure electron-cloud induced single bunch vertical instability. Proposed studies and outlook - W. Hofle
2. First results from the SPS scrubbing run
3. Progress report on coatings and grooves - M. Taborelli

Elena Shaposhnikova, 15.05.2008