

**Minutes of the 17th meeting of the SPS Upgrade Study Team  
on 5 August 2008**

**Present:**

P. Chigiato, K. Cornelis, R. Garoby, W. Hofle, E. Mahner, R. de Maria (BNL), G. Rumolo, E. Shaposhnikova, M. Taborelli, J. R. Thompson (LBNL), C. Yin Vallgren

**Excused:** G. Arduini, F. Caspers, E. Metral

**• Transverse feedback to cure electron-cloud induced single-bunch vertical instability in the SPS. Proposed studies and outlook - W. Hofle**

It is planned that a significant part of this work will be done in the framework of LARP (USA). Some studies already started this year. Previous observations of e-cloud in the SPS showed a coupled bunch instability in the H-plane with low-frequency signal and single bunch instability in the V-plane with high frequency spectrum. At the moment the instability in the H-plane is cured by the transverse damper and in V-plane by operation with a high V chromaticity after a scrubbing run.

Feasibility of a feedback in the V-plane was analysed. The first question is related to incoherent effects due to e-cloud, which are probably difficult to suppress if they are not connected with any detectable bunch oscillations. Other undesirable phenomena related to e-cloud build-up will also still be present in the ring (pressure rise, septa sparking, enhanced outgasing).

This feedback (FB) would need to be very powerful (and even distributed for a growth time less than 10 turns) with large bandwidth (or several bands) at high frequency ( $\sim 1$  GHz). The parameters and choice of main components of the required FB system depend on instability growth rates and bandwidth and therefore accurate measurements of the instability during the acceleration cycle have been foreseen. More data will be acquired during the SPS MD next week (W33).

The SPS head tail monitor used in the past has a notch in the frequency response and some ringing at high frequencies. Another PU installed in the SPS is based on 4 exponential couplers. The quality of the signal was recently improved due to elimination of the combining hybrids.

Simulations made with Headtail code (modified to include FB module) show that dipole feedback is not sufficient to damp the e-cloud instability. In simulations bunch spectrum extends up to 1 GHz. The FB with bandwidth of 800 MHz was able to stabilise the bunch. The origin of the narrow signal observed at 700 MHz in the past with head-tail monitor is not clear (seems to be too narrow for a single bunch). The benchmarking of the Headtail code against an experimental data is very important both for understanding of the e-cloud instability and design of the FB.

It is highly recommended to include in studies and design a possible damping of the TMC instability observed in the SPS due to conventional transverse impedance, which is not yet completely identified and in any case is difficult to reduce (as for MKE kickers) or remove from the ring.

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

The aging of C-based coatings was studied. Measurements of two identical samples show saturation effect in increase of maximum SEY from initial value of 0.9(0.95) to 1.25(1.15) after 2 weeks

of air exposure. More statistics is required to draw a conclusion about the role of a radiation dose received during the measurements and more time is needed to confirm a small aging (SEY below 0.9) observed during the first week for C-coating on rough Zr.

New measurements of dust particles done twice, before and after coating, do not show any difference between a reference SS and C-coated SS tube.

First measurements with scanning e-beam of effect of grooves on SEY show reduction of 1.2 (for  $B=0$ ) in comparison with factor 2 expected in ideal case (for  $B=0$  also) and 1.3 in realistic case with a magnetic field  $B=2$  T. More efforts will go into production of the required shape in CERN workshop. At the same time measurements will be done on Al grooves produced at SLAC (M. Pivi).

New liner (aged 15 days CNe13 with initial SEY of 1) will be installed in the SPS on August 11. High intensity LHC beam will be used in e-cloud studies and RF studies planned for period of August 12 - 13.

- The next meeting will be on **9 September 2008** at 15:30 in the JBA room (bld. 864).

Agenda:

Experience with production of coatings with low SEY, effects of venting and scrubbing -  
N. Hilleret

Progress report on coatings and grooves - M. Taborelli

Elena Shaposhnikova, 7.08.2008