

## Minutes of the 5th meeting of the SPS Upgrade Study Team on 24 July 2007

**Present:** G. Arduini, S. Calatroni, K. Cornelis, T. Kroyer, G. Rumolo, M. Taborelli, E. Shaposhnikova

**Excused:** F. Zimmermann

### • SPS beam for LHC upgrade - E. Shaposhnikova

The LHC upgrade scenario requires 50 ns spaced bunches with an intensity of  $5 \times 10^{11}$  with nominal transverse and twice the nominal longitudinal emittance. Future PS2 should be able to produce bunches spaced at 25/50 ns with an intensity of  $3.7 \times 10^{11}$ . Preliminary ideas on a production scheme for this beam such as beam merging and momentum slip stacking were discussed. Bunch merging requires the 20 MHz and 40 MHz RF systems. Therefore the best place for this gymnastics is the PS2 flat top. The momentum slip stacking probably can be done on the SPS flat bottom using the existing 200 MHz RF system. In this case the main advantage would be a smaller bunch emittance for the PS2-SPS bunch to bucket transfer.

→ Further studies including simulations and MDs are required to test the feasibility of momentum slip stacking for high intensity beams - Elena.

### • Resources for the SPS upgrade - E. Shaposhnikova

This part of presentation was devoted to the discussion of resources required to the SPS upgrade studies. It is clear that the SPS upgrade will need serious investments to make full use of its injector upgrade (PS2). However it was noted that at this stage more beam dynamics studies and MDs are necessary to define the main directions of the future upgrade. There is also an overlap with subjects included in the White Paper for the RF activities.

→ Sergio *et al* will prepare a summary of resources required for studies of the SPS vacuum chamber upgrade.

### • News around table

**G. Arduini** showed the photos of the existing measurement set-up for e-cloud studies in the SPS which includes four magnets with a standard SPS vacuum chamber. There is 1 cm of vertical space for the samples.

Two samples with TiN coating will be installed. First results of simulations for sputtering of the SPS vacuum chamber using four wires were presented by **S. Calatroni**. The thickness of coating in the horizontal direction has variations up to  $\pm 25\%$ , however it remains within a  $\pm 10\%$  window over more than 80% of the total width. It is expected that such a variation is acceptable for the production of suitable TiN coating. The sample with grooves can be also produced if their parameters are defined.

→ Tom will estimate the optimum size as a function of beam energy (magnetic field) and make suggestions (together with Fritz) about possible improvements of the SPS measurement set-up based on their experience from the PS.

**M. Taborelli** presented a sketch of the e-cloud measurement installation of M. Pivi (PEP-II). We need to have a similar set-up at CERN with a possibility to install and transport the samples

without breaking the vacuum. Tom suggested that U-shape magnets could be used to ease the manipulations. This magnet should provide a magnetic field up to 2 kGauss.

→ K. Cornelis will check if magnet of this type is available at CERN.

**T. Kroyer** informed about new option of cleaning electrodes under study. This is a metallic band with an isolating (enamel) layer covered by a conducting layer which can be welded to the bottom of the SPS chamber in several points and fixed at the magnet ends. The requirement of a minimum aperture reduction should also be fulfilled.

**G. Rumolo** reported about preliminary results of the last e-cloud MD in the SPS which this time was carried out with the e-cloud monitor in operation. This allowed the presence of e-cloud to be monitored during the vertical instability at 26 GeV/c and 37 GeV/c. This instability was observed for short bunches created by a voltage increase (to 4 MV) both on the flat bottom and flat top. It looks like this instability has a different character (and probably nature) at two energies: at 26 GeV/c it was observed in the absence of the e-cloud and had a coupled-bunch structure while at 37 GeV/c it seems to be a single bunch phenomena (at the end of the batch) and was associated with simultaneous appearance of the e-cloud signal on the monitor. A lot of precaution is still required to draw a conclusion about the energy dependence of the e-cloud instability. The next MD is planned for week 35 with a flat portion at 55 GeV/c.

**F. Zimmermann** wrote an e-mail about the e-cloud study programme at CESR-TA, a conversion of CESR into an ILC test facility. Their electron-cloud study programme is for positrons and its goals are very similar to what we have in mind for SPS upgrade with protons. In 2008 and 2009 CESR will install various test chambers with different coatings and/or clearing electrodes, all equipped with advanced electron-cloud diagnostics ("integral RFA's") to find the best suppression technique. They will also study the scaling of the electron-driven head-tail instability with beam size and with beam energy. The key contact for these studies at Cornell is Mark Palmer, who attended the ECL2 workshop.

- The next meetings (TBC) will be on **21 August 2007** at 16:00 in the JBA room (bld. 864).

- **Topics for future meetings**

Meeting on 21.08.2007:

- SPS impedance (E. Metral)
- SPS beams from PS2 (M. Benedikt)

Meeting on 18.09.2007

- Beam loss and radiation in the SPS for higher intensities and injection energy (G. Arduini)

November:

- Beam instrumentation upgrade (BI person)

Elena Shaposhnikova, 25.07.2007