

SPS Studies Working Group Eleventh Meeting - 9th November 1999

Presents: G. Arduini (secretary), H. Burkhardt, K. Cornelis (chairman), W. Höfle, J. Klem, T. Linnecar, E. Shaposhnikova, J. Tuckmantel, L. Vos, F. Zimmermann.

Results of recent MDs

- G. Arduini reported on the measurement of the emittance evolution along the batch of the LHC beam for different intensities. The measurement was performed on the MD segment at 26 GeV for intensities ranging from 2.5×10^{12} to 6.5×10^{12} p/batch. Only one damper pair was operational and strong octupole Landau damping component in the horizontal plane was needed to stabilise the beam. The profile measurements were performed with the rotational wire scanner in BA4. The measurement of the different part of the batch is performed by gating the photomultiplier signal, the gate is triggered by the revolution frequency and was 350 ns. A measurement of the peak signal as a function of the gate position shows that the response time of the system is of the order of few hundreds ns and therefore allows to distinguish different parts of the batch. Measurements were performed just after injection and 600 ms after injection both in the horizontal and vertical planes. An increase of the emittance is observable in both planes going from the head to the tail of the batch for intensities equal or higher than 4×10^{12} p/batch, which is the measured threshold for the onset of beam-induced electron cloud for the LHC beam. The observed dependence of the horizontal emittance on the position in the batch is already present at injection and does not evolve with time. In the vertical plane this dependence is enhanced with time from injection if the intensity of the beam is above threshold for the electron cloud onset. G. Arduini added that J. M. Jimenez monitored the vacuum during the MD and measurements of the pressure increase were taken for different batch lengths and bunch intensities. The threshold for the onset of the electron-cloud is about 4×10^{12} p/batch as previously measured but the pressure increase seems to be smaller than during the proton run. The electron cloud builds up for shorter and shorter batches as the intensity per bunch increases. T. Linnecar added that some measurements were performed during the same MD session with a wide-band vertical pick-up. These showed that the tail of the batch is violently oscillating at frequencies which are within the damper bandwidth but which increase with decreasing batch length. W. Hofle mentioned that the tail of the batch might require more damping strength than the head of the batch and therefore the possibility of increasing the gain of the damper along the batch should be tested.

- W. Höfle reported on the status of the damper operation and on the pending MDs for 1999. Dampers H2 and V4 are not operational since the beginning of the lead ion run because of a cooling problem requiring a two-hour intervention in the tunnel (performed on Tuesday 09/11 afternoon). The horizontal damper H1 alone is not providing enough kick strength and the beam is unstable at injection for about 20 ms. In the presence of badly kicked bunches (this happens when the incoming batch is not fully injected in the machine) the baseline oscillations in the pick-up signals due to electron-cloud are amplified. The same phenomenon can be observed when the batch is kicked with the Q-meter pingers. During the MD the solenoids installed around the damper pick-ups proved to be more efficient than in the previous MDs. This seems to confirm the above-mentioned observation performed on the vacuum. A limitation of the damper performances might also occur when the beam is not centred at the pick-ups because of the limited resolution of the ADC/DAC for the damper digital notch filter. 10 and 12 bit solutions (as compared to the 8 bit installed) will be tested in the next parallel machine development session. New electronics working at frequencies multiples of 40 MHz which should be insensitive to baseline distortion induced by electron cloud will be tested with different loading (high impedance FET and 50 Ω wideband hybrid) of the pick-ups. The aim of the experiment is to obtain information about the frequency band where the electron cloud effects are visible and whether these are sensitive to the loading of the pick-up. This will provide the input for the hardware modifications to be performed during the shutdown 1999-2000.
- The planning for the remaining MDs is available on the web at the address: <http://nicewww.cern.ch/~arduini/spsmd/1999/Mdplanning.html>.

Next meeting

The next meeting will take place on Tuesday 23rd November 1999, at 09:15 in room 865-1-D17. A reminder will be sent by e-mail in due time and the agenda will be announced on the web page of the working group <http://wwwinfo.cern.ch/~ghislain/sswg/sswg.html>.

G. Arduini
9th November 1999