

Minutes of the SPS Studies Working Group (SSWG)

12th meeting -29th August 2000

Present: G. Arduini, T. Bohl, P. Baudrenghien, H. Burkhardt, P. Collier, K. Cornelis (chairman), P. Collier, C. Fisher, W. Hofle, L. Jensen, J. Klem, T. Linnecar, D. Manglunki, K. Ohmi, G. Rumolo, J. Tuckmantel, F. Zimmermann, M.P. Zorzano (secretary)

1 Matters from previous meetings

F. Zimmermann will contact Argonne and explore the possibility of borrowing the device that measures the spectrum of the electron motion in the electron cloud.

2 Planning of long MD (K. Cornelis)

From the 30th-31st/08 (from midday to midday) SPS will operate with 2 batches of 48 LHC-like bunches, injected on a cycle like the LHC one (7.2 s plateau and acceleration to 450 GeV). For this beam the intensity is $I \approx 8 \times 10^{10}$ p/bunch. There will be an access to the tunnel. From 12:30 to 22:00 the rf-studies will take place (MDrf beam), first with one batch and if possible with the two batches. C. Fisher will do measurements with the rest gas profile monitor. If there is time the rf-people will try to study the beam in coast at 26 GeV. Also electron cloud studies will be done during the night.

It is recommended to start the studies on 3 batches as soon as possible, next week there will be another long MD that could be used for this.

3 Results from recent MDs.

3.1 Impedance measurements at 120 GeV and 26 GeV with a single proton bunch (M.P. Zorzano).

As a continuation of last years measurements a number of MDs have been performed with a single bunch of protons, in a linear machine with (almost) corrected chromaticity. The slopes

of the coherent tune shifts measured at 120 GeV and 26 GeV as a function of bunch population are negative in the vertical plane and positive in the horizontal plane. The slopes scale with energy in both planes suggesting that space-charge has no effect on the coherent tune. The growth rates of the head-tail modes for varying ξ have also been monitored.

3.2 Summary of MDrf beam experience (K. Cornelis)

For $I \approx 8 \times 10^{10}$ in the LHC-like beam (no octupoles, no dampers):

- The electron cloud instability starts roughly at bunch 20.
- The rise time is $\tau_H \approx 50$ turns and $\tau_V \approx 300$ turns.
- In the horizontal plane the amplitude of centroid oscillation is smaller at the beginning of the train and increases in amplitude smoothly towards the end of the train.
- In the vertical plane, the amplitude of the oscillations does not increase constantly but changes from bunch to bunch, as if it was modulated by a higher order frequency or if it was a single bunch effect.
- In the vertical plane, generally the instability starts at a bunch with higher population suggesting that the instability threshold in the vertical plane depends on the single bunch intensity.
- Current losses are produced vertically.

Remarks:

Sometimes the beam injected from CPS with $I \approx 10^{11}$ is already unstable and shows this oscillations. (D. Manglunki) This cycle has not yet been optimized transversely at the CPS.

There is a phase difference between head and tail. For the bunches at the beginning of the batch the phase difference oscillates with Q_s , whereas at the end of the batch is oscillates with a frequency that is roughly $2Q_s$ indicating the existence of a short wake field.

There are evidences that using the octupoles to blow up the beam horizontally stabilises the vertical plane.

3.3 Matching at the transfer line from PS to SPS (G. Arduini)

The dispersion matching measurements have been repeated with closed orbit correction. The initial conditions agree within a percent with those of last year. The new optics has been installed and looks fine in both planes.

3.4 Coupling (J. Klem)

Profile measurements performed with OTR monitors at the transfer line evidence the presence of coupling between the two planes. Measurements at places with dispersion in only one plane confirm this. Changing the momentum spread of the beam the tilt is enhanced as expected from the known dispersion. Some studies have been done to monitor the tilt at several locations as a function of the septum strength and changing the strength of the bump at extraction. There is no clear correlation. Further studies should be done to determine the source of this coupling.

4 Next meeting

The next meeting is scheduled for Tuesday 12th September, at 09:15, Room 865-1D17. A reminder will be sent by email in due time and the agenda will be announced on the web page of the working group

<http://cern.ch/sl-mgt-sps-swg>

M.P. Zorzano 30th August 2000