LHC ecloud simulations Meeting

Date: 12/14/2010
Meeting Room: 6-2-008

Attendees: Elias Metral, Giovanni Rumolo, Octavio Dominguez Sanchez de La Blanca, Kevin Shing Bruce Li, Chandra Bhat, Frank Zimmermann

Excused: Humberto Maury Cuna

Actions from the past meeting:
Gianluigi Arduini clarified that the spacing between trains had always been 225 ns, for both 50 and 75 ns studies.
Concerning the question of effect of magnetic field, we still need to check the electron distribution to see if the explanation for the effect of magnetic field is correct.
There was a question if the multipacting threshold inferred from the central density is the same as for line density.
Octavio Dominguez has seen a magnetic field effect also for the SPS simulations.

Tatiana Pieloni reported on an analysis of experimental turn-by-turn bunch-by-bunch position data. Three different bunch intensities were used: 6,8 and 10e10. Measurements were done with damper pick ups. 50 ns spacing data shows coherent oscillations of the tail bunches. The oscillations were damped after injection. The damper was on. The damping time of oscillation increases for higher intensities. Horizontal and vertical data were shown. Something appeared to be kicking two bunches. Both data for the very first bunch and bunches within the 36-bunch train were included. Coherent oscillations in the vertical plane occurred at a bunch intensity of 8e10. The bunch numbers of the two pick ups are shifted with respect to each other (an error which might affect the performance of the feedback). Lines separated at 0.005 correspond to two synchrotron sidebands. Another signal was seen at a tune of 0.37, but only for some bunches.

Gianluigi Arduini pointed out a problem with the damper, if the orbit was close to zero. HE asked for which beam the data had been taken. Tatiana Pieloni replied that this effect had been known and affected data had already been removed from the analysis.

The Schottky monitor had suffered from software problems.

Gianluigi Arduini inquired abut a **correlation in the phase of oscillation between bunches**. HE suggested plotting the bunch position turn by turn, and/or to perform an SVD decomposition (referring to a KEKB paper from Ohnishi et al). (***ACTION Tatiana***)

Chandra Bhat asked about evidence for emittance growth from the SR monitor.

Bunches in the tails showed decreasing intensities. Different spacings between several 24-bunch trains were studied with 75-ns spacing.
Beam 2 oscillations versus time were displayed.

Gianluigi Arduini recalled that it was beam 2 which had a damper problem at zero orbit.
Beam 1 showed larger effects in the horizontal plane and not in the vertical.

The fact that positions for different bunches were obtained from the two pickups complicated the analysis.
It had been tried to find the **tune peaks for various bunches** in order to search for a tune shift along the trains.
For **next year more bunches and more turns + Schottky monitor** would be available (Mathilde Favier with Rhodri Jones).

Gianluigi Arduini and Elias Metral suggested collecting questions for Chamonix.

The full machine would be even worse. There was only a 3 microsecond gap once per turn.
For low secondary emission yield, it might take ten trains for the cloud to build up.

Octavio Dominguez presented updated e-cloud simulations for the SPS.
In particular he studied the build up and electron energy spectra for different emittances. The latter showed a sharp edge at 1500 eV.

The target values for delta_max, R, and epsilon_max should be determined.
The simulated heat load should always be recorded.
The emittance-effect simulation should be repeated for the LHC at injection (***ACTION Octavio and/or Humberto***).
Compute heat load, total flux, and flux above 30 eV (also as a function of horizontal position)
A list of parameters and set of questions would be compiled by Gianluigi Arduini.

- ⇨ verify that emittance is a critical parameter for LHC at injection; Humberto can do it (ACTION)

- ⇨ flux and distribution versus *x* for different bunch intensities (***ACTION Octavio and/or Humberto***)

Was a **25 ns scrubbing run** possible/useful/recommended?

Near term simulations should yield:
=> **arc secondary electron yield & R at present**
=> **which values do we need to have to run with 75 ns w/o problems from e-cloud**, i.e. no instability and no blow up?

Which level of blow up is acceptable? Gianluigi Arduini specified this to be equal to no significant effect over seconds.

Guidelines for 75 ns running should be established, taking into account pressure rise, spatial flux, and the entire agreed list of simulation parameters.

Humberto Maury Cuna was not present, but had sent some slides to be presented. It was noticed that, in his slide no. 4, the central cloud density increases significantly with higher magnetic field, which might be in possible contradiction with his earlier finding that a higher field leads to a higher SEY multipacting threshold.

Reported by Frank Zimmermann