**Meeting of LIU SPSU-BD WG on 30/08/2012**

**Present:** Fanouria Antoniou, Gianluigi Arduini, Theodoros Argyropoulos, Hannes Bartosik, Thomas Bohl, Fritz Caspers, Juan Esteban Muller, Silke Federmann, Giovanni Iadarola, Michael Holz, Y. Papaphilippou, Elena Shaposhnikova, Helga Timkó;

**Presentations:**

**Fanouria: IBS and Touschek studies for the ion beam at the SPS**

LHC ion beams in the SPS suffer from bunch shortening and losses on the SPS long flat bottom (both in Q26 and Q20 optics). Calculations of IBS show only a small effect of bunch length reduction and can thus not explain the observations in the machine.

*The effect of RF noise is not taken into account in the present theories for IBS. In order to include RF noise, an additional term in the model can be added as done for example for coupling.*

The observed losses can be described by the Touschek effect.

*The intensity evolution is calculated taking into account the measured bunch length along the cycle and the corresponding Touschek parameter for different values of the momentum acceptance and lifetime for low current.*

*It is planned to implement Touschek scattering in numerical tracking codes developed for IBS simulations.*

*The RF Voltage can be increased in future experiments to see if a larger “acceptance from the bucket” will reduce losses. Measurements with different voltages exist for Q26, which can be analyzed.*

*Further studies should also investigate if the observed losses could be related to space charge effects like for example periodic resonance crossing.*

**Hannes: Final steps for making Q20 optics operational**

The impact of the smaller longitudinal emittance on IBS effects on the LHC flat bottom remains to be studied. Furthermore the observed bunch length increase along the batch at SPS flat top should be addressed. The switch to Q20 will be done just before or right after the technical stop 3.

*The 25ns beam in the Q20 optics should be prepared in upcoming MDs in view of the LHC scrubbing run.*

**Silke: Preliminary results of the microwave transmission measurements**

A new vector spectrum analyzer with larger memory is now used for the measurements, which allows for longer recording time and/or higher bandwidth.

*An increase of the phase modulated signal is observed after the third injection.*

*The case with a “delayed” second injection and three injections in total corresponds to a missing second injection.*

**Gianni: Electron cloud studies for the SPS**

Effects on the beam (tune shift, …) and dynamic pressure rise are the only observables for electron cloud effects (outside of the e-cloud monitors) which can be used to determine the present conditioning state of the machine. At present there is no visible effect of electron cloud on the nominal 25ns LHC beam and the dynamic pressure rise is a factor 10000 smaller compared to measurements in 2004.

*The increased dynamic pressure rise in LSS5 is related to aluminum parts in the UA9 setup. Therefore electron cloud build-up might still be observed in a few localized regions of the machine, however not affecting beam quality in LHC type cycles.*

*Dynamic pressure rise is observed mainly in combination with (slow) losses, without a delay of 6 seconds as could be expected if uncaptured beam would enhance the pressure rise.*

*A clear pressure rise is observed with ultimate intensity, which could be explained by the non-conditioned parts of the vacuum chambers encountered by the e-cloud with high intensity (e-cloud stripes are further apart). Some conditioning effect over 200 super cycles was observed during the scrubbing run with ultimate intensity.*

*A factor 10 increase of the dynamic pressure rise is observed when applying a radial steering with the 50ns beam, as could be explained by the fact that the vacuum chambers are scrubbed only in the central regions.*

*Further studies should be performed with ultimate intensity (performing also bunch-by-bunch emittance measurements), with coasting cycles of different energies, and beam displacement to investigate how localized is the scrubbing effect.*

**Theodoros: Longitudinal impedance identification**

Injecting long bunches (25-30ns) while the SPS RF is switched off allows to identify resonant impedances (causing a modulation of the line density at the resonant frequencies). A significant peak in the Fourier spectrum due to an unknown source is observed at 1.4GHz, similar to the measurements in 2001 and 2007.

*The measured spectrum can be reproduced in simulations when adding a resonator at 1.4 GHz with R/Q=58kΩ and Q=7 to the present model of the SPS longitudinal impedance. The average intensity during the measurement is used in the simulations (while losses are observed in reality) and the bunch length increase is neglected.*

*For understanding better the longitudinal instabilities, the next step is to perform simulations with short bunches.*

*Possible sources for the resonance at 1.4 GHz could be high order modes (HOMs) of the RF cavities. In particular the HOMs of the 800 MHz cavity are not well known. Measurements and simulations could be performed during LS1. Other possible sources could be the vacuum chamber transition pieces (between chambers with elliptical and other geometrical shapes).*

Minutes written by Hannes Bartosik