MINUTES

LIU-SPS BD WG  
MEETING No. 05/19

04 July 2019

Present: H. Timko, N. Nasresfahani, M. Schwarz, E. Shaposhnikova, H. Damerau, T. Argyropoulos, I. Karpov, R. Calaga, I. Karpov, K. Li

# Matter Arising and Follow-up of Actions

* **N. Nasresfahani**: Study the possibility to use the new coupler design to replace all existing 630 MHz HOM couplers
* **M. Schwarz**: Include the momentum acceptance limitation in simulations.
* **M. Schwarz**: Is it possible to understand if the instability observed with the radial-loop is real or only related to numerical problems?
* For the slip-stacking cycle, determined the aperture needed for the collimation system.
* A list of the key moments in the various cycles (slip-stacking!) is necessary to adjust the design of the collimation system.
* Measurements of the beta beating to include optics errors in simulation of the collimation system.
* Check the impedance of the new collimation system.
* **M. Schwarz**: Quadrupole oscillations are observed at flat bottom with the feedforward activated. Study where this is coming from.
* **A. Farricker**: Check with C. Zannini for the discrepancy in MKEs impedance.
* Calculate the maximum voltage in the 800 MHz RF system due to power limitations and beam-loading.
* **C.** **Vollinger:** Check how many cross section step-like changes are in the SPS
* **M. Schwarz:** Organize meeting to discuss issues with bunch length measurements
* **T. Argyropoulos:** Include intensity effects in emittance calculations

**New:**

# General News

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# Presentations

General comment by Elena: Up to now, only single batch simulations were possible and showed no effect of the 915 MHz HOM. The 915 MHz HOM has a very high Q-value, which could affect multi-batch stability.

## **First look on 915MHz HOM in SPS cavities – P. Kramer**

The talk focusses on the *three*-section cavity. The 915 MHz mode as a low E-field at the position of the access ports, which makes it difficult to damp directly. But the 630 MHz couplers also damp the 915 MHz mode. But no difference was observed between the old and new 630MHz damping scheme. The FPCs have a stronger influence on the 915MHz mode than the 630MHz couplers. The 938MHz transverse couplers also have a damping effect on the 915MHz mode. Including them yields an impedance that is smaller than the one in the BLonD impedance model.

* **Nasrin**: How long were the wake field simulations?
  + **Patrick**: 700m
* **Elena**: You don’t observe an effect of a specific coupler?
  + **Patrick**: Not when starting from an existing 630MHz damping scheme.
  + **Elena**: We need beam dynamics simulations to determine the required amount of 915MHz damping for beam stability.

## **HOMs around 915 MHz in 200 MHz TWCs of SPS – N. Nasresfahani**

The talk focusses on the *four*-section cavity. Two high R/Q modes around 915MHz were found in simulations. Boundary conditions are important, because they couple to the FPCs. Unlike three-section cavity, these modes are not affected by the 630MHz or 938MHz couplers. However, it might be possible to modify the resonant loop of the 938MHz couplers to also damp the 915MHz mode.

## **Multi-batch flat top simulations – M. Schwarz**

With BLonD-MPI, it is possible to simulate 4x72 bunches with 2 million macro-particles per bunch. This is used to study the effect of the 915 MHz HOM on multi-batch stability. Simulations for a single resonator, modeling the 915 MHz HOM, show that it drives instabilities in batches 3 and 4.

Simulations were done with a complex SPS impedance model. A comparison with J. Repond’s simulation for a single batch showed a higher instability threshold. The cause is under investigation. Simulating with 4 batches showed an 11% reduced instability threshold compared to single batch case. Preliminary results for 4-batch simulations without 915MHz HOM show a threshold close to the single batch case.

Different bunch-matching-methods were studied. The disagreements are under investigation.

## **Outcome**

* Boundary conditions need to be carefully investigated, since they have a strong influence on the 915MHz mode.
* The electromagnetic simulations of the 3- and 4-section cavities suggest that the BLonD model used in beam dynamics is too pessimistic.

# Next Meeting 8 August 2019

Minutes written by M. Schwarz