MINUTES

LIU-SPS BD WG
MEETING No. 01/20

16 January 2020

**Present:** K. Li, G. Papotti, G. Rumolo, M. Schwarz, E. Shaposhnikova, T. Argyropoulos, C. Zannini, A. Lasheen, L. Medrano, A. Farricker, C. Vollinger, P. Kramer, V. Kain, R. Calaga, B. Salvant, H. Bartosik, H. Damerau, I. Karpov

# Matter Arising and Follow-up of Actions

* **~~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.
* **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
* **C. Zannini**: Simulate what happens if the 460 MHz couplers were removed (to make room for potential 915 MHz couplers)
* **I. Karpov**: Simulate 4x72 bunches along entire cycle with four injections and blow-up during ramp.

**New:**

# General News

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# Presentations

## **Update on the SPS horizontal instability studies – C. Zannini**

Measurements showed an instability threshold for four batches at 2e11 p/b, which could be cured by increasing the batch spacing. Growth rates from Sacherer theory show that different modes grow for different chromaticities.

* **Elena:** Where is the proof that mode 3 is growing?
	+ **Carlo:** Growth rate is positive, but difficult to see on this scale.

Dedicated multi bunch simulations were developed. The kicker wake had to be improved to cover the multi-bunch range (by fitting short range wake and extrapolating).

* **Aaron:** Is it only the seraphic peak that couples between batches?
	+ **Carlo:** No, resistive wall also contributes.

Simulations could reproduce instability threshold (which is defined by the particle losses). Preliminary simulations at LIU intensity show a strong instability!

* **Elena:** Could this instability be cured by using a higher damper gain?
	+ **Carlo:** Simulations are on-going

## **Single Bunch Instability at Flat Top – I. Karpov**

Pre-LS2 measurements of the flat-top single-bunch instability threshold could be reproduced in BLonD and MELODY simulations. Post-LS2 simulations suggest a *lower* threshold, which can be increased by using the 800 MHz cavity.

* **Elena:** Keep in mind that these results are for single-bunch reference measurements. For LHC beams, we are limited due to coupled bunch instability.

## **Reference Measurements at Flat Bottom – M. Schwarz**

The measured instability threshold for 1x12 bunches at flat bottom with feedback off could be reproduced in BLonD simulations, if the frequency shift due to the HOM couplers is included. The post-LS2 simulations show a 20% higher threshold, in agreement with the 20% reduction of the impedance of the 200 MHz TWC. The reduced beam loading also leads to shorter filamented bunches.

Measurements of substructures of long bunches with RF off can be reproduced in simulations, if the initial phase space density is constructed from the measured profile and a fit to the energy projection (with reduced energy spread). Simulations with the post-LS2 longitudinal SPS impedance model show an absence of the 1.4 GHz peak, and a prominent peak at 800 MHz. By using data from an improved tomographic reconstruction algorithm, the measured peak at 1.8 GHz could also be reproduced.

* **Alex:** In the past, we could not reproduce the peak at 1.8 GHz in simulations.

# Next Meeting xx February 2020 (t.b.d.)

Minutes written by M. Schwarz