MINUTES

LIU-SPS BD WG
MEETING No. 08/19

24 October 2019

**Present:** W. Hofle, H. Timko, H. Bartosik, G. Papotti, M. Schwarz, E. Shaposhnikova, A. Lasheen, T. Argyropoulos, I. Karpov, A. Farricker, P. Kramer, H. Damerau, C. Zannini, L. Medrano, K. Li

# 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

**New:**

* **M. Schwarz**: BLonD simulations of ‘worst case’ scenario of 915 MHz HOM impedance
* **C. Zannini**: Simulate what happens if the 460 MHz couplers were removed (to make room for potential 915 MHz couplers)

# General News

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# Presentations

## **Studies of 915MHz HOM in SPS travelling-wave structure – P. Kramer**

The impedance of the 915 MHz HOM depends on the termination of the FPCs, which is presently not known. The two extremes are the open and short boundary conditions.

* **Elena**: We need beam dynamics simulations to find out how ‘bad’ the worst case is.
	+ **Markus**: I will be working on it -> action list

It is especially the TE11 mode at 915MHz that couples to the FPC. Only the TEM mode can be measured so far and measurement of TE11 would require reliable mode converter. Comparing measured S11 for TEM mode with simulations for the water load give only a rough agreement.

* **Wolfgang**: Is it a coincidence that the absorption lines of the water load are similar to the TWC HOM frequencies?
	+ **Patrick**: Not intentionally, but the HOM field profile is similar to that of the fundamental.

One possibility to damp the 915 MHz HOM would be to use a stub in the FPC to enforce a standing wave pattern.

* **Elena**: Would you be allowed to put a stub in?
	+ **Aaron**: This would require dedicated studies.

Another way would be to make the 915 MHz HOM a fully travelling mode by modifying the end plate ports, which would remove the 460 MHz couplers.

* **Patrick**: The 460 MHz couplers were installed in 1976. Are they still needed?
* **Elena**: What would happen if we remove them?
	+ **Carlo**: I will be working on it -> action list

## **Impedance considerations for the proposed eSPS– A. Farricker**

eSPS is accelerating electrons in the SPS. Different cavity designs are under consideration. The first option is to re-use the normal conducting LEP cavities. This would add 40% of additional impedance at 200 MHz.

* Elena: The HOM damping did not work well.

The second option are SRF cavities. When they are not in bypass, their impedance is seen by the proton beam.

## **SPS-LHC transfer losses – L. Medrano**

Bunches are matched at SPS flat-top. Feedback (FB) and Feedforward (FF) are simulated by ‘impedance reduction’ during tracking.

* **Markus**: Are bunces matched without FB and FF?
	+ **Luis**: Yes

Simulated bunch positions agree with analytical result.

* **Wolfgang**: What are vertical bars in the simulated bunch position plot?
	+ **Luis**: They are the minimum and maximum positions during the tracking.
* **Wolfgang**: Why does the FF not iron out all the relative bunch displacements?
	+ **Elena**: The FF can only act via the generator impedance, which is different from the cavity impedance and leads to imperfect beam loading compensation.

Losses in the LHC were computed from the separatrix without taking intensity effects into account.

* **Markus**: You could also use the bunch profiles, as was done for the SPS
* Elena: How do the simulated LHC losses compare to measurements?
	+ Helga: This will be the next step. What is a good benchmark case?
	+ Theo: We have high-resolution profiles available.

Next steps are to perform a convergence study (number of macro-particles).

# Next Meeting 21 November 2019

Minutes written by M. Schwarz