# Meeting of LIU SPS-BD WG on 28.08.2018

Present

Participants:

Elena Shaposhnikova, Hannes Bartosik, Helga Timko, Nasrin Nasresfahani, Ivan Karpov, Giulia Papotti, Markus Schwarz, Patrick Kramer, Christine Vollinger, Mario Beck, Michele Carla’, Joël Repond, Alexandre Lasheen.

Agenda

1. Longitudinal instability of 12 bunches on the SPS flat bottom – Measurements – M. Schwarz
2. Longitudinal instability of 12 bunches on the SPS flat bottom – Simulations – J. Repond
3. Sorting of the SSS machine elements for Impedance mitigation – C. Vollinger
4. Present status of HOM damping – P. Kramer

Actions

* pending
* **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.
* **A. Farricker**: Provide an updated longitudinal SPS impedance model for the present and future cases.
* **D. Quartullo**: Check the loss of Landau damping in Q26 for the ion cycle (are the oscillations more violent than in Q20?).
* Calculate the maximum voltage in the 800 MHz RF system due to power limitations and beam-loading.
* Ask the feedback team if it is possible to program a separated voltage program for a slip-stacking MD.
* New
* **M.** **Schwarz:** Measure flat bottom instability without LLRF systems (in particular phase loop)
* **C.** **Vollinger:** Check how many cross section step-like changes are in the SPS

**1 – Longitudinal instability of 12 bunches on the SPS flat bottom – Measurements – M. Schwarz**

* Measurement of instability threshold for 12 bunches and nominal intensity
* Measured threshold follows coupled bunch threshold, but all bunches become unstable even though SPS is not evenly filled (12 bunches for harmonic number 4620)
	+ **E. Shaposhnikova:** Coupling is provided by phase loop. We need measurements without phase loop.
* Instability starts earlier for higher intensities
* Stable beams lose less than unstable beams with similar bunch length, but stable beams lose more than unstable beams with similar intensity.
	+ **H. Timko:** I suggest plotting losses, intensity, and bunch length in 3D plot.
* Simple ‘mode analysis’ by fitting sine-curves to bunch profile maxima shows no dominant single ‘mode’.

**2 – Longitudinal instability of 12 bunches on the SPS flat bottom – Simulations – J. Repond**

* Simulations with matched bunches show much higher instability threshold than observed in measurements
* Generate bunch distribution in the PS from binomial distribution with $μ=1$ and simulate bunch rotation in PS ; simulated bunch profiles agree with measured ones
* Simulated threshold agrees (too well) with measurements, even for $μ=2$
	+ **E. Shaposhnikova:** How do simulated bunch profiles compare with measured profiles for different $μ $?
	+ **J. Repond:** No simulated profiles were saved.
* In simulations, first bunch is not unstable; but it is in measurements.
	+ Due to phase loop not included simulations?
	+ **E. Shaposhnikova:** We need measurements this Thursday where phase loop is turned off.
* **G. Papotti:** Were measurements performed with the 800 MHz voltage adjusted along the ramp?
	+ **J. Repond :** Measurements could not be done, yet. Planned this Thursay.

**3 – Sorting of the SSS machine elements for impedance mitigation – C. Vollinger**

* Cross section changes excite wake fields; four straight sections were identified where sorting the elements can reduce cross section changes and, thus, impedance without compromising functionality (upstream QFA.21610, QFA.21810, QFA.41810, and QFA.61810).
* Cross section step in QFA.21810 could not be tapered due to space constrains.
	+ **E. Shaposhnikova:** How many of these steps are in the SPS?
	+ **C. Vollinger:** We need to check.
* Entire area had to be simulated simultaneously; adding element-by-element not sufficient
* Four separate ECRs are drafted and will be circulated in the next days.

**4 – Present status of HOM damping – P. Kramer**

* Using a 23 Ohm coupler is close to critical coupling -> damping of 629 HOM improved by factor of 2! Fabrication of new coupler parts could be avoided by developing a complex load.
* Overall impedance of 3-section cavity reduced by factor 7 in eigenmode simluations
	+ **E. Shaposhnikova:** In simulations, R/Q is kept constant when Rshunt is reduced. HOM become broad-band impedances and cause instabilities in Joël’s simulations.
* Measurements of 3-section cavity show that spare section 1 and 3 are well tuned, but spare section 2 is detuned. Tuning of spare section 2 in progress.
	+ **C. Vollinger:** Assembly of section 2 was done without taking the tunes of the cells into account.

Next meeting 25th of September.

Minutes written by M. Schwarz