# Meeting of LIU SPS-BD WG on 30.06.2016

Present

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Agenda

1. Synchrotron frequency shift: measurements vs simulations - A. Lasheen
2. First results of ramp simulations for 72 bunches - J. Repond
3. **– Synchrotron frequency shift: measurements vs simulations – A. Lasheen**

The measurements in 2013 and 2015 predicted one missing Ohm in the reactive part Z/n of the impedance model of the SPS. A new set of data has been measured for confirmation.

* The old and the new measurements are comparable.
* Rescaling of the data to lower the dependence in bunch length and make the comparison with simulation easier.
* The new data set includes smaller bunch length.
	+ Effective ImZ/n constant for small bunch lengths.
* The new measurements and the old ones with rescaling show a possible **up to 2 Ohm of missing inductive impedance** in simulations to reproduce the results.
* Still for very small bunches we are not able to reproduce the measurements in simulation with 2 Ohm
* 2 Ohm may be missing (equivalent to miss half of the SPS kickers)
	+ This value seems to be too big.
	+ Could be related to problems in the measurements.
	+ A very high frequency resonant impedance may be missing.
* Future:
	+ Try measurements at higher energy where the space charge is negligible (but then the stability could be a problem).
	+ Try high frequency impedance in simulations for comparison.
	+ Fritz: Possible impedance from vacuum chamber transition changes between different equipment.
	+ Space charge could be possibly smaller (-1.3 Ohm now).

**2 – First results of ramp simulations for 72 bunches – J. Repond**

The SPS impedance reduction campaign may be not sufficient to reach the High Luminosity LHC goals. Simulations at flat-top increasing the voltage in the 800MHz cavity have shown a big possible increase in the stability threshold. The behavior through ramp is investigated.

* Possible problems through ramp
	+ At flat-bottom, larger bunches can sit in the flat portion of the synchrotron frequency distribution due to double RF operation.
	+ The controlled emittance blow-up is not implemented in simulation. Too small bunches become unstable.
	+ The synchrotron frequency distribution is modified in an accelerating bucket.
* The number of slices and macroparticles have been divided by 2, meaning a maximum frequency sampled of 12.5GHz (just enough to sample all the impedance model)
	+ Now, simulations done in 4 days.
	+ Lowers the stability threshold by 5%.
	+ Sufficient for a first overview of the stability through the ramp.
* RF voltage program
	+ Momentum program given by present operation.
	+ First approximation computed for a constant bucket filling factor. The bunch length is computed which gives the induced voltage from beam loading. Summing the two contribution, we obtain the voltage program.
* **Increase the TWC800** above the operational value of 10% of the TWC200 from the beginning, **lowers the stability threshold.**
	+ Change phase shift during ramp to have more monotonic dependence of synchrotron frequency on particle amplitude

MDS

* Possible beams
	+ Low energy bunches are still accepted.
	+ Possible to accelerate a single high intensity bunch but on dedicated MD (Wednesday).
* Possible MDs
	+ Synchrotron frequency shift at higher energy to avoid space charge.
	+ Hannes: Study the LHC beam losses at low energy on the injection plateau. Special cycle with acceleration to 200 GeV/c

Minutes written by J. Repond