

Meeting 2 on Stochastic Cooling for HL-LHC Heavy Ions

05 June 2014 09:34

Meeting 2

Meeting Date: 05/06/2014 15:30

Location: CERN 30-6-041

Link to Outlook Item: [click here](#)

Invitation Message

Participants

- [John Jowett](#) (Meeting Organizer)
- Michaela Schaumann
- Wolfgang Hofle
- Kevin Mernick
- Manfred Wendt
- Silvia Verdu Andres
- [Julia Double](#)
- [Cecile Noels](#)
- [Lars Thorndahl](#)
- Fritz Caspers

Notes

MW talk on Schottky signals in the LHC

JJ talk on what should be presented in the LMC on 2014/06/11

- MW explains how longitudinal Schottky signals build up.
 - LHC ions give beautiful signals - longitudinal sidebands are visible at injection energy already in difference-signal.
 - Coherent peak in difference signal ~15-20dB above incoherent signal at injection energy in difference-mode.
 - Suppress coherent signal by using sum-signal.
 - Delta-signals ("humps" between revolution lines) would disappear in sum-signal.
- FC: In theory, the coherent peak produced by the J0 (Bessel)-component of the Schottky current should disappear for Gaussian bunches - in reality it does not and a several dB high signal is measured (FC: this is what killed SPS cooling).
- KM: similar signals at RHIC (~20dB) with narrow peaks - can be dealt with, no showstopper.
- FC: Signal quality and coherent peak depend on pickup - narrowband pickup needed for low coherent signal.
- KM: RHIC has broadband pickups working well.

- MW: LHC has 4 Schottky pickups installed: H and V for each beam:
 - 1 has to be modified for ion run to get improved longitudinal signals which can be used for cooling.
 - Connect good cable.
- FC: Stochastic cooling in SPS did not work due to saturation of amplifiers (coherent signals introduce nonlinearities and intermodulations in head amplifier).
- FC: Peak voltage given to head amplifier is key figure - voltage times gain quantity to investigate if head-amplifier is driven into saturation.
 - For high pickup sensitivity high voltages are required.
 - 3dB difference of peak could be important - 10dB would drive preamplifier into compression.
 - Put bandpass-filter to save amplifier.
- The heavier the ions, the less coherent signal - advantage of LHC to SPS, but careful design

- required.
- MW: Look at scope to estimate peak voltages with existing Schottkys during upcoming ion run.
 - Investigate signal-to-noise and gain requirements.
 - KM: out of memory ~40dB gain on long. system at RHIC (to be checked).
 - Highest peak voltage after high pass filter, measure ~10mV (?) before amplifier with almost no compression.
 - WH: strategy should be to identify showstoppers first:
 - Setup time in each run and to first commission the system.
 - KM: 1 plane of cooling takes 3h setup (optimistic (!?))
 - el.mag. simulations are necessary at all required frequencies with tank to ensure compatibility with pp.
 - Cavity bandwidth has to be adjusted for smallest expected bunch spacing (100 ns now but we might need to foresee 50 ns)
 - FC: some thoughts on PUs:
 - LHC Schottky PU are not broadband - they have only 1 synchronous band.
 - Series of cavities could be used as PU.
 - Cherenkov pickups (Brambiller 1985/86 AA Cherenkov pickup dielectric, <http://cds.cern.ch/record/187093?ln=en>) - better for low frequency heating.