

LMC Presentation 11/6/2014

- Will be on behalf of us all but needs to take larger view of how this fits in with priorities of the 2015 Pb-Pb run
 - Few resources devoted to LHC heavy ions
 - 2015 run is very short: 4 days setup + 24 days physics to include intermediate energy p-p run – so only ~20 days physics
 - Final stochastic cooling system will be part of HL-LHC although it could start earlier

Summarise case for stochastic cooling in LHC

- Impressive success cooling of bunched Au and U beams at RHIC
- Mature subject, rather well understood
- Expertise at CERN but may need to be preserved
- Best possible luminosity upgrade for a hadron collider
 - extract maximum luminosity from injected particles, totally changes picture
 - Need for beam cleaning with collimators much reduced (non-existent? RHIC paper in PRC) (show estimate)
 - Need for low beta* much reduced, no worries about dynamic aperture,

Summarise work done on LHC stochastic cooling so far

- Informal collaboration established with experts at BNL and a few people in key groups at CERN
- MS visit to BNL
- Good quality of Schottky signals for Pb
- Impedance calculations for RHIC-like cavities in open and closed positions, probably needs reduction to allow co-existence with HL-LHC proton beams
- Simulations with reasonable assumptions show ~50% luminosity gain, show example
 - Possibility to stage, cooling only one or two transverse planes initially

Demonstration with minimal system

- Summarise concept of the feasibility test in 2015
- Show expected result
- Conclude (?) that the predicted effect might be difficult to measure conclusively
- BUT: Not essential – mature subject, theory understood, we can go on to design operational system
- BUT: 2015 HI run will demand full attention of the very small LHC Heavy ion team: new optics, filling schemes, running close to quench limit, new operational procedures to spread beam losses from luminosity, levelling and sharing luminosity, vital need to acquire data on quench limits around experiments and in collimation insertions to determine planning for LS2 (DS collimators).

Further information

- Slide with references to show more details what has been done
 - IPAC'11, COOL'13, IPAC'14 papers on cooling
 - Schottky papers ?
 - These meetings

Conclusion

- We do not wish to push for the limited demonstration of longitudinal cooling in Run 2
- More structured study with necessary resources
 - ABP, RF, BI, collaboration with BNL, ...
- Design an operational system, possibly staged
 - Beam dynamics simulations
 - Kicker cavity design, impedance and heating, compatibility with proton beams
 - Hardware specification (pickups, kickers, amplifiers, delay lines, etc.), integration, space reservation