Contribution ID: **17** Type: **not specified**

Numerical Modeling of E-Cloud Driven Instability and its Mitigation using a Simulated Feedback System in the CERN SPS

Sunday, October 10, 2010 10:00 AM (30 minutes)

Electron clouds impose limitations on current accelerators that may be more severe for future machines, unless adequate measures of mitigation are taken. Recently, it has been proposed to use feedback systems operating at high frequency (in the GHz range) to damp single-bunch transverse coherent oscillations that may otherwise be amplified during the interaction of the beam with ambient electron clouds. We have used the simulation package WARP-POSINST to study the growth rate and frequency patterns in space-time of the electron cloud driven transverse instability in the CERN SPS accelerator with, or without, feedback models (with various levels of idealization) for damping the instability. We will present our latest simulation results, contrast them with actual measurements and discuss the implications for the design of the actual feedback system. More simulations results are presented by Raffaello Secondo using a Finite Impulse Response (FIR) as processing channel in a more realistic, albeit yet highly simplified, model of feedback control system.

- Supported by the US-DOE under Contract DE-AC02-05CH11231, the US-LHC Accelerator Research Program (LARP) and the SciDAC program ComPASS. Used resources of NERSC and the Lawrencium cluster at LBNL.

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Session Classification: Beam Dynamics Issues

Track Classification: Oral Sessions