Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Measurements and Analysis of Collective-Mode Oscillations of the Beam Envelope in the Paul Trap Simulator Experiment (PTSX)[1]

L. D'IMPERIO, SUNY College at Oneonta, E.P. GILSON, R.C. DAVIDSON, P. C. EFTHIMION, R. MAJESKI, H. WANG, Princeton Plasma Physics Laboratory

— The Paul Trap Simulator Experiment (PTSX) simulates magnetic alternating-gradient (AG) charged particle transport systems. The small size and flexibility of PTSX allows the physicist to experimentally study relevant beam dynamics and transport system properties at a relatively lower cost and in less time. In PTSX, an oscillating quadrupole electric field is used to radially confine a charge bunch for times that correspond to kilometers of equivalent propagation in an accelerator. Random, resonant, or induced variations in the system create transverse collective-mode oscillations about the equilibrium. The presence of these oscillations can lead to beam emittance growth and other forms of beam degradation. A diagnostic was installed to detect azimuthally symmetric and quadrupolar collective-mode excitations. Experimental results are compared with the theoretical model of the collective-mode frequency as a function of experimental parameters. Possible modifications to the diagnostic design and collective-mode analysis processes are addressed. Collective-mode oscillations, and their correlation with beam emittance, are discussed.

[1]This research is supported by the U.S. Department of Energy.

Erik Gilson

Date submitted: 16 Jul 2010 Electronic form version 1.4