Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Breaking the Four-Fold Symmetry in the Paul Trap Simulator Experiment[1] S. KOPPELL, University of Texas at Austin, H. WANG, R.C. DAVIDSON, E.P. GILSON, P.C. EFTHIMION, R. MAJESKI, E.A. STARTSEV, Princeton Plasma Physics Laboratory — The Paul Trap Simulator Experiment (PTSX) is a cylindrical Paul trap used to study transverse beam dynamics for propagation over many lattice periods. Previous experiments have studied the effect of various symmetric perturbations on beam properties. An additional arbitrary function generator was added to the system to generate asymmetric fields. Dipole field components were used to excite and identify collective modes of excitation in the beam. In agreement with expectations, mode excitation by a dipole field was found to efficiently excite a different set of modes than those excited by perturbations with quadrupolar spatial symmetry. Asymmetric fields were also used to study beam response to lattice errors. It is demonstrated that lattice errors due to finite mechanical tolerance in a series of quadrupole magnets will manifest itself primarily as the superposition of an oscillating constant voltage offset, and a dipole field. It has been shown that the presence of an oscillating voltage offset in the trap does not affect the dynamics of the plasma. The magnitude of dipole noise is related to the rate of emittance growth and particle loss.

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

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Date submitted: 26 Jul 2011 Electronic form version 1.4