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Advanced Diagnostic Design for Paul Trap Simulator Experiment (PTSX)[1] A.B. GODBEHERE, Cornell University, M. CHUNG, R.C. DAVIDSON, E.P. GILSON, Princeton Plasma Physics Laboratory — The Paul Trap Simulator Experiment (PTSX) is a compact laboratory Paul trap that uses a pure-ion plasma to simulate a long, thin charged particle bunch coasting through a kilometers-long magnetic alternating-gradient transport system. Current PTSX experiments are exploring the limits of the smooth focusing model, and using the detection of collective mode oscillations to infer key bunch properties such as the line density and transverse temperature. These experiments require the use of advanced diagnostics to measure the transverse distribution of the plasma perticles at a given instant in time. One set of experimental diagnostics uses a CCD camera with a short exposure time to collect light from Laser Induced Fluorescence (LIF) of the cross section of a barium plasma beam. A second set of experimental diagnostics utilizes capacitive coupling of the ions with four electrodes, which are connected to high- input-impedance active filters. Details of the design and performance of the laser system, CCD camera system, and collective mode diagnostic electronics will be presented.

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Erik Gilson
Princeton Plasma Physics Laboratory

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