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**Masking the Paul Trap Simulator Experiment (PTSX) Ion Source to Modify the Transverse Distribution Function and Study Beam Stability and Collective Oscillations<sup>1</sup>** E.P. GILSON, R.C. DAVIDSON, M. DORF, P.C. EFTHIMION, R. MAJESKI, E.A. STARTSEV, H. WANG, Princeton Plasma

Physics Laboratory — A variety of masks were installed on the Paul Trap Simulator Experiment (PTSX) cesium ion source in order to perform experiments with modified transverse distribution functions. Masks were used to block injection of ions into the PTSX chamber, thereby creating injected transverse beam distributions that were either hollow, apertured and centered, apertured and off-center, or comprising five beamlets. Experiments were performed using either trapped plasmas or the single-pass, streaming, mode of PTSX. The transverse streaming current profiles clearly demonstrated centroid oscillations. Further analysis of these profiles also shows the presence of certain collective beam modes, such as azimuthally symmetric radial modes. When these plasmas are trapped for thousands of lattice periods, the plasma quickly relaxes to a state with an elevated effective transverse temperature and is subsequently stable. Both sinusoidal and periodic step function waveforms were used and the resulting difference in the measured transverse profiles will be discussed.

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Erik Gilson  
Princeton Plasma Physics Laboratory

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