Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Cylindrical short-pulse Child-Langmuir law[1] WEE SHING KOH, LAY KEE ANG, Nanyang Technological University, Singapore — Laser-driven short pulses have been prevalently used in photo-injectors to produce extremely high current densities. If the pulse length of the short-pulse current is less than the transit time across the gap, the space-charge-limiting (SCL) current density of the electron beam exceeds that of the classical long-pulse limit as given by the Child-Langmuir (CL) Law. The 1D short-pulse CL law for a planar electrode has been derived with verification from PIC simulation [1]. The extension to the 2D and 3D models of the short-pulse CL law has also been presented recently [2]. In the long pulse limit, the 2D and 3D CL laws for both planar and cylindrical diodes have also been developed [3]. In this paper, we will present the 1D and 2D short-pulse CL law in the coaxial cylinder configuration for both convergent and divergent flows. The analytical results will be compared with 2D PIC simulation results. [1] Ágúst Valfells *et. al.* , "Effects of pulse-length and emitter area in virtual cathode formation in electron guns", Phys. Plasmas 9, 2377 (2002). [2] W. S. Koh and L. K. Ang, "Two-dimensional Short-Pulse Chid-Langmuir Law", The 32nd International Conference on Plasma Science (ICOPS), N05CH37707, 3P38, pp. 298 (2005).[3] W. S. Koh, *et. al.*, Three-dimensional Child-Langmuir law for hot electron emission, Phys. Plasmas 12, 053107 (2005). Email: elkang@ntu.edu.sg

[1]Supported by Singapore ASTAR Grant 042 101 0080

Lay Kee Ang
Nanyang Technological University

Date submitted: 22 Jul 2005 Electronic form version 1.4