Cylindrical short-pulse Child-Langmuir law\textsuperscript{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 \cite{1}. The extension to the 2D and 3D models of the short-pulse CL law has also been presented recently \cite{2}. In the long pulse limit, the 2D and 3D CL laws for both planar and cylindrical diodes have also been developed \cite{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. \cite{1} Ágúst Valfells \textit{et. al.}, “Effects of pulse-length and emitter area in virtual cathode formation in electron guns”, Phys. Plasmas 9, 2377 (2002). \cite{2} W. S. Koh and L. K. Ang, ”Two-dimensional Short-Pulse Child-Langmuir Law”, The 32nd International Conference on Plasma Science (ICOPS), N05CH37707, 3P38, pp. 298 (2005).\cite{3} W. S. Koh, \textit{et. al.}, Three-dimensional Child-Langmuir law for hot electron emission, Phys. Plasmas 12, 053107 (2005). Email: elkang@ntu.edu.sg

\textsuperscript{1}Supported by Singapore ASTAR Grant 042 101 0080

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Date submitted: 22 Jul 2005

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