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Development of Three-Dimensional Kinetic Codes for Modeling of a Plasma Switch ANDREW POWIS, Princeton University, JOHAN CARLSSON, IGOR KAGANOVICH, Princeton Plasma Physics Laboratory — The plasma switch is a proposed alternative mechanism for performing AC to DC (or visa-versa) power conversion within a compact and robust device. Accurate three-dimensional kinetic models for the discharge are critical towards understanding the fundamental physics and improving device performance. To this end we have updated the commercially available Partice-in-Cell, Monte-Carlo-collision (PIC-MCC) code, Large Scale Plasma (LSP) [1] for applications to low-temperature (electrostatic) plasma devices such as the plasma switch. Improvements include an updated circuit model and updated collision models [2]. Furthermore we have updated the Poisson's equation solver to take advantage of state-of-the-art direct and iterative techniques. By taking advantage of massively parallel architectures, these improvements allow us to perform self-consistent kinetic simulations of large scale systems within reasonable time frames. We foresee a wide range of applications for this code beyond the plasma switch such as plasma micro-discharges and sputtering-magnetrons. [1] Welch, D. R., et al. "Integrated simulation of the generation and transport of proton beams from laser-target interaction." Physics of Plasmas 13.6 (2006): 063105. [2] Carlsson, J., et al., "Validation and benchmarking of two particle-in-cell codes for a glow discharge." Plasma Sources Science and Technology 26.1 (2016): 014003.

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