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Low-temperature plasma simulations with the LSP PIC code[1] JOHAN CARLSSON, ALEX KHRABROV, IGOR KAGANOVICH, PPPL, DAVID KEATING, UC Berkeley, SVETLANA SELEZNEVA, TIMOTHY SOMMERER, GE Global Research — The LSP (Large-Scale Plasma) PIC-MCC code has been used to simulate several low-temperature plasma configurations, including a gas switch for high-power AC/DC conversion, a glow discharge and a Hall thruster. Simulation results will be presented with an emphasis on code comparison and validation against experiment. High-voltage, direct-current (HVDC) power transmission is becoming more common as it can reduce construction costs and power losses. Solid-state power-electronics devices are presently used, but it has been proposed that gas switches could become a compact, less costly, alternative. A gas-switch conversion device would be based on a glow discharge, with a magnetically insulated cold cathode. Its operation is similar to that of a sputtering magnetron, but with much higher pressure (0.1 to 0.3 Torr) in order to achieve high current density. We have performed 1D (axial) and 2D (axial/radial) simulations of such a gas switch using LSP. The 1D results were compared with results from the EDIPIC code. To test and compare the collision models used by the LSP and EDIPIC codes in more detail, a validation exercise was performed for the cathode fall of a glow discharge. We will also present some 2D (radial/azimuthal) LSP simulations of a Hall thruster.

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