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Speed-Limited Particle-in-Cell Simulation of Townsend Discharge[1] JOSEPH THEIS, GREGORY WERNER, University of Colorado, Boulder, THOMAS JENKINS, Tech-X Corporation, JOHN CARY, University of Colorado, Boulder — Townsend discharge has been simulated using the speed-limited particle-in-cell (SLPIC) algorithm [1]. This algorithm limits the speed of the fastest electrons in the simulation to enable larger time steps and, therefore, faster computing times. The SLPIC algorithm facilitates a straightforward, fully-kinetic treatment of effects such as secondary emission and collisions. In this application, we simulated the amplification of a current accelerating across an argon-filled voltage gap, including electron-impact ionization, electron-neutral elastic collisions, and ion-induced secondary-electron emission. SLPIC provided more than an order of magnitude speed-up. SLPIC correctly determined the breakdown voltage (where the electron avalanche begins). [1]Werner, G. R., Jenkins, T. G., Chap, A. M., Cary, J. R. (2018). Speeding up simulations by slowing down particles: Speed-limited particle-in-cell simulation. Physics of Plasmas, 25(12), 123512.

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