Particle-in-Cell Simulation of Low-Temperature Atmospheric Pressure Plasmas for Biomedical Applications

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Debye number (N_D) is a physical number [1], which is the average number of electrons in a plasma contained within Debye sphere or length. The number of super particles in a numerical cell of PIC simulation [2] is N_C. In 1D, N_C is the same as N_D. Results of particle simulations is sensitive to N_D [1,2]**.** With N_D increasing, the electron temperature is increasing and the electron density is decreasing as the number of MCC ionization is decreasing**.** The physical quantities such as the electron temperature T_e, the electron energy probability function (EEPF), and the plasma density are sensitive and should be obtained via a proper numerical convergence. N_D should be larger than 500 or 1000 [1,2] although the computational speed is slow at the atmospheric pressure for microwave discharge, which is the major subject of the present study for the biomedical applications.

[1] M. M. Turner, Phys. Plasmas 13, 033506 (2006)

[2] H.C. Kim, F. Iza, S.S. Yang, M. Radmilovic-Radjenovic, and J.K. Lee, J. Phys. D: Appl. Phys. 38 , R283-R301 (2005)