STUDY OF THE LIMITING CURRENT IN A DIODE BY ELECTROMAGNETIC PARTICLE-IN-CELL SIMULATION

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The limiting current of an electron beam with a short pulse, i.e. the pulse length is shorter than the gap separation of a diode, and a finite pulse width was studied by using the electromagnetic particle-in-cell simuation. The scaling law of the limiting currents shows that the second power of the ratio of the pulse width and the pulse length dominates in the equation, which is different from the scaling law of the limiting current for a long pulse with the first power of the same scale factor by setting the pulse length as the gap separation of the diode[1,2]. The simulation results infer that the electrostatic model can not provide the correct estimation of the limiting current for a short electron pulse in a diode even at non-relativisitc regime. The physical details will be presented in the paper.

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2. Y. Y. Lau, Phys. Rev. Lett. 87, 278301 (2001).

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