Abstract Submitted
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Darwin Particle-in-Cell Code Simulations of Dual Frequency Capacitively Coupled Discharges on Graphical Processing Units DENIS EREMIN, Ruhr University, PHILIPP MERTMANN, MARKUS GEBHARDT, THOMAS MUSSENBROCK, RALF-PETER BRINKMANN, Ruhr University Bochum — Demands of the industrial plasma-assisted production processes drive frequency and size of the plasma discharges to ever higher values. Under such conditions the electromagnetic effects, such as the standing surface wave or the skin effect begin to play a significant role. So far there has been no fully self-consistent kinetic tool for description of such plasmas. A particle-in-cell (PIC) code offers such a tool. To circumvent Courant condition, severly limiting applicability of the explicit electromagnetic PIC simulations, we use Darwin approximation to solve for the electromagnetic fields, whereby the transversal component of the displacement current is neglected in the induction law. We demonstrate that all the important effects are reproduced in the framework of Darwin approximation both analytically and numerically. PIC codes are amenable to the parallelization on the graphical processing units (GPUs), a recent development in the field of high performance scientific computing. We will demosntrate a significant speedup of the PIC code massively parallelized on a single GPU or a cluster of GPUs compared to the calculations on a single CPU.

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