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Two-dimensional particle-in-cell simulation for the control of the standing wave effect in a dual-frequency capacitively coupled plasmas[1]
CHANG HO KIM, HAE JUNE LEE, Pusan National University — The high driving frequency of a capacitively coupled plasma (CCP) is helpful to achieve a high plasma density, but the plasma non-uniformity caused by the standing wave effect is a significant drawback especially for a large scale wafer. It was experimentally reported that the addition of a low-frequency source is helpful for the mitigation of the standing wave effect [1], but the underlying kinetic effects are not fully understood yet. In this study, a two-dimensional GPU-based PIC simulation is utilized for the investigation of the mitigation of the standing wave effect by low-frequency driving power. The standing wave effect in the electrostatic PIC simulation is mimicked with the addition of the electron acceleration by the analytic standing wave solution with the Darwin model for electromagnetic plasma simulation. With the addition of the low-frequency driving power, the transport and heating of electrons show different behaviors for the non-local and the local kinetics. [1] K. Zhao, Y.-X. Liu, K. Kawamura, D.-Q. Wen, M. A. Lieberman, and Y.-N. Wang, Plasma Sources. Sci. Technol. **27**, 055017 (2018).

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