Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

A hybrid model to estimate particle fluxes in a fluid mode using a particle-in-cell Monte Carlo collision method[1] SEOK WON HWANG, HO-JUN LEE, HAE JUNE LEE, Department of Electrical Engineering, Pusan National University — Fluid models have been widely used in plasma simulations and conducted successfully under near-atmospheric pressure conditions such as plasma display panels and atmosphere pressure plasma devices. However, fluid models have drawbacks in low pressure conditions because they cannot describe exact energy distribution of species in spatial and temporal domains. As a result, fluid models are not able to calculate the transport and the reaction coefficients, nor represent nonlocal effects at low pressure. In order to minimize these, the Monte Carlo collision (MCC) methods have been additionally used to obtain the energy distribution function of each species, especially for electrons in conventional hybrid models. Another problem in conventional fluid models is to utilize a drift-diffusion approximation (DDA) for transport fluxes for electrons and ions instead of the momentum conservation equation. However, if DDA is used at low pressure, the flux is overestimated because the approximation assumes the instant local balanced steady state from collisions. In this work, a new hybrid method is introduced to provide the correct flux using particle-in-cell (PIC) coupled with MCC instead of DDA. The results of the modified hybrid simulation show better agreement with a full PIC simulation. In addition, the effect of boundary conditions on the potential and density distribution is investigated.

[1]This work was supported by National Fusion Research Institute (NFRI) in South Korea.

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Date submitted: 14 Jun 2013 Electronic form version 1.4