Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

**A particle-in-cell/Monte Carlo simulation of a capacitively coupled chlorine discharge** JON T. GUDMUNDSSON, University of Iceland, SHUO HUANG, University of Michigan - Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University — We demonstrate the oopd1 (object oriented plasma device for one dimension) particle-in-cell/Monte Carlo simulation tool for the capacitively coupled chlorine discharge with a comprehensive reaction set. The simulation results are compared with available experimental measurements and good agreement is achieved. We explore a typical capacitively coupled chlorine discharge operated at both single frequency and dual frequency using oopd1 and obtain key plasma parameters, including particle density, effective electron temperature, electron energy probability function and ion energy and angular distributions for both $Cl^+$ and $Cl_2^+$ ions. The dependence of the plasma parameters on the discharge pressure is systematically investigated. As the pressure increases from 5 mTorr to 100 mTorr, the heating mechanism evolves from both stochastic and ohmic heating to predominantly ohmic heating and the electron heating outweighs the ion heating at high pressure. The creation of $Cl^+$ ions in the sheath region is mainly due to conversion from $Cl_2^+$ ions to $Cl^+$ ions through non-resonant charge exchange, while in the bulk region the creation of Cl+ ions is mainly ascribed to electron impact ionization processes.

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Date submitted: 07 Jun 2013 Electronic form version 1.4