Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Particle simulation of a micro inductively coupled plasma source including an external circuit YOSHINORI TAKAO, MASATAKA SAKAMOTO, KOJI ERIGUCHI, KOUICHI ONO, Department of Aeronautics and Astronautics, Kyoto University, Japan — A numerical study of micro inductively coupled plasma (ICP) sources has been conducted. We employ a two-dimensional axisymmetric particle-in-cell with Monte Carlo collisions (PIC-MCC) method, where a transformer model including the effect of capacitive coupling is incorporated. The plasma source is 5 mm in radius and 10 mm in length with a 5-turn helical coil around a cylindrical quartz chamber, where the Ar and Xe plasmas are excited. The simulation was performed for pressures in the range $1-500$ mTorr and rf frequencies in the range $1-500$ MHz at rf powers less than 10 W. The results indicated that capacitive coupling dominated over inductive coupling and the most of the rf power was deposited in the bulk area at high pressures while the power was absorbed in the sheath area at low pressures. On the other hand, the circuit model was also applied to a conventional large ICP source, and then the result showed that inductive coupling dominated over capacitive coupling. The micro ICP would be E-mode dominated plasmas under the present conditions.

Yoshinori Takao
Department of Aeronautics and Astronautics, Kyoto University

Date submitted: 15 Jun 2012 Electronic form version 1.4